

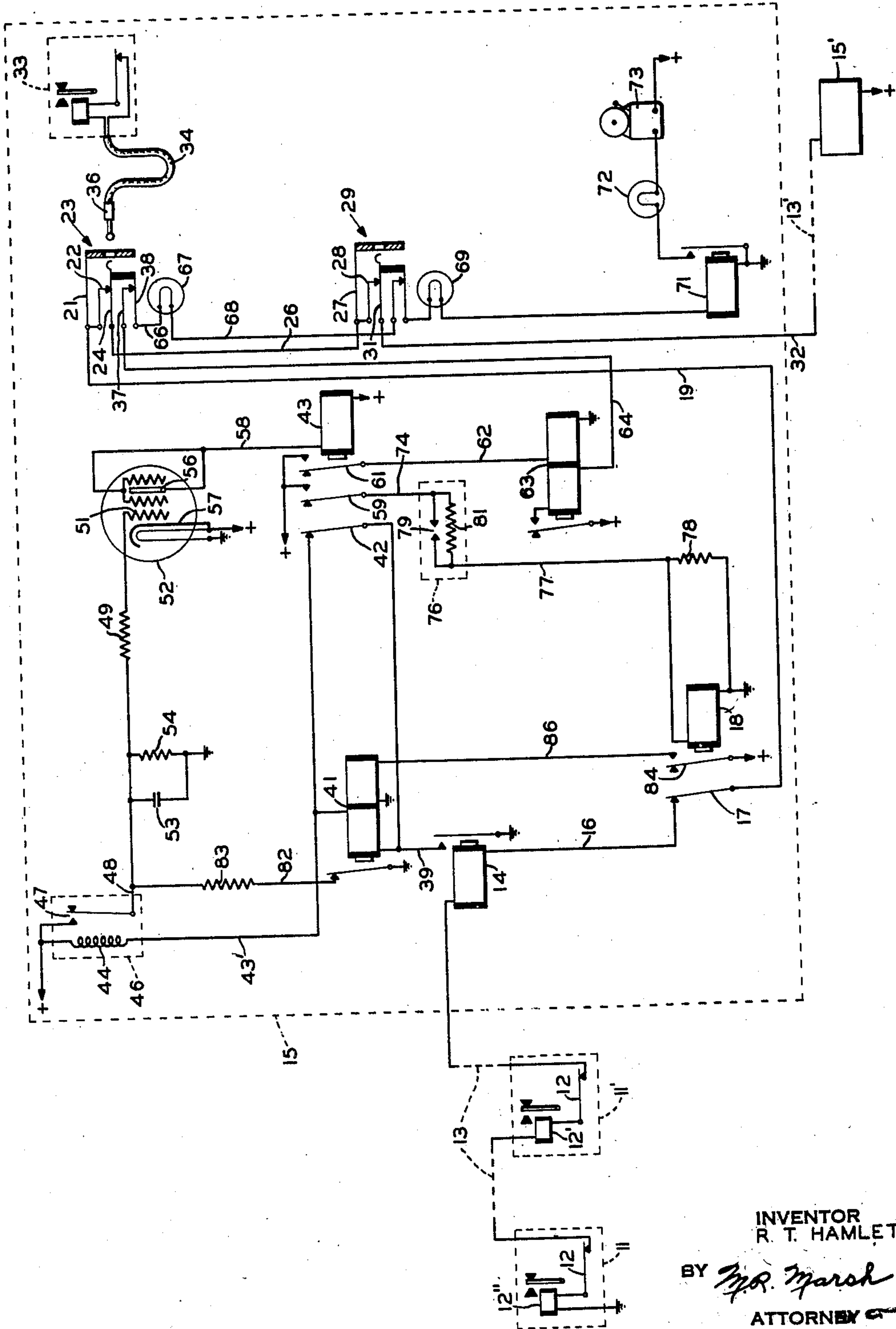
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ANSWER-BACK TELEGRAPH SYSTEM

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ANSWER-BACK TELEGRAPH SYSTEM

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This invention relates generally to an answer-back telegraph system and more specifically to that type of telegraph system wherein a calling station receives a predetermined so-called answer-back signal from a called station to indicate that the called station has received and recorded the call.

The invention is hereinafter described in connection with or as applied to a Morse way-wire or circuit which has associated therewith a concentrator position. A Morse way-wire circuit, as well known, is one wherein Morse instruments such as keys and sounders are employed in transmitting and receiving the signals and although the invention is described in connection with such a circuit, it will be obvious hereinafter that the principles thereof can equally well be applied to various other types of circuits and those using other types of instruments. A concentrator of the type with which the invention is described and shown is a position at a central office where a plurality of similar way-wire circuits terminate or are looped in multiple positions. In the embodiment shown the concentrator position is connected to the way-wire circuit through a selector, as is the usual practice, the selector operating in response to a predetermined set of signals to notify the concentrator operator that a call has been received. Although as shown in the drawings and hereinafter described, only the concentrator position is associated with a selector the various other stations on the circuit could be associated with selectors through an arrangement similar to that shown or any one of a plurality of other well-known arrangements.

On a way-wire circuit, such as that along a railroad right-of-way, a large percentage of the business carried over the wire is usually between various way stations and only a small percentage of the business or messages are relayed through the central office for retransmission to other circuits. Accordingly, it is advantageous to have the central office connected to the way-wire by a selector and when a message originating at a way station is to be relayed through the central office, the selector responds to a predetermined signal or set of signals to notify the central office a call is registered. The central office may have several such way-wires terminating thereat or looping therethrough, and the usual practice is to have all such way-wires terminate or loop through a concentrator position. The concentrator position enables operators at the central

office to connect to any one of the way-wire circuits at a time and normally the operators are not connected to any particular circuit. When an operator at a way station selectively calls the central office, the operator at the central office may be busy on another circuit and therefore unable to answer the call immediately. The way station operator has no way of determining whether or not his call is registered at the central office and may therefore call several times before the central office has a chance to answer his call. Such an arrangement results in inefficient use of the wire and loss of the operator's time.

In accordance with the invention an answer-back arrangement is provided whereby the called station automatically transmits to the line a set of predetermined signals to inform the calling station that his call has been received and will be answered as soon as possible.

In conjunction with the above it is another object of the invention to provide an answer-back system or arrangement wherein the called station automatically transmits a predetermined answer-back signal and after the transmission thereof the line is restored to normal so it can be used for other services if desired.

Still another object of the invention is to provide an answer-back system wherein the operator at a called station may stop or break the transmission of the answer-back signal to answer the call and not be required to wait until the entire answer-back signal has been transmitted, thus enabling more efficient use of the line.

Still another object of the invention resides in the arrangement whereby any of the stations or operators along the circuit may break in and stop the transmission of the answer-back signals in the event the particular operator considers he has business which may be of more importance than that between the original calling and called stations, such as so-called flash news which usually has precedence over other messages on particular circuits.

Still another object of the invention resides in its simplicity, ease of maintenance, reliability, and the low cost thereof.

Still another object of the invention resides in the arrangement whereby the answer-back signals may be readily varied so that each station on a circuit may have its particular arrangement of answer-back signals.

These and other objects of the invention will be more apparent hereinafter when taken in con-

junction with the drawing and the detailed description of the invention.

In the drawing a way-wire circuit 13 is shown, at the left thereof, connecting two way stations, indicated in general by reference numerals 11 and 11', each with key and sounder sets such as 12 and 12', respectively, together with the apparatus at a central office such as that represented within the dot-dashed rectangle 15. The way-wire 13 continues from the central office 15 through another section such as 13' thereof to a station 15' which may have apparatus therein similar to the way stations 11 or to the central office station 15. As shown the left hand end of the way-wire is grounded at the way station 11 and has potential connected thereto at the station 15'. As well-known, the operation of a way-wire station is such that signals transmitted from any station are received or passed through all the other stations on the circuit and the signals consist of opened and closed line conditions in various sequences to represent the messages or information transmitted.

The way-wire circuit 13 from the way station 11' is connected to one of the terminals of the winding of a line relay 14 at the central office 15. The other terminal of the winding of relay 14 is connected by a conductor 16 to the back stop associated with a tongue 17 of a relay 18. The tongue 17 of the relay 18 is connected by a conductor 19 to the elements or members 21 and 22 of a jack indicated in general by reference numeral 23. The element 22 of the jack 23 normally contacts an element 24 thereof to complete a circuit from the conductor 19 to a conductor 25. The conductor 26 continues the circuit through the elements 27 and 28 of a jack 29. As in the jack 23, the element 28 normally contacts an element 31 to complete the circuit to a conductor 32 which is connected through the section 13' of the way-wire circuit and station 15' to potential. Jacks such as 23 and 29 are connected in multiple and located in various sections or positions of the concentrator to enable an answer set such as 33, comprising a key and sounder, to be plugged therein to answer various calls that may be received or to transmit over the way-wire circuit. The answer set 33 is connected by a cord circuit 34 to a plug 36 which upon insertion in one of the jacks, such as 22, connects the answer set 33 in series with the way-wire, separating the elements such as 22 and 24 while at the same time opening normally closed contacting elements 37 and 38. The purpose or function of the elements 37 and 38 will hereinafter be pointed out.

From the above described arrangement of the circuits which are shown in their normal position, it will be obvious that the way-wire circuit 13 is in a normally closed position and with the plugs 36 of an answer set 33 out of the jacks, such as 23 or 29, the answer set or sets at the central office are normally unresponsive to signals transmitted over the circuit. Accordingly, the way stations such as 11 and 12 can communicate with one another without bothering or affecting the central office or having the central office answer set instruments respond to such transmissions.

The operation of the various circuits will now be described in conjunction with the transmission of a message from one of the way stations to the central office for delivery thereat or for relay to any one of a number of other stations not connected to the particular way-wire 13. When a way station desires to call the central office the operator thereat transmits a predeter-

mined series of calling signals which, like all of the signals transmitted over the way-wire 13, operate the line relay 14. The line relay 14 has a grounded tongue with an associated make stop connected by a conductor 39 to one of the terminals of the left hand coil of a relay 41 in parallel with a tongue 42 of a relay 43. The break stop of relay 43 associated with tongue 42 together with the other terminal of the left hand coil or winding of relay 41 are connected by a conductor 43' through the operating coil 44 of a selector 46 to battery. The selector 46 is of the well-known Gill selector type which operates in response to the predetermined series of signals to close a set of contacting elements such as 47. The contacting elements 47 are normally open and only close after the operating coil 44 of the selector has been energized and deenergized in a predetermined manner in accordance with the predetermined series of signals.

The receipt of the predetermined series of signals over the circuit 13 from a way station operates the line relay 14 to actuate the tongue thereof to apply ground to the above described circuits and operate the selector 46 to close the contacts 47. In the normal position of the relay 43, which is unoperated, the tongue 42 thereof contacts its back stop and serves as a shunt around the left hand coil of the relay 41 and hence for the above described conditions the relay 41 is not operated.

The closing of the contacting elements 47 in the selector 46 applies positive potential over a conductor 48 and through a resistance 49 to a control electrode or grid 51 of a space discharge device 52 such as a thermionic or vacuum tube. A grounded condenser 53 and a grounded resistance 54 are connected to the conductor 48 as shown and comprise a grid leak for timing or controlling the operation of the vacuum tube 52 in a manner hereinafter pointed out. The application of positive potential on the controlled grid 51 renders the tube 52, which heretofore was non-conducting, conducting and permits the passage of current between the plate 56 and the cathode 57. The plate 56 is connected by a conductor 58 to the coil of the relay 43, the other end of which has positive potential thereat. As the plate 56 passes current the relay 43 is operated and the various tongues thereof including the heretofore mentioned tongue 42 are positioned in an operated position.

In addition to the tongue 42, the relay 43 has tongues 59 and 61. The make-stops associated with the tongues 59 and 61 have positive potential applied thereto, and as the relay 43 is energized to operate the tongues to their operated positions, the positive potential is applied through the tongue 61 over a conductor 62 and through the right-hand coil of a relay 63 to ground. The above described circuit renders the relay 63 operative and moves the tongue thereof into contact with its associated make-stop. The tongue of the relay 63 has positive potential applied thereto, and as it contacts its associated make-stop, a circuit is completed therefrom through the left hand winding of the relay 63, over a conductor 64, through the elements 37 and 38 of jack 23 and over a conductor 66 to a lamp 67. The circuit from the lamp 67 continues over a conductor 68, through elements of jack 29, similar to 37 and 38 in jack 23, thence through a second lamp 69 and the coil of a relay 71 to ground. The above described circuit serves as a locking circuit for the relay 63 when the circuit to the right hand coil is broken in a man-

ner hereinafter described. The completion of the above described circuit also renders the lamps 67 and 69 operative to indicate that the particular concentrator position with which the way-wire 13 is associated has a call thereon. Signal lamps like 67 and 69 are associated with jacks such as 23 and 29 in the various multiple positions of the concentrator to indicate into which ones of the jacks a plug, such as 36 of an answer set 33, may be inserted to answer the call from the calling way station. The relay 71 in series with the lamps 67 and 69 is operated simultaneously with the illumination of the latter, and on the operation of the relay 71, the grounded tongue thereof engages its associated make-stop to complete a circuit through signaling devices, such as a lamp 72 and a bell 73. The signaling devices 72 and 73 are common to each way-wire passing through or terminating at the concentration and serve to indicate that there is a call in the concentrator, while the signal lamps 67 and 69 indicate which particular way-wire the call is on.

To answer the call, the operator at the central office, as hereinbefore set forth, inserts the plug 36 of an answer set 33 in one of the jacks such as 23 and 29. The insertion of the plug 36 in the jack 23 separates the elements 22 and 24 and places the answer set 33 in series with the way-wire circuit 13 and thereby renders it capable of receiving or transmitting signals over the circuit. The insertion of the plug in the jack also separates elements 37 and 38 which opens the circuit to the signal lamps 67 and 69 and the relay 71. As the circuit to the lamps and relay are opened, they no longer are illuminated and the tongue of the relay 71 returns to its unoperated position to open the circuit to the signaling elements or devices such as 72 and 73 and to render the same inoperative. Thus, it will be noted that when a call is made, the signal lamps 67 and 69 are illuminated, and when the call is answered the same are rendered inoperative. It will be noted that the circuit through the left hand winding of the relay 63 is a locking circuit and remains completed when once established until interrupted or broken by the insertion of a plug in one of the jacks. This circuit is independent of the way-wire and remains completed when once established regardless of other signals being transmitted over the way-wire until the call is answered at the concentrator.

The tongue 59 of the relay 43 is connected by a conductor 74 through a thermal unit 76, hereinafter described in more detail and thence over a conductor 77 through the coil of relay 18, in parallel with a resistance 78, to ground. The thermal unit 76 has a set of contacting elements 79 therein, together with a controlling resistance winding 81. On the application of potential to the winding 81, it heats up and after an adjustable period causes the normally open contacting elements 79 to close. The closing of the contacting elements 79 shunts the circuit around the winding 81, allowing the same to cool, which subsequently permits the contacting elements 79 to open. The construction of the thermal unit and operation thereof is well understood and only the brief description of the operation thereof as set forth above is believed necessary for an understanding of the invention. The above closing and opening of the contacting elements 79 continue as long as a circuit is complete there-through, and in the preferred embodiment of the invention the time constants of the thermal

unit 76 are preferably set so that the contacting elements close two or three seconds after the circuit such as the above is completed and remain in a closed condition for two or three seconds. The thermal unit 76 may be adjustable to vary the time required to close the contacting elements thereof and to vary the length of time the same are in a closed condition for reasons hereinafter apparent.

The resistance of the operating coil 81 of the thermal unit 76, the resistance 78 and the winding of the relay 18 are such that with the contacting elements 79 open there is insufficient current passing through the relay 18 to operate or hold the same in an operated condition on the completion of the above described circuit by the tongue 59 of relay 43 making with its make-stop. However, with the contacting elements 79 closed the winding or operating coil 81 is shunted and sufficient current is allowed to pass through the circuits from the tongue 59 to operate the relay 18. Accordingly, the relay 18 is operated each time the contacting elements 79 close and remains in an operated condition until the contacting elements 79 open whereupon it returns to its unoperated condition.

The tongue 42 of relay 43 moving to its operated position removes the shunt hereinbefore described normally existing around the left hand coil of the relay 41 and therefore with the tongue 42 in its operated position the left hand coil of the relay 41 will accordingly be energized in substantial synchronization with the operation of the line relay 14.

After the transmission of the selector code which causes the operation of the selector 46 as pointed out above, the calling operator closes the line at his station and accordingly the line relay 14 will be operated, which in turn causes the operation of the relay 41 by the left hand coil thereof through the above described circuits. The grounded tongue of the relay 41 normally applies ground through its back-stop and over a conductor 82 through a resistance 83 to the conductor 48, and accordingly on the operation or energization of relay 41 the ground at this point on the above conductor is removed. The purpose of the relay 41 and function thereof will hereinafter be pointed out in connection with the circuit to the right hand coil thereof.

Two or three seconds after the operation of the relay 43, the time depending upon the adjustment of the thermal unit 76, the contacting elements 79 therein close to cause the operation of the relay 18 as pointed out above. The operation of the tongues of the relay 18 to their energized position on the energization of the relay 18 is arranged so that the tongue 84 thereof contacts its make-stop prior to the opening of the circuit through the tongue 17 and associated break stop. The purpose of this adjustment of the stops associated with the tongues 17 and 84 of relay 18 will appear hereinafter. The tongue 84 has battery applied thereto and the make stop is connected by conductor 86 through the right hand coil or winding of relay 41 to ground and holds the tongue of the latter relay in its operated position when the circuit to the left hand coil of the same relay 41 is open. As stated above, the tongue 17 breaks with its break stop shortly after the tongue 84 contacts its make stop and this operation of the tongue 17 opens the way-wire circuit 13 at the tongue 17.

The opening of the circuit 13, as is the usual practice, causes all the instruments connected

thereto to return to their unoperated position and in addition allows the tongue of the line relay 14 to return to its unoperated position. This movement of the tongue of relay 14 opens the circuit to the left hand coil of relay 41 and also to the coil of the operating winding 44 of the selector 46. The opening of the circuit through the operating winding 44 of the selector 46 allows the contacting elements 47 to open, which when closed as pointed out above, in addition to rendering the thermionic tube 52 conductive, placed a positive charge on the condenser 53 of the grid leak. The positively charged condenser 53 maintains the tube 52 conducting for a period of about fifteen seconds or until the positive charge has dissipated from the control grid 51 and leaked to ground through the resistance 54. The length of time the tube is maintained conducting can be varied by changing the values of the condenser 53 and the resistance 54 to allow the charge to leak off in a shorter or longer interval of time, the fifteen seconds being the time desired in the preferred embodiment of the invention.

As hereinbefore stated, the closing of the contacting elements 79 in the thermal unit 76 short circuits the operating winding 81 thereof, allowing the same to cool, whereupon the contacting elements 79 open. The contacting elements 79 are so adjusted that they will remain closed for approximately two or three seconds and require approximately the same time to again close after opening. As the contacting elements 79 open, the value of the current in the relay 18 decreases to such an amount that it no longer holds the tongues 17 and 84 thereof in their operated positions whereupon the same return to their normal position. The sequence of operation of the tongues 17 and 84 in returning to their unoperated positions is in reverse to that in moving to their operated positions with respect to the associated stops thereof, that is the tongue 17 makes with its break stop before the tongue 84 breaks from its make stop. The making of the tongue 17 with its break stop again closes the way-wire circuit to energize all the instruments connected thereto while the breaking of the tongue 84 from its make stop interrupts the circuit to the right hand winding of relay 41. However, the tongue of relay 41 does not return to its unoperated position because at the time the circuit in the right hand coil is interrupted, the circuit through the left hand coil is completed due to the closing of the circuit 13 which operates the relay 14 to complete the circuit through the said left hand coil by way of the tongue 17 of relay 18 and its break stop.

Thus, as long as the relay 43 remains in an energized condition, the relay 18 is periodically energized and deenergized to control its tongues in accordance therewith and the operation of the tongue 17, as stated above, opens and closes the line circuit to send signals to all of the receiving instruments in the line circuit.

As before stated, the positive charge of the condenser 53 is allowed to leak off and render the tube 52 non-conductive about fifteen seconds after the contacting elements 47 in the selector 46 are opened, the latter being opened and staying open on the first operation of the relay 18 to open the circuit 13. As the tube 52 returns to its normal non-conducting condition, the circuit through the relay 43 is interrupted and the tongues thereof returned to their normal unoperated positions. The tongue 51 of

relay 43 returning to its normal position, opens the circuit through the right hand winding of relay 63. However, this relay is maintained in its energized position by the locking circuit through the left hand coil and tongue thereof. The tongue 59 of relay 43 in returning to its normal position, opens the circuit to the thermal unit 76 and the relay 18 and hence the tongues 17 and 84 thereof return to their normal positions. The tongue 17 in returning to its normal unoperated position returns the circuit 13 to its normal closed condition whereupon it is available for other use. The tongue 42 of relay 43 returning to its normal position reestablishes the short circuit around the left hand coil of relay 41, allowing the tongue thereof to return to its normal unoperated position as the circuit through the right hand coil is subsequently opened at the tongue 84 of relay 18.

Thus, from the above it is evident that on and only on the transmission of a predetermined set or group of signals by an operator at a way station does the apparatus at the central office operate to transmit back to the way station and all other stations on the circuit a second predetermined set of signals or an answer-back signal comprising open and closed line conditions of a prearranged sequence and number, following which the line is restored to its normal position. The transmission of the answer-back signal informs the calling operator that the selector at the central office is functioning properly and that his call is registered in a concentrator position by lamps such as 67 and 69 to inform the operator at the central office that someone has called. However, since the circuit is restored to its normal condition following the transmission of the answer-back signal, the line is not tied up and may be used for other messages before the operator at the central office has time to answer the call.

When a call is registered at the concentrator position, an operator thereat may be available to immediately answer the call, and in order to save the operator's time it is advantageous that the answering operator be able to answer the call immediately and not be required to wait for the transmission of the entire answer-back signal. The manner in which an answering operator is capable of stopping further transmission of the answer-back signals prior to the transmission of a complete set will now be described. In answering a call the operator at the central office inserts a plug, such as 36, of his answer set in one of the jacks, such as 23, and acknowledges the call by actuating the key. If at the time he inserts the plug in the jack the answer-back signals are still being transmitted, he opens his key and leaves it open for a length of time approximately equal or slightly in excess of that necessary for the automatic answer-back mechanism heretofore described to transmit one of the signals of the answer-back group.

The opening of the way-wire circuit 13 at the key of the answer set causes the tongue of the line relay 14 to return to its unoperated position, if the same is not already in this position, due to the opening of the line circuit at the tongue 17 of the relay 18. With the tongue of the relay 14 in its unoperated position the circuit to the left hand coil of the relay 41 is interrupted and as the circuit to the right hand coil, if not at this time interrupted, will be interrupted in the next subsequent deenergization of the relay 18, the tongue of relay 41 will return to its nor-

mal position. The tongue of relay 41 in returning to its unoperated position, applies ground through the break stop associated therewith, the resistance 83 and conductor 48 to the grid-leak comprising the condenser 53 and resistance 54. The application of ground to the grid-leak allows the positive charge on the condenser 53 to leak off quickly and remove the positive potential from the control electrode or grid 51 of the thermionic tube 52. Thereupon the tube 52 becomes non-conductive, the relay 43 controlled thereby is deenergized and the tongues of the relay 43 return to their normal unoperated positions. Upon the deenergization of the relay 43 the tongue 59 thereof opens the circuit to the thermal unit 76 so that relay 18, will no longer operate to transmit the answer-back signal through opening of the way-wire circuit at the tongue 17 thereof.

After leaving his key open for a sufficient length of time to insure the return of the thermionic tube 52 to its normal or non-conducting condition, as above described, the central office operator through operation of his answer set key instructs the way station operator to proceed with the transmission of the message. Thus, from the above it is evident that the operator at a called station can interrupt the transmission of the answer-back signals and is not required to wait until the entire set of answer-back signals has been transmitted.

In a similar manner any other operator on the circuit, such as one who has so-called flash news, may interrupt the transmission of the answer-back group of signals by merely opening the circuit at his station and leaving the same open for a period of time sufficient to allow an answer-back mechanism, which may be operating at this time, to return to its normal position in the manner described above. This feature of enabling a called station, as well as any of the other stations on the circuit, to interrupt the transmission of the answer-back set or groups of signals constitutes one of the features of the invention and enables a way-wire circuit, such as the one described, to operate or be operated more efficiently.

Although the invention has been described as employing a selector and an answer-back arrangement only at the central office, it will be obvious that a selector and answer-back arrangement could be employed at any one or all of the so-called way stations, such as 11 and 11'. Obviously, where a number of selectors are employed in a single way-wire circuit, each has a particular group of signals assigned thereto to which it is responsive, and accordingly only operates to close its associated contacts, such as 47, when the particular assigned set of signals are received. When more than one answer-back arrangement is employed on a single way-wire circuit, the signals transmitted from each answer-back position may be distinguished from those transmitted from other such positions by adjusting the timing characteristics of the thermionic units, such as 76, and/or the condensers and resistances, such as 53 and 54 of the grid-leaks. As appears from the above, varying the time characteristics of the grid-leak will vary the length of time that the answer-back signals are transmitted, while varying the adjustment of the thermionic unit 76 will vary the frequency or number of signals transmitted in a given length of time. Accordingly, when there is more than one answer-back arrangement in a circuit, the

signals transmitted from each may have distinguishing characteristics to identify the particular station from which they originate. Where a way-wire, such as that extending between two central offices with one or more way stations in between, the employment of two answer-back arrangements one at each central office, enables the way station to call either one of the central offices and receive an answer-back signal to inform him that he is connected to the desired central office.

It is obvious, of course, that various modifications of the invention, other than those suggested above, may be made without departing from the spirit or essential attributes thereof, and it is desired, therefore, that only such limitations be placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

What is claimed is:

1. In a telegraph system, a central office station, a plurality of way stations, a way-wire connecting said stations normally in a closed condition, means at said central office station responsive to signals from any of said way stations for initiating the automatic transmission of a predetermined sequence of signals from said central office station to all of said way stations, means operative thereafter for returning said way-wire to normal condition and means at all of said stations operative during the transmission of said predetermined sequence of signals for stopping transmission thereof and returning said way-wire to said normal condition.

2. In a Morse answer-back telegraph system, a Morse way-wire circuit, a plurality of way stations along said circuit, each with key and sounder sets, a central station, selector means at said central station responsive to the selective operation of a key at any of said way stations, means controlled by said selector means on the selective operation thereof to initiate the transmission to said circuit for a first predetermined length of time of a predetermined sequence of signals, means responsive to the opening of a key for at least a second predetermined length of time at any one of said way stations during the transmission of said predetermined sequence of signals to stop further transmission thereof on the subsequent closing of said key, said second predetermined length of time being less than that required to transmit the remainder of said predetermined sequence of signals at the time said key is opened.

3. In an answer back telegraph system, a calling station, a called station, a circuit connecting said stations normally in a closed condition, an answer back arrangement at said called station, means at said calling station for initiating the operation of said answer back arrangement at said called station to start the transmission of a predetermined sequence of answer back signals to said called station, means for automatically returning said circuit to said normal condition following the transmission of said predetermined sequence of signals and means at both of said stations for stopping the transmission of said predetermined sequence of signals before the complete transmission thereof and returning said circuit to said normal closed condition.

4. In an answer back telegraph system, a calling station, a called station, a circuit connecting said stations normally in a closed condition, an answer back arrangement at said called station, means at said calling station for initiating

the operation of said answer back arrangement at said called station to start the transmission of a predetermined sequence of answer back signals to said called station, means for automatically returning said circuit to said normal condition following the transmission of said predetermined sequence of signals and means operative at either of said stations during the transmission of said predetermined sequence of answer back signals for stopping further transmission thereof and returning said circuit to said normal closed condition.

5. In a Morse answer-back telegraph system, a normally closed Morse way-wire, a plurality of way stations connected by said way-wire, at least one of said stations being a calling station and at least one of said stations being a called station, selective means at said called station or stations responsive to predetermined calling signals, automatically operative means controlled by said selective means for normally alternately opening and closing said way-wire a plurality of times not exceeding a predetermined number and means for opening and closing said way-wire for a lesser number of times than said predetermined number.

6. In a Morse answer-back telegraph system, a normally closed Morse way-wire, a plurality of way stations connected by said way-wire, at least one of said stations being a calling station and at least one of said stations being a called station, selective means at said called station or stations responsive to predetermined calling signals, automatically operative means controlled by said selective means for normally alternately opening and closing said way-wire during a period not exceeding a predetermined length and means for opening and closing said way-wire for a shorter length of time than said predetermined length of time.

7. In a Morse answer-back telegraph system, a normally closed Morse way-wire, a plurality of way stations connected by said way-wire, at least one of said stations being a calling station and at least one of said stations being a called station, selective means at said called station or stations responsive to predetermined calling signals, automatically operative means controlled by said selective means for normally alternately opening and closing said way-wire a number of times not exceeding a predetermined number and means operative on the independent opening of said way-wire for at least a predetermined length of time during the said alternate opening and closing thereof for rendering the means controlled by said selective means inoperative to further open and close said way-wire.

8. In a Morse answer-back telegraph system, a normally closed Morse way-wire, a plurality of way stations connected by said way-wire, at least one of said stations being a calling station and at least one of said stations being a called station, selective means at said called station or stations responsive to predetermined calling signals, means controlled by said selective means for normally alternately opening and closing said way-wire a number of times not exceeding a predetermined number, means operative following such alternate opening and closing of said way-wire for returning said way-wire to said normal closed condition, and means controlled from any one of said stations for returning said way-wire to said normal closed condition during such alternate opening and closing thereof.

9. In an answer-back telegraph system, a nor-

5 mally closed way-wire circuit, a plurality of stations along said way-wire circuit, an answer-back transmitting means at at least one of said stations for opening and closing said circuit in a predetermined sequence for a predetermined length of time to transmit answer-back signals, selective means associated with each of said answer-back transmitting means for initiating the operation thereof and means responsive to the opening of said circuit at any point other than at said answer-back transmitting means during the transmission of said answer-back signals for rendering said answer-back transmitting means inoperative to further open and close said circuit.

10. In an answer-back telegraph system, a normally closed way-wire circuit, a plurality of stations along said way-wire circuit, an answer-back transmitting means at at least one of said stations for opening and closing said circuit in a predetermined sequence for a predetermined length of time to transmit answer-back signals, selective means associated with each of said answer-back transmitting means for initiating the operation thereof, means responsive to the opening of said circuit at any point other than at said answer-back transmitting means during the transmission of said answer-back signals for rendering said answer-back transmitting means inoperative to further open and close said circuit and to return said circuit to said normal closed condition on the closing thereof at the said point other than at said answer-back transmitting means.

11. In an answer-back telegraph system, a normally closed way-wire circuit, a plurality of stations along said way-wire, an answer-back transmitting means at at least one of said stations having a main operating cycle comprising a plurality of sub-operating cycles, said sub-operating cycles consisting of one opening and closing of said way-wire circuit, selective means associated with said answer-back transmitting means for initiating the same into a main cycle of operation, means responsive to an extended opening of said circuit at any point other than at said answer-back transmitting means, for a length of time equal to at least that required for said answer-back transmitting means to operate through a sub-cycle of operation, for disabling said answer-back transmitting means and returning said circuit to normal closed condition on the closing thereof at said point.

12. In an answer-back telegraph system, a line circuit, a selector responsive to predetermined signal codes received over said line circuit, a space-discharge device, a signal transmitting means controlled by said space-discharge device for transmitting answer-back signals to said line circuit, means operative on the selective operation of said selector for rendering said space-discharge device effective to control said signal transmitting means to initiate the operation thereof, a first means independent of said selector for controlling said space-discharge device to stop said signal transmitting means following a period of operation thereof of a predetermined length and a second means effective on the opening of said line circuit for at least a predetermined length of time at a point other than at said signal transmitting means during the operation of said signal transmitting means for controlling said space-discharge device to stop further operation of said signal transmitting means.

13. In an answer-back telegraph system, a line

circuit, a selector responsive to predetermined signal codes received over said line circuit, a normally inoperative space-discharge device, a normally inoperative answer-back transmitting means controlled by said space-discharge device, means including said selector for rendering said space-discharge device operative to control said answer-back transmitting means to transmit answer-back signals to said line circuit and means independent of said selector for invariably rendering said space-discharge device inoperative following a period of operativeness thereof of not more than a predetermined length.

14. In an answer-back telegraph system, a line circuit, a selector responsive to predetermined signal codes received over said line circuit, a

5 normally inoperative space-discharge device, a normally inoperative answer-back transmitting means controlled by said space-discharge device, means including said selector for rendering said space-discharge device operative to control said answer-back transmitting means to transmit answer-back signals to said line circuit, a first means independent of said selector for invariably rendering said space-discharge device 10 inoperative following a predetermined period of operation thereof and a second means operative during the operation of said space-discharge device for rendering the same inoperative to control said answer-back transmitting means and thus 15 to stop further transmission thereby.

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