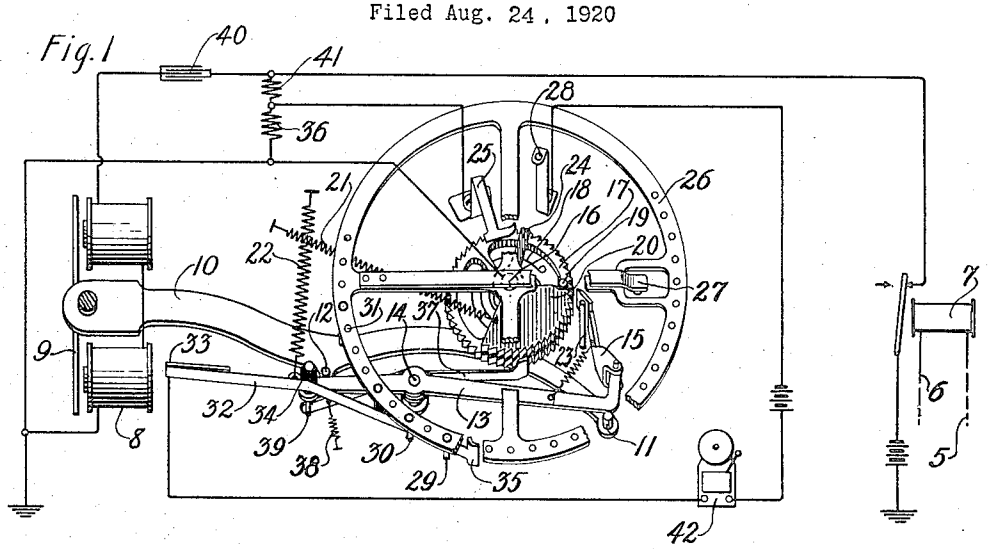
Dec. 18, 1923. 1,478,005

J. C. FIELD

SIGNALING SYSTEM

Filed Aug. 24, 1920

Fig. 1



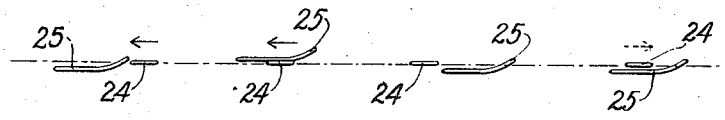
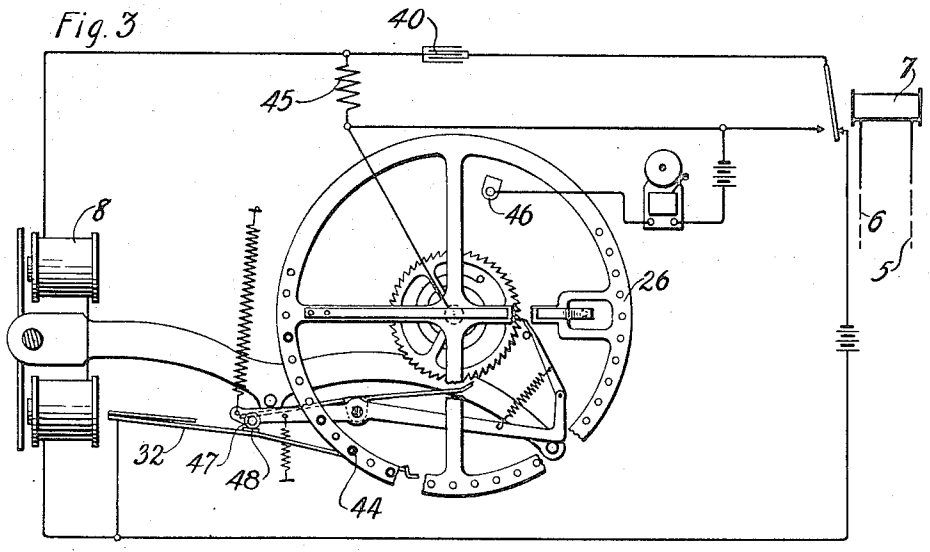


Fig. 2.

Fig. 3



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UNITED STATES PATENT OFFICE.

JOSEPH C. FIELD, OF ORANGE, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

SIGNALING SYSTEM.

Application filed August 24, 1920. Serial No. 405,627.

To all whom it may concern:

Be it known that I, JOSEPH C. FIELD, a citizen of the United States, residing at Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Signaling Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to selective signaling systems and particularly to improvements in selectively-operated circuit-controlling devices of the step-by-step type.

The principal object of this invention is the provision of means whereby a device of the above character may be associated with a line circuit over which telegraph signals are normally flowing and which will respond only to predetermined characteristic code combinations. More specifically the invention contemplates an improved step-by-step circuit control device which may be included in or associated with a telegraph line and which will not be operated by Morse signals but will be actuated by a predetermined combination of code impulses.

One of the novel features of this invention is the provision of means whereby the step-by-step selecting device, after responding to a limited number of telegraphic impulses is rendered non-responsive to additional impulses when transmitted in rapid succession.

Another novel feature of the invention is the provision of a selector arranged with means whereby upon the continued transmission of telegraph impulses, such as for example, Morse impulses, the selecting element after having been advanced to a predetermined position will be restored to normal and the selector rendered non-responsive to the subsequent continuous transmission of such impulses.

The selector of this invention is a modification of that disclosed and claimed in Patent 1,343,256, dated June 15, 1920.

The above and other objects of this invention will be fully set forth in the following description and claims and will be more readily understood by reference to the accompanying drawings in which Fig. 1 is a partial view of a selectively operated circuit controlling device; Fig. 2 is a detailed view illustrating the various relative positions of a set of movable and stationary contacts shown in Fig. 1; and Fig. 3 is an alternative arrangement or modification of Fig. 1.

Referring to the drawings and especially to Fig. 1, there is shown a pair of line conductors 5 and 6 which extend from a central office (not shown) and have connected thereto at different points a plurality of relays 7, only one of which has been shown. This relay controls through its contacts the connection of a source of current with the windings of a polarized electro-magnet 8 which forms a part of the selector. The polarized electro-magnet 8 controls a centrally pivoted armature 9 to which is attached an arm 10 carrying at its free end a pin 11 and at a point intermediate the ends thereof a second pin 12. Both of these pins are adapted to engage a pivoted lever 13. This lever 13 is pivoted at 14 and carries at its upper end a stepping pawl 15. Suitably journalled to the frame (not shown) is a shaft 16 which has mounted thereon a ratchet wheel 17. By means of a spring 18 ratchet wheel 17 is normally retained in a position whereby a pin 19 is in engagement with a toothed sector 20. In order that the sector 20 may be restored to normal independent of the ratchet wheel 17, a retractile spring 21 is attached thereto. Secured to one end of the lever 13 is a spring 22 which serves to retain the stepping pawl 15 against the pin 23 with the stepping pawl 15 out of engagement with the ratchet wheel 17 and the sector 20. The lever 13 is engaged on opposite edges by the pins 11 and 12 and at points on opposite sides of the pivot 14. Thus whenever the armature 9 is moved in either direction in response to the energization of the electromagnet 8, the stepping pawl 15 will be caused to engage a tooth in both the ratchet wheel 17 and the sector 20 for causing a one step movement of each of these members. Secured to the sector 20, or formed integral therewith is a contact arm 24 which is arranged to engage a stationary contact spring 25 as will hereinafter be described. This arm controls the short-circuiting of a resistance 36.

Mounted on the shaft 16, and secured to the ratchet wheel 17 is an element 26 carrying a contact spring 27. This contact spring 27 is adapted to engage contact 28 for effecting the closure of a circuit for causing the operation of an alarm device 42. Posi-

tioned in the element 26 are a plurality of pins 29, 30 and 31. These pins are arranged to cooperate with a holding arm 32 secured at 33 in any suitable manner, such as is clearly shown in the above mentioned patent. Holding arm 32 normally bears against an insulating roller 34 carried by the lever 13. This holding arm is so flexed or bowed that the free end thereof which is provided with a curved projection 35 normally extends inside of the circumference of a circle described by the holding pins in the element 26. When the armature of electromagnet 8 is attracted due to current traversing the windings thereof, the member 10 is also moved for causing an oscillation motion of the lever 13. The lever 13 in oscillating moves the arm 32 so that the projection 35 is outside of the pins in the element 26. The stepping pawl 15 is likewise moved by the actuation of 10 and effects advancement of both the ratchet wheel 17 and the sector 20. When the electromagnet 8 is deenergized the lever 13 is restored to normal by the action of spring 22, which in turn allows the arm 32 to move inward and engage the holding pin which is in the path of the projection 35. The element 26 will thus be mechanically retained in its advanced position.

In order that the ratchet wheel 17 will not be restored to normal by the action of spring 18 during the time that the armature is travelling from one extreme to another in response to a change in current through the electromagnet 8, a holding pawl 37 is provided. This pawl is also pivotally mounted at 14 and is moved into engagement with the teeth of the ratchet wheel 17 by means of a spring 38 upon the actuation of the lever 13. The holding pawl 37 is normally held out of engagement with the ratchet wheel 17 by means of a pin 39 carried by the lever 13. It is to be noted that the holding pawl 37 not only engages the teeth in the ratchet wheel 17 but also those in the sector 20.

In order that the selecting device heretofore described may be connected to a circuit over which Morse impulses are transmitted without danger of advancing the selecting element sufficiently to effect the closure of the signaling contact by such impulses, a condenser 40 is inserted in series with the windings of the electromagnet 8. The electromagnet 8 will thus be energized upon the charging and discharging of the condenser, which is controlled by relay 7. The discharge circuit is a shunt circuit around the condenser and electromagnet including resistances 41 and 36, the latter being larger and short-circuited at times by the circuit including the contacts 24 and 25, and is entirely local, while the charging circuit thereof is completed through the front contact of relay 7. The function of these resistances is to control the rate of discharge of the condenser and in turn the operation of the selecting device. Thus, if the charging circuit of the condenser is opened and closed rapidly with the high resistance in circuit with the condenser and the windings of the electromagnet, there will not be sufficient time between successive closures for the current in this circuit to attain a high enough amperage to energize the electromagnet. However, if the resistance 36 is short-circuited, the electromagnet 8 will be energized upon the rapid opening and closing of the charging circuit of the condenser. In this case the condenser is permitted to discharge through the resistance 41 and the winding of the electromagnets, thereby causing the advancement of the selecting element one step for each energization of the electromagnet. When a series of Morse impulses composing a message are transmitted it is usually the practice to send a starting impulse which causes the deenergization of relay 7 for a time long enought to permit the condenser to discharge through the resistances 41 and 36, and the windings of the electromagnet, thereby energizing the same and causing the advancement of the selecting element one step. Upon the initial operation of the electromagnet, the ratchet wheel 17 and the sector 20 will be advanced one step. The sector 20 in advancing causes the arm 24 to engage contact spring 25, thereby short-circuiting resistance 36 and reducing the value of the resistance in circuit with the windings of the electromagnet and the condenser. As shown in Figure 2, when the arm is moving in the direction of the solid arrow, which will be the case when the sector 20 is stepped around in a counter-clockwise direction, contact is made with the under side of contact spring 25 but when it is moving in the direction of the dotted arrow, due to the release of the sector 20, it passes over contact spring 25 without making contact therewith except at the extreme end of spring 25. Thus, if Morse impulses are tranmitted the ratchet wheel 17 and the sector 20 will be advanced so long as the condenser 40 is permitted to discharge through the resistance 41 and the windings of the electromagnet 8 for effecting the operation of the stepping pawl 15. Such discharge occurs so long as the contacts 24 and 25 are in engagement in the counter-clockwise movement of the sector 20, corresponding preferably to 4 or 5 steps of the stepping pawl. At the end of this movement the contact 24 slips off contact 25, putting the resistance 36 in series with resistance 41 and preventing the effective energization of the electromagnet 8. The armature 9 and arm 10 are returned to neutral position, releasing the stepping and holding pawls and permitting the spring 21 to return the sector 20 in a clockwise direction to its normal position. When the spring

21 is returning the sector 20 to its normal position, the contact 24 will strike the curved portion of the contact 25, and, providing the contact of the relay 7 happens to be open, will again short-circuit the high resistance 36 and permit the condenser to discharge through the low resistance 41 and the coils of the electromagnet 8. This discharging of the condenser, however, is not essential and does not serve to again step the selector around, due to the fact that the contact arm 24 passes quickly over the tip of the curved contact spring 25 and these contacts are in engagement for only a very small fraction of a second. Furthermore, in transmitting Morse signals, the contact of relay 7 will be closed more often than open and consequently the contact arm 24 when released will very likely pass over the contact 25 at an instant when the contact of the relay 7 is closed and when the condenser is being charged by the battery. It will thus be seen that it is not essential that the contact 24 engage the contact 25 when the sector 20 is returning to normal, and that the contact 25 is provided with a curved tip primarily in order to serve as a guide for the contact 24 when it is being advanced step by step in a counter-clockwise direction. It will therefor be apparent that this operation prevents the complete discharge of the condenser and consequently the further advancement of the element 26 by Morse impulses. This is of course only true when the interval between succeeding impulses is such that the condenser does not have sufficient time to completely discharge through the resistances 41 and 36. It is therefore intended to make the value of these resistances relatively high, thereby requiring the lapse of several seconds before the condenser 40 will be completely discharged.

When it is desired to close the signaling circuit contact 28 a definite code in which each digit is represented by four impulses or less, is required to be transmitted. The electromagnet 8 will thus respond in accordance with the energization of relay 7 for causing the advancement of the element 26 to a position in which the contact spring 27 engages contact 28, the element 26 being held in its advanced position due to the engagement of the holding arm 32 with a holding pin arranged in this element. Upon the closure of this contact a circuit is completed including the alarm device 42 with a source of battery. This alarm device will thus be operated for advising the operator at that station that the dispatcher desires to communicate with him.

Referring now to Fig. 3, which illustrates a modification of the arrangement of the structure shown in Fig. 1, instead of employing a toothed sector, a suitable contact in the discharge path of the condenser is opened when the selector reaches a holding position, or, in other words, when the element 26 has been stepped around to a predetermined point a contact in the normal discharge path of the condenser is opened and is held open as long as Morse impulses are being transmitted over the line. In this modification, the normal discharge path of the condenser extends from one side of the condenser, through the windings of electromagnet 8, holding arm 32 and contact 48 thereof, contact 47 and the conducting mechanisms of the selector, back contact of relay 7 to the other side of condenser 40. By discharging over this circuit the condenser 40 serves to short-circuit the high resistance 45 and to operate the electromagnet 8, each energization of the electromagnet serving to advance the element 26. However, after the element 26 has been advanced to a predetermined point, the holding arm 32 engages pin 44 suitably positioned in the element 26. The element 26 will thereby be mechanically held in its advanced position. Pin 44 is insulated from the element 26 and since contacts 47 and 48 will be opened upon the engagement of the arm 32 with this pin, the short-circuit about the resistance 45 is removed, the discharge circuit then extending from the condenser 40, through resistance 45 and back contact of the relay 7, back to the condenser 40. Thus, upon the closure of the back contact of relay 7, the condenser will discharge through the resistance 45 and providing this contact is not closed for a length of time sufficient to permit the condenser to completely discharge the electromagnet 8 will not be energized upon the closure of the front contact of relay 7. Selecting element 26 will thereby not be advanced beyond this point by Morse impulses.

The circuits shown in Figs. 1 and 2 are the same in principle but differ in that in Fig. 1, there is a high resistance in the discharge path of the condenser which normally prevents the discharge of the condenser from advancing the selector wheel on closely recurring impulses, but which is short-circuited after the selector has taken its initial step, and remains short-circuited for four succeeding impulses. This short-circuiting is effected by means of the contact arm 24, carried by the sector 20 which makes contact with the stationary spring contact 25. As soon as the contact arm passes off of the spring contact the high resistance is again inserted in the discharge circuit so that the selector cannot be further advanced because of the accumulated charge on the condenser, until a sufficient time has elapsed for the condenser to discharge through the high resistance. In the modification shown in Fig. 2, however, the contacts 47 and 48 are normally closed in the

discharge path of the condenser 40, and serve normally to shunt the high resistance out of the discharge path, making it possible to step the selector around in response to Morse impluses. These contacts, however, are opened mechanically by the engagement of the arm 32 with the pin 44 when the selector reaches a predetermined position, thus including the high resistance 45 in the discharge path of the condenser, and thus preventing the selector from further advancing on Morse impulses, since there is not sufficient interval between such impluses to permit the condenser to discharge through the high resistance.

From the above description it is seen that the present invention provides an arrangement whereby a step-by-step selecting device may be connected with a telegraph circuit over which Morse impulses are being transmitted without the danger of advancing the selecting element to close the signaling circuit. This thereby greatly reduces the amount of wear on the selector as the Morse impulses are transmitted at a practically uniform rate.

What is claimed is:

1. In a selective signaling device, a step-by-step circuit closing element, an electromagnet responsive to current impulses, a condenser in the energizing circuit of said electromagnet, and means rendered effective upon the advancement of said element to a predetermined position for preventing the discharge of said condenser when the time intervening between succeeding impulses is of a predetermined value.

2. In a selective signaling device, a step-by-step circuit closing element, an electromagnet responsive to current impulses, means associated with said electromagnet for advancing said element, a condenser in the energizing circuit of said electromagnet, a resistance, and means whereby said resistance is included in the discharge path of said condenser after said element is advanced to a predetermined position.

3. In a selective signaling device, a ratchet wheel, a signaling circuit contact, an electromagnet, a condenser in circuit with said electromagnet for controlling the energization thereof, a stepping pawl for advancing said ratchet wheel in response to a predetermined combination of impulses to close said signaling circuit contact, a sector adapted to be advanced by said stepping pawl, a resistance, and means controlled by said sector for including said resistance in circuit with said condenser and said electromagnet when said sector is advanced to a predetermined position.

4. In a selective signaling device, a shaft, a ratchet wheel carried by said shaft, a signaling circuit contact, an electromagnet, a condenser in circuit with said electromagnet for controlling the energization thereof, a stepping pawl responsive to the energization of said electromagnet for advancing said ratchet wheel to close said signaling circuit contact, a sector carried by said shaft and adapted to be advanced by said stepping pawl, a resistance normally in shunt of said condenser, means secured to said sector for including said resistance in circuit with said condenser and electromagnet when said sector is advanced to a predetermined position, and means for restoring said sector to normal after it has been advanced to a predetermined position for rendering said electromagnet non-responsive to current impulses of a character different from that required to close the signaling circuit contact.

In witness whereof, I hereunto suscribe my name this 17th day of August, A. D. 1920.

JOSEPH C. FIELD.