

June 30, 1925.

1,543,836

J. C. FIELD

SIGNALING SYSTEM

Filed Nov. 26, 1920

2 Sheets-Sheet 1

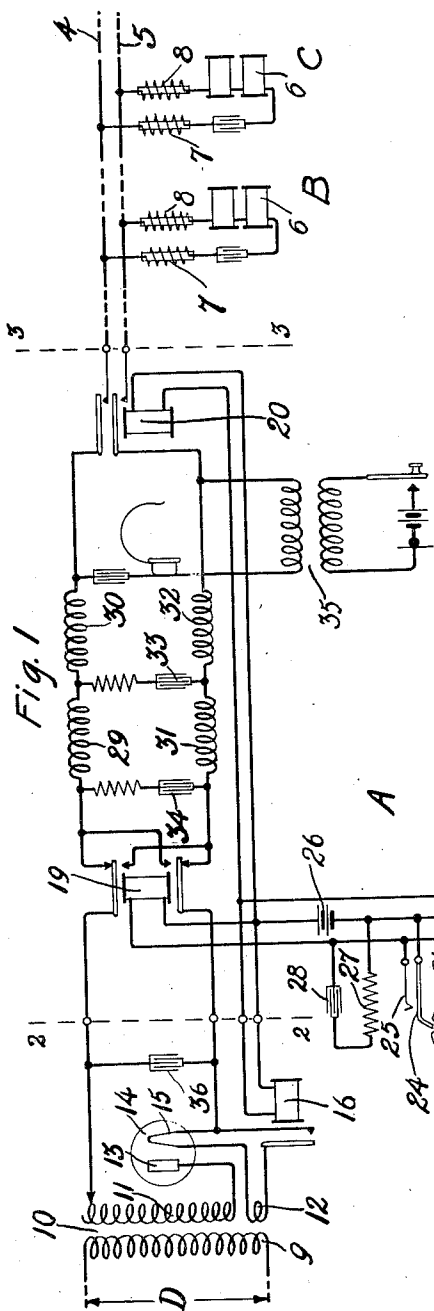


Fig. 3

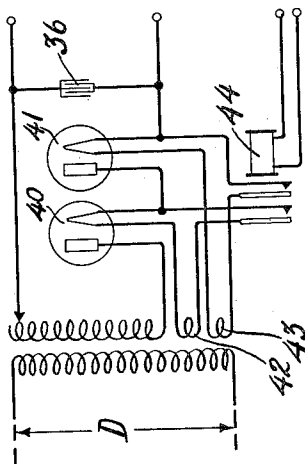
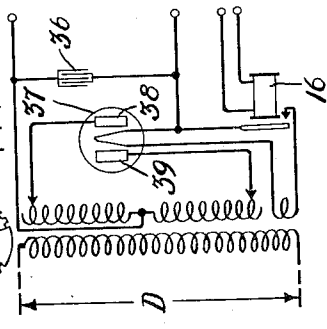


Fig. 2



Inventor:
Joseph C. Field
by *Jul. C. Ranner* Att'y.

June 30, 1925.

1,543,836

J. C. FIELD

SIGNALING SYSTEM

Filed Nov. 26, 1920

2 Sheets-Sheet 2

Fig. 4

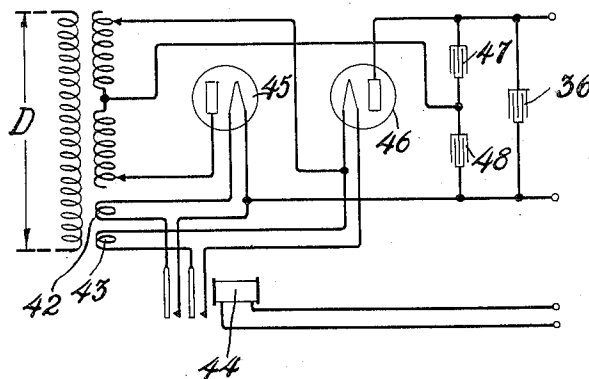


Fig. 5

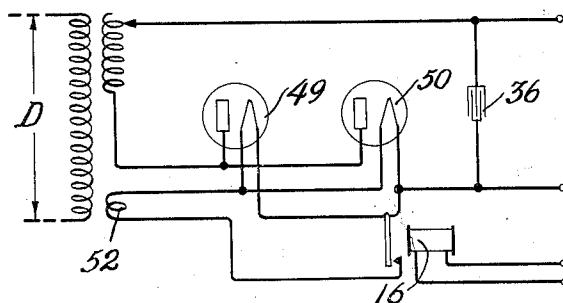
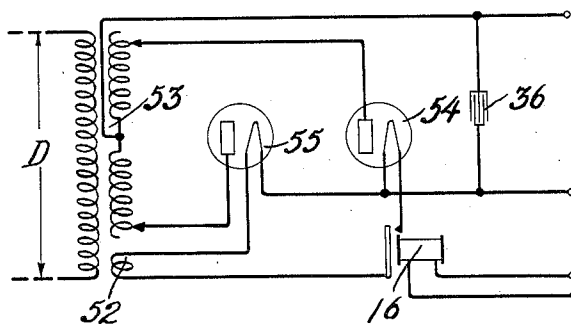


Fig. 6



Inventor:
Joseph C. Field
by Joseph H. Palmer Att'y.

Patented June 30, 1925.

1,543,836

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 November 26, 1920. Serial No. 426,409.

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, 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 signaling systems, and particularly to improvements in selective signaling systems for train despatching and like purposes wherein the necessary electrical energy is supplied from a source located at a central station.

The principal object of the present invention is the provision of a selective signaling system embodying means whereby the current generating device is entirely under the control of the impulse transmitting mechanism.

The second object of this invention is the provision of a rectifier in combination with a system of train despatching, which will be rendered active only during the operation of the impulse transmitting mechanism.

The invention provides a selective signaling system comprising a number of way-stations, at each of which is a selector selectively responsive to a definite combination or code of impulses. The impulses for effecting the operation of the selectors are supplied from a rectifier set under the control of a calling or impulse transmitting key.

The above and other objects of the invention will be more clearly understood after considering the following description when taken in conjunction with the accompanying drawings, wherein Fig. 1 illustrates a system embodying the principle of controlling the application of a source of electrical energy to the line only during the interval the impulse transmitting mechanism is operated. Fig. 2 illustrates an alternative arrangement of the one disclosed in Fig. 1, only so much of the system being shown as is necessary for a clear understanding of the invention. Fig. 3 is a modification of the arrangement disclosed in Fig. 1, wherein two vacuum tubes are connected in series. Fig. 4 illustrates another embodiment of the invention being similar to the arrangement disclosed in Fig. 3. Fig. 5 illustrates a further embodiment of the invention in which two vacuum tubes are connected in

multiple, while Fig. 6 shows two vacuum tubes of the two element type arranged to rectify both halves of the waves.

Referring especially to Fig. 1, there is shown a pair of conductors 4 and 5 extending from a central or train despatcher's office A to a plurality of way-stations B and C. The apparatus to the left of the broken line 3-3 is located at the central or train despatcher's office, and the portion to the right thereof is located at the various way-stations to which the conductors 4 and 5 extend. At each way-station there is a selector 6, the operating windings of which are connected in bridge of the conductors 4 and 5, and in series with the retardation coils 7 and 8. Each way-station is equipped with the usual apparatus which for the sake of clearness has been omitted. A selector suitable for use with this invention is disclosed in Patent No. 1,343,256 issued June 15, 1920, and since this patent illustrates and describes in detail the various operations of the selector it is considered unnecessary to show a complete structure here. It is, of course, understood that the invention is not limited to the provision of such a selector.

At the central or train dispatcher's office A, there is a main source of current supply D. This source of current D may be a lighting or power circuit of 110 volts and 60 cycles. The source of current D is normally connected with the primary winding 9 of a power transformer 10. This transformer has two secondary windings 11 and 12. To the winding 11 there is connected the terminal of the plate electrode 13 of a vacuum tube rectifier 14. The vacuum tube rectifier 14 is also provided with a cathode, or heated filament 15 having one terminal thereof connected with the winding 12. Current for heating the filament to incandescence so as to emit electrons is thus supplied from the primary winding 9 through the secondary winding 12. Normally current is not applied to the filament 15 as the circuit thereof is normally open at the contacts of relay 16. This relay is controlled through contacts on transmitters 17 and 18. A pole changing relay 19 is provided for reversing the connections from the vacuum tube rectifier 14 to the line conductors 4 and 5. Connected in parallel with relay 16 is a relay 20 which is likewise controlled by the transmitters 17 and 18. This relay 20 extends through its

contacts the conductors 4 and 5 to the contacts of the pole changing relay 19. The transmitter 17 is for calling way-station B and 18 for calling station C. Each of the transmitters is provided with teeth 21, certain ones of which may be blocked out by one or two adjustable cams 22 and 23 to obtain a certain number and combination of effective teeth for calling purposes. The transmitters are each adapted to rotate in the direction of the arrow, and the teeth thereof control the engagement of contact springs 24 and 25. These contacts control the energization of pole changing relay 19. The free end of contact spring 24 is bent downward, and is adapted to complete the energizing circuit for relays 16 and 20.

The contact spring 24 of each transmitter is normally out of engagement with the revolving disc thereof. During the revolution of the disc of each transmitter, contact spring 24 is in engagement therewith, maintaining the circuit for relays 16 and 20 closed to complete the circuit of the filament 15 of the vacuum tube rectifier 14 and the secondary winding 12, and the extension of conductors 4 and 5 to the contacts of pole changing relay 19 respectively. Assuming that transmitter 17 is operated as the disc thereof starts to rotate, the circuit of relays 16 and 20 is completed operating these relays. The closure of the contacts of relay 16 connects the secondary winding 12 of the power transformer 10 with the cathode or heated filament 15. Since current is normally traversing the primary winding 9 filament 15 will receive sufficient energy to effect the operation of the vacuum tube rectifier 14. Current is thus caused to flow to the line conductors 4 and 5 upon the energization of relay 20. As contact spring 24 rides upon the first tooth, it also engages contact spring 25 to actuate the pole changing relay 19 by current from battery 26 to reverse the connections of the output circuit of the tube 14 to the line conductors 4 and 5. When contact spring 24 drops between two teeth, relay 19 will be deenergized, and during the time this contact is passing over cam 22, relay 19 will be energized to furnish a prolonged impulse of one polarity. As the disc continues to rotate, current impulses are sent over the line conductors 4 and 5. The selector at way-station B will respond to such impulses for effecting the closure of the signaling circuit contact controlled thereby. Across the contact springs 24 and 25, there is connected a resistance 27 and condenser 28. These units serve to prevent excessive sparking upon the disengagement of contact springs 24 and 25.

Retardation coils 29, 30, 31 and 32 are connected in the line conductors 4 and 5 respectively upon the energization of relay 20, and condensers 33 and 34 in bridge thereof co-

operate to smooth out current impulses used for selectively signaling the way-stations to prevent disagreeable thumps in a receiver which may be in bridge of the conductors 4 and 5 during the periods of operation of the transmitter. A despatcher's telephone set 35 comprising the usual transmitter and receiver is associated with conductors 4 and 5.

Connected in the output circuit of the vacuum tube rectifier 14 is a condenser 36. By the use of a condenser connected in this manner the rectified voltage is much higher and the wave shape with light loads is approximately the same as with a direct current battery.

In all of the other figures which illustrate various modifications only the portion of the arrangement which differs from the one disclosed in Fig. 1 has been shown. It is of course understood that such equipment as shown to the right of the broken line 2—2 is utilized in all of the modifications.

Referring now to Fig. 2 there is shown a vacuum tube rectifier 37 of the two-way type. As in Fig. 1 a power transformer is provided, but having the secondary winding divided in two sections, one section being connected with the plate electrode 38, the other to the plate electrode 39. With such an arrangement both halves of the wave may be rectified. The filament circuit as before is controlled through the contacts of relay 16.

The modification illustrated in Fig. 3 is similar to the one shown in Fig. 1, except that two vacuum tubes 40 and 41 of the two element type are employed. The vacuum tubes 40 and 41 are connected in series. Each of the tubes has its filament circuit connected with secondary windings 42 and 43 respectively. The completion of the filament circuit with the respective secondary winding is controlled through contacts on relay 44. An arrangement of the character disclosed in Fig. 3 not only rectifies half of the wave, but also permits the use of vacuum tubes of a lower voltage.

Referring to Fig. 4 which illustrates an alternative arrangement of the one disclosed in Fig. 3, there is shown a pair of vacuum tubes 45 and 46. As in Fig. 3 the filaments of the tubes have an individual secondary winding which is associated therewith upon the energization of relay 44. This arrangement, however, differs from the one disclosed in Fig. 3 in that the secondary winding of the power transformer is in two sections. With the secondary winding of the power transformer divided in this manner a condenser is connected in each of the respective circuits. These condensers are designated by the numerals 47 and 48.

In Fig. 5 is shown a further modification of the invention in that the vacuum tubes

49 and 50 are connected in multiple. One secondary winding 52 furnishes current for heating the filaments of the two tubes. This arrangement increases the current output of the set and also reduces the potential drop therein.

Fig. 6 shows a pair of two element vacuum tubes connected to rectify both halves of the wave. This is accomplished by dividing the secondary winding in two sections. One of the sections is connected to the tube 54 while the other is connected to the tube 55. In this way the alternations of the wave will be rectified upon the closure of the contacts of relay 16 for connecting the coil 52 in circuit with the cathode or heated filaments of tubes 54 and 55.

Although the invention has been illustrated and described as applied to a vacuum tube filled with an inert gas other types of rectifiers, such as for example, a rectifier comprising a refractory cathode, such as a tungsten filament adapted to be heated to incandescence so as to emit electrons and a self-reconstructing anode of volatilizable material, such as mercury may be provided without departing from the spirit and scope of the invention.

What is claimed is:

1. In a signal system, a line extending from a central office to a plurality of way-stations, means at each of the way-stations selectively responsive to current impulses, a transformer at the central office having a primary and a secondary winding, a source of alternating current connected to the primary winding of said transformer, a rectifier having an anode and a cathode and associated with the secondary winding of said transformer, a normally open electrical connection for heating said cathode, and a transmitting mechanism having means for effecting the closure of said electrical connection for operating said rectifier and to impress signaling current impulses on said line.

2. In a signal system, a line extending from a central office to a plurality of way-stations, means at each of the way-stations selectively responsive to current impulses, a transformer having a primary and a pair of secondary windings, a source of alternating current connected to the primary winding of said transformer, a vacuum tube rectifier having an anode and a cathode, said anode being connected to one of said secondary windings, a normally open electrical connection extending from said cathode to the other of said secondary windings, and a transmitting mechanism controlling the closure of said circuit connection for rendering said tube effective and for impressing signaling current impulses on said line.

3. In a signal system, a line extending from a central office to a plurality of way-stations, means at each of the way-stations selectively responsive to current impulses, a transformer at the central office having a primary and a secondary winding, a source of alternating current connected to the primary winding of said transformer, a rectifier having an anode and a cathode and associated with the secondary winding of said transformer, a normally open electrical connection for heating said cathode, a transmitting mechanism having means for effecting the closure of said electrical connection for operating said rectifier and to impress signaling current upon said line, and means controlled by said transmitting mechanism for intermittently reversing the polarity of the current impressed upon the line.

4. A signaling system comprising a line, a rectifier set having an anode and a cathode, a normally open electrical connection for said cathode, and an impulse transmitting mechanism associated with said line having means for controlling the closure of said connection whereby said rectifier set is rendered effective to supply signaling current to said line.

5. A signaling system comprising a line circuit, a rectifier set having an anode and a cathode, a normally open electrical connection for said cathode, a transmitting mechanism having means for controlling the closure of said connection whereby said rectifier set is rendered effective for supplying signaling current to said line circuit, and means controlled by said transmitting mechanism for intermittently reversing the polarity of said signaling current.

6. In an electric control system, the combination with a controlling device, of a plurality of auxiliary devices to be controlled, electromagnetic means for controlling said auxiliary devices, means for operating said electromagnetic means comprising a source of alternating current, and a thermionic rectifying device, and means associated with said controlling device for rendering said rectifying device operative.

7. In a signaling system, a source of alternating current, a rectifying circuit comprising a two element rectifier, a heating circuit for one of the elements of said rectifier, a plurality of signaling devices intermittently energized over a circuit from said alternating current source through said rectifier, said heating circuit being controlled by the means for intermittently energizing said signaling devices.

In witness whereof, I hereunto subscribe my name this 20th day of November A. D., 1920.

JOSEPH C. FIELD.