

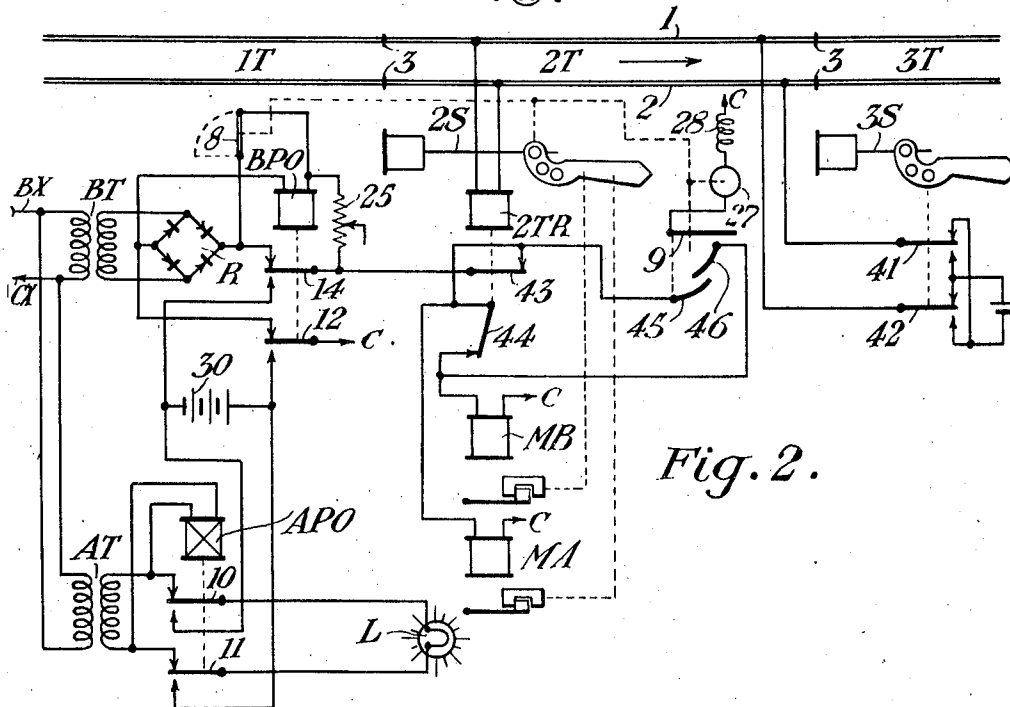
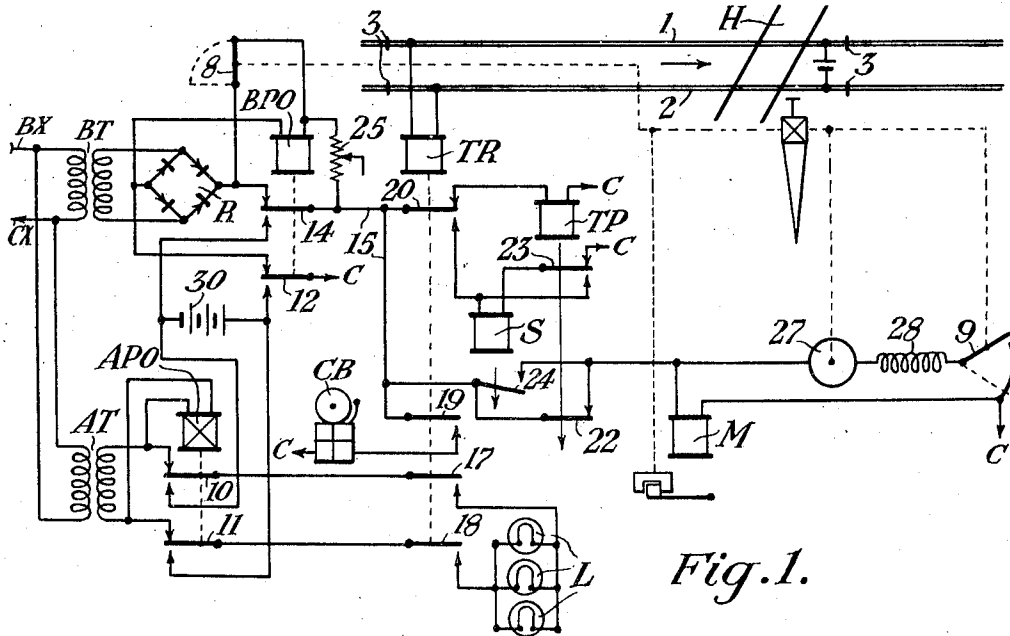
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RAILWAY SIGNALING APPARATUS

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RAILWAY SIGNALING APPARATUS

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My invention relates to signaling apparatus of the type involving a main source of current, such as an alternating current transmission line, for normally supplying current to the signaling apparatus, an auxiliary source of current, such as a storage battery, for supplying current to the signaling apparatus in the event of failure of the main source, and means for connecting the signaling apparatus with the main source or the auxiliary source according as the main source is or is not effective to supply current of satisfactory voltage to the signaling apparatus.

In some types of signaling apparatus, as for example, highway crossing gates or semaphore signals, there is a member which is moved from a horizontal to a vertical position by an electric motor, and is held in its vertical position by a normally energized holding magnet, this member usually having one or more lamps associated therewith.

In situations of the type described, a small reduction in the voltage of the energy supplied from the main source will reduce the brilliance of the lamps of the apparatus to an unsatisfactory level, but will not reduce the energization of the holding magnet to such an extent as to cause release of the movable member. Likewise, a reduction in line voltage which produces unsatisfactory lighting of the lamps may not result in failure of the motor to move the movable member, while a reduction in line voltage which is insufficient to cause release of the holding magnet may be sufficient to result in failure of the motor to move the movable member.

An object of my invention is to provide apparatus of the type described and incorporating improved means responsive to the voltage of the main source for transferring connection of the apparatus from the main source to the auxiliary source.

A further object of the invention is to provide an improved system of the type described which operates to transfer connection of the lamps to the auxiliary source on a small reduction in the voltage of the main source, but which operates to maintain connection of the motor and the holding magnet with the main source until there is a greater reduction in the voltage of the main source.

Another object of the invention is to provide an improved system of the type described which operates to transfer connection of the motor and holding magnet from the main source to the auxiliary source on a reduction in the voltage of the main source to one value if the movable member

is in its vertical position, and on a reduction in the voltage of the main source to a value higher than this one value if the movable member is in its horizontal position.

A further object of the invention is to provide improved apparatus of the type described which is arranged so that on release of the power-transfer or power-off relay controlling the supply of energy to the motor of the signaling apparatus, this relay will remain released until the movable member is in its vertical position to thereby prevent fluctuations in the voltage of the main source from affecting this relay after its release.

Other objects of the invention and features of novelty will be apparent from the following description taken in connection with the accompanying drawing.

I shall describe two forms of apparatus embodying my invention and shall then point out the novel features thereof in claims.

In practicing my invention I employ one power-transfer relay to transfer connection of the lamps from the main source to the auxiliary source, and a second power-transfer relay to transfer connection of the motor and the holding winding from the main source to the auxiliary source. The second relay is designed so that it does not transfer the connections controlled thereby until the voltage of the main source falls to a much lower value than is effective to cause the first relay to transfer the connections controlled thereby, while the circuit of the second relay is controlled by the movable member in such a manner that this relay releases at a higher voltage when the movable member is in its horizontal position than when this member is in its vertical position. In addition, the circuit of the second relay is arranged so that this relay can be energized only with current supplied from the main source, and when the relay is released, only if the movable member is in its vertical position.

In the drawing, Fig. 1 is a diagram of a highway crossing gate control system embodying my invention, and

Fig. 2 is a diagram of a stretch of track equipped with semaphore signals and also embodying my invention.

Similar reference characters refer to similar parts in each of the two views.

Referring to Fig. 1 of the drawing, there is shown therein a stretch of railway track which is intersected at grade by a highway H, while a crossing gate is located at this intersection. Traffic normally moves in the direction indicated by the arrow, that is, from left to right

in the track stretch, while the track rails 1 and 2 of the track stretch are divided by insulated joints 3 into a control section for controlling the crossing gate. A track battery is connected across the section rails at the exit end of the section, while a track relay TR has its winding connected across the section rails at the entrance end of the section.

The relay TR controls relays TP and S which co-operate in a manner well known in the art to control the circuit of the holding magnet M and of the motor for operating the crossing gate. In addition, the relay TR controls the circuit of a bell CB and of warning lights L associated with the crossing gate.

The power for operating the crossing gate motor, the holding magnet, and the warning lights and bell is normally supplied from a main source of current, such as a commercial source of alternating current. This energy may be supplied over a transmission line, not shown, the terminals of this source being designated BX and CX.

An auxiliary local source of energy in the form of a battery 30 is provided, while a first power-off or power-transfer relay APO governs transfer of the circuits of the warning lamps from the main to the auxiliary source of energy, and a second power-off or power-transfer relay BPO governs transfer of the connections of the motor, the holding magnet and the crossing bell from the main to the auxiliary source of energy. The designations power-off and power-transfer for these relays are interchangeable, as used herein.

The construction and operation of the crossing gate itself is not a part of this invention and any appropriate form of device may be employed for this purpose. The mechanism of the crossing gate may be similar to that shown in Letters Patent of the United States No. 1,138,087 granted to John P. Coleman on May 4, 1915, for Railway signals, the gate arm being an extended form of the semaphore of the patent. This arm has associated therewith contacts 8 and 9 which are governed in accordance with the position of the arm. The contact 8 is closed only when the gate arm is in its vertical position, as shown, while contact 9 is closed in all positions of the gate arm except its vertical position.

The equipment is shown in the condition which it assumes when the track strength is vacant, the crossing gate arm is in its vertical or 90° position, and the voltage of the main source of power is at its normal value.

At this time, energy from the commercial source is supplied through transformer AT to the power-off relay APO and its contacts 10 and 11 are picked up so that it is now possible to connect the circuits of the lamps L to the transformer AT.

As the gate arm is in its 90° or vertical position, contact 8 is closed and energy from the commercial source is supplied through transformer BT and rectifier R to the power-off relay BPO. The circuit for supplying energy to the relay BPO is traced from the positive output terminal of the rectifier through contact 8 and winding of relay BPO to the negative output terminal of the rectifier R. The energy supplied to relay BPO keeps the contacts of this relay picked up so its contact 14 establishes connection from the positive output terminal of the rectifier R to supply wire 15, while contact 12 of relay BPO establishes connection from the negative output

terminal of the rectifier R to the common terminal C.

As the track circuit is vacant, the track relay TR is picked up so that its contacts 17 and 18 interrupt the circuit of the lamps L, while its contact 19 interrupts the circuit of the bell CB, and its contact 20 interrupts the circuit of relay S and establishes the circuit of relay TP. Accordingly, contact 22 of relay TP is picked up and establishes connection from wire 15 to one terminal of the winding of the holding magnet M, the other terminal of which is connected to terminal C so that this winding is energized and the magnet serves to hold the gate arm in its vertical position. Contact 22 of relay TP also establishes connection from wire 15 to one terminal of the motor of the crossing gate, but at this time the circuit of the motor is interrupted by contact 9 so the motor is not energized.

When a train moving in the normal direction of traffic enters the control section, track relay TR releases so its contacts 17 and 18 establish the circuits of the lamps L and these lamps are lighted by energy supplied from transformer AT. In addition, on release of relay TR, its contact 19 establishes the circuit of the bell CB and this bell operates to warn users of the highway of the approach of a train and of lowering of the crossing gate.

On release of relay TR, its contact 20 interrupts the circuit of the slow releasing relay TP and establishes a momentary circuit including front contact 23 of relay TP for supplying energy to the slow releasing relay S so the contact 24 of relay S is picked up and establishes connection from wire 15 to the holding magnet M to maintain this magnet energized after release of relay TP.

After a short time interval, the relay TP releases and its contact 23 interrupts the supply of energy to relay S and establishes a snubbing circuit for this relay to delay its release. After a short period, the relay S releases and its contact 24 interrupts the circuit of the holding magnet M so this magnet releases the gate arm which thereupon is moved by gravity to its horizontal or 0° position.

On this movement of the gate arm, contact 9 is closed, but the circuit of the motor is still interrupted as contact 24 of relay S and contact 22 of relay TP are both released. In addition, on movement of the gate arm, contact 8 is opened, but energy continues to be supplied to power-off relay BPO over the circuit which is traced from the positive output terminal of the rectifier, through front contact 14 of relay BPO, resistor 25, and winding of relay BPO to the negative output terminal of the rectifier. The resistor 25 reduces energization of the relay BPO somewhat, but, as the voltage of the power source is assumed to be substantially at its normal value, the energy supplied through the resistor 25 is effective to maintain the contacts of the relay BPO picked up.

When the train advances far enough to clear the intersection and vacate the control section, track relay TR picks up and its contacts 17 and 18 interrupt the circuit of the lamps L, while contact 19 interrupts the circuit of the bell CB. In addition, contact 20 establishes the circuit of relay TP and its contact 22 picks up and establishes the circuit of the holding magnet M and of the motor for the crossing gate. The circuit for the motor is traced from the positive output terminal of the rectifier R through front contact 14 of relay BPO, wire 15, front contact 22 of relay TP, motor ar-

mature 27, motor field winding 28, and contact 9 to terminal C which is connected through front contact 12 of relay BPO to the negative output terminal of the rectifier R.

The energy supplied to the motor causes the motor to move the gate arm to its vertical or 90° position, and when the arm reaches this position, contact 9 interrupts the circuit of the motor, while the magnet M serves to hold the gate arm in this position. In addition, when the gate arm is in its vertical position, contact 8 is closed and establishes the circuit controlled thereby for supplying energy to the relay BPO.

The first power-off relay APO is selected and proportioned so that its contacts are held picked up as long as the voltage of the main source exceeds a predetermined level, such for example as 70 per cent of the normal voltage of this source. If the voltage of the main source falls below this level, the contacts 10 and 11 of the relay APO will release and transfer the circuits of the lamps L from the transformer AT to the auxiliary source comprising the battery 30.

The battery 30 supplies the lamps with energy of a voltage high enough to insure that the lamps give a satisfactory indication, but of lower voltage than that supplied to the lamps from the main source when the voltage of the main source is at its normal level.

The holding magnet M is proportioned so that it will maintain the gate arm in its vertical position until the voltage of the energy supplied thereto falls to a relatively low level, such for example as below 40 per cent of that supplied from the main source when the voltage of the main source is at its normal level. Accordingly, the second power-off relay BPO is selected and proportioned so that when contact 8 is closed and energy of the full voltage supplied from the rectifier R is supplied to the relay BPO, the contacts of this relay remain picked up until the voltage of the main source falls below 40 per cent of its normal value in the example chosen. If the voltage of the main source drops below this level at a time when the gate arm is in its vertical position, the relay BPO will release and transfer connection of the holding magnet M, the relay TP, and the motor of the crossing gate from the main to the auxiliary source of power.

This arrangement insures that the supply of energy from the main source to the holding magnet will be maintained unless there is either a complete failure or an exceptionally large reduction in the voltage of this source. It is desirable to avoid transferring the holding magnet M from the main to the auxiliary source if possible since during movement of the contacts of the power-off relay BPO from their picked-up to their released positions the supply of energy to the holding magnet M is interrupted and the crossing gate arm may be released and start to drop.

As this system operates to maintain the supply of energy from the main source to the holding magnet unless the voltage of the main source falls to a value too low to effectively energize the holding magnet, it reduces to a minimum the possibility of momentary interruption of the circuit of the holding magnet and resultant accidental release of the crossing gate arm.

The motor for operating the crossing gate arm takes considerable energy, and to insure satisfactory operation of this motor, the voltage applied thereto must be higher than is required to effectively energize the holding magnet, but it need not be so high as is required to cause the lamps to provide satisfactory indications. The

motor will operate to move the crossing gate arm from its horizontal to its vertical position as long as the voltage applied thereto does not fall below a value such, for example, as 60 per cent of that which is normally supplied from the main source, and the relay BPO is arranged to transfer the motor from the main to the auxiliary source if the voltage of the main source becomes less than 60 per cent of the normal value at a time when the crossing gate arm is in its horizontal position.

In this position of the crossing gate arm, contact 8 is open so the relay BPO is energized from the main source through the resistor 25. For a particular rectifier and mechanism the resistor may be adjusted so that it reduces the energy supplied to the relay to such an extent that the relay contacts will release if the voltage of the main source falls below 60 per cent of its normal value. As pointed out above, when contact 8 is closed and the full voltage supplied through rectifier R is supplied to the relay BPO, instead of being reduced by resistor 25, the contacts of relay BPO do not release until the voltage of the main source decreases to 40 per cent of its normal value.

Accordingly, if while the crossing gate arm is in its lower position the voltage of the main source falls below 60 per cent of its normal value, the contacts of relay BPO will release and transfer connection of the crossing gate motor and the associated apparatus from the transformer BT to the battery 30. The battery 30 supplies energy of a voltage high enough to insure that the motor will move the crossing gate arm to its vertical position.

When the relay BPO releases, its contact 14 interrupts the connection from the positive output terminal of the rectifier through resistance 25 to one terminal of the winding of relay BPO, and energy will not thereafter be supplied from the rectifier to the relay BPO until the crossing gate arm is returned to its vertical position so that contact 8 is closed to establish connection from the positive output terminal of the rectifier to this same terminal of the winding of the relay BPO.

In addition, when the relay BPO releases, its contact 12 transfers connection of the common terminal C from the negative output terminal of the rectifier to the negative terminal of the battery. At this time there is no connection from the negative terminal of the battery to the negative output terminal of the rectifier, nor to a terminal of the winding of relay BPO, so there is no possibility that energy from the battery will be supplied to the relay BPO to pick up the contacts of this relay and thereby interrupt the supply of energy from the battery.

When the control section is vacated, the track relay TR picks up and establishes the circuit of relay TP so that its contact 22 picks up and energy is supplied from the battery 30 to the crossing gate motor and to the holding magnet M.

When the crossing gate arm reaches its vertical position, contact 9 interrupts the circuit of the motor, while contact 8 establishes the circuit for connecting the relay BPO directly across the rectifier R so the relay is supplied with energy of the full value from the main source through the transformer BT. If the voltage of the main source is at or near its normal value, the energy supplied to the relay BPO will be effective to pick up the relay contacts and thus transfer the circuits of the crossing gate motor and associated

apparatus back to the main source of supply. However, if at the time the crossing gate arm reaches its vertical position and contact 8 is closed, the voltage of the main source is still substantially below its normal value, the current supplied to the relay BPO will not be effective to pick up this relay and its contacts will remain released and will maintain the circuit of the battery until the voltage of the main source is restored to a sufficiently high level.

As the contacts of the relay BPO when once released remain released until the crossing gate arm reaches its vertical position, there is no possibility that voltage fluctuations resulting from the relatively heavy current required to operate the crossing gate motor will produce undesired pickup and release of the contacts of the relay BPO or of the relay APO.

This system is adapted for use with semaphore signals and Fig. 2 is a diagram showing this application of the invention. The system shown in Fig. 2 is similar to that shown in Fig. 1, but differs therefrom in that the track relay is of the polarized type and controls the circuit of the signal motor and holding magnets directly, without the intervention of repeater apparatus.

Referring to Fig. 2 of the drawing, there is shown therein a stretch of railway track having track rails 1 and 2 over which traffic normally moves in the direction indicated by the arrow, that is, from left to right. The rails of the track stretch are divided by insulated joints 3 into the customary successive track sections for signaling purposes. One such section, designated 2T, and portions of the adjoining sections 1T and 3T are shown in the drawing.

Each section has at the entrance end thereof a semaphore signal for governing movement of traffic in the track stretch. Each such signal may be of any well-known construction, as for example, that shown in the above-identified patent to John P. Coleman. Each signal has a semaphore arm which is biased by gravity to a horizontal or stop position, and is movable therefrom by the motor incorporated in the signal to a 45° or caution position, and to a 90° or clear position, while suitable holding magnets MA and MB are incorporated in each signal to maintain the semaphore arm in its 45° or 90° position.

Each semaphore arm is provided with roundels or lenses of different colors which are positioned in front of the lamp L in different positions of the semaphore arm. These include a red, a yellow and a green roundel through which light is projected in the stop, caution and clear positions of the semaphore arm.

Each semaphore arm has associated therewith a contact 8 which is closed only when the semaphore arm is in its vertical position, while each semaphore arm also has associated therewith contacts 41 and 42 which control the polarity of the energy supplied to the track rails of the adjacent track section in the rear. The contacts 41 and 42 are controlled in such a manner as to cause energy of reverse polarity to be supplied to the section rails when the associated signal displays its stop indication, and to cause energy of normal polarity to be supplied to the section rails when the associated signal displays its caution or its clear indication.

Each semaphore arm also has associated therewith a contact 9 for controlling the circuit of the motor for operating the signal. The contact 9 is controlled so as to engage a contact 45 when the semaphore arm is between its 0° and 44° posi-

tions, and to engage a contact 46 when the semaphore arm is between its 40° and 89° positions.

The equipment is shown in the condition which it assumes when the track stretch is vacant and the voltage of the main source is substantially at its normal value. At this time, contacts 41 and 42 associated with signal 3S cause energy of normal polarity to be supplied to the rails of section 2T and the neutral contact 43 of relay 2TR is picked up, while the polar contact 44 of the relay occupies its left-hand or normal position so that energy is supplied to magnets MA and MB to cause the semaphore arm of signal 2S to be held in its vertical or clear position, while contact 9 interrupts the circuit of the signal motor. As the semaphore arm is in its vertical position, contact 8 is closed and the second power-off relay BPO is connected directly across the output terminals of the rectifier R, and as the voltage of the main source is assumed to be substantially at its normal value, the contacts of relay BPO are picked up and connect the magnets MA and MB to the output terminals of the rectifier R and thus to the main source of power. Likewise, the first power-off relay APO is picked up and connects the lamp L to the transformer AT and thus to the main source of power.

When a train traveling in the normal direction of traffic enters section 2T, the neutral contact 43 of relay 2TR releases and cuts off the supply of energy to the magnets MA and MB so the semaphore arm of this signal drops to its horizontal or stop position, while contact 8 is opened, but relay BPO is maintained picked up by energy supplied through the resistor 25.

When the train advances into section 3T, signal 3S is caused to display its stop indication and contacts 41 and 42 cause energy of reverse polarity to be supplied to the rails of section 2T. When the train vacates section 2T, the energy of reverse polarity feeds to the track relay 2TR and the neutral contact 43 of this relay picks up while the polar contact 44 of the relay is moved to its right-hand or reverse position.

As a result of picking up of the neutral contact 43 of relay 2TR, energy is supplied through contacts 9 and 45 to the motor of signal 2S to cause it to move it the semaphore arm to its 45° or caution position so that contact 9 is moved out of engagement with contact 45 and thus interrupts the supply of energy to the motor, while energy is also supplied to the holding magnet MA of the signal to maintain the semaphore arm in the caution position.

When the train vacates section 3T, the signal 3S displays its caution indication, while contacts 41 and 42 cause energy of normal polarity to be supplied to the rails of section 2T and the polar contact 44 of relay 2TR is shifted to its left-hand or normal position and neutral contact 43 of the relay is picked up so energy is supplied through contacts 9 and 46 to the motor of the signal to cause it to move the semaphore arm to its vertical or clear position so that contact 9 is moved out of engagement with contact 46 and thus interrupts the supply of energy to the motor, while energy is also supplied to a holding magnet MB to maintain the signal arm in its vertical position.

As long as the voltage of the main source of power exceeds 70 per cent of its normal value, the first power-off relay APO remains picked up and connects the lamp L to the transformer AT and thus to the main source of power. How-

ever, if the voltage of the main source falls below 70 per cent of normal, the contacts 10 and 11 of relay APO release and connect the lamp L to the battery 30 to insure that the lamp will give a satisfactory indication.

If, while the semaphore arm of the signal is in its vertical or clear position, at which time the contact 8 is closed, the voltage of the main source falls below 40 per cent of its normal value, the relay BPO will release and transfer connection of the signal mechanism from the main source of power to the auxiliary source, that is, the battery 30.

If, while the semaphore arm of the signal is in any position except its vertical position, at which time contact 8 is open, the voltage of the main source falls below 60 per cent of its normal value, the energy supplied through resistor 25 to the relay BPO will be ineffective to maintain the contacts of the relay picked up, and they will release and transfer connection of the signal mechanism to the battery 30. As pointed out above in connection with the system shown in Fig. 1, when the relay BPO is released, there is no connection from the negative terminal of the battery to the negative output terminal of the rectifier R and energy cannot be supplied from the battery to the relay BPO. Accordingly, after release of the relay BPO, this relay is certain to remain released until the semaphore arm is returned to its vertical position so that contact 8 establishes the circuit to supply energy from the rectifier R to the relay BPO.

Although I have herein shown and described only two forms of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In power supply means for apparatus of a type having a member biased to a first position and having a lamp associated therewith, an electric motor for moving said member from its first to a second position, and a magnet effective when energized to hold said member in said second position, in combination, a main source of power, an auxiliary source of power, a first power-transfer relay energized from said main source and being effective to connect said lamp to said main or said auxiliary source according as the voltage of said main source exceeds or falls below a relatively high value, a second power-transfer relay effective according as it is picked up or released to connect said motor and said magnet to said main or said auxiliary source respectively, a circuit complete only when said member is in its second position for supplying from said main source to said second power-transfer relay energy effective to maintain said relay picked up as long as the voltage of said main source exceeds a predetermined relatively low value, and a circuit for supplying from said main source to said second power-transfer relay energy effective to maintain said relay picked up as long as the voltage of the main source exceeds a predetermined intermediate value.

2. In power supply means for apparatus of a type having a member biased to a first position and having a lamp associated therewith, an electric motor for moving said member from its first to a second position, and a magnet effective when energized to hold said member in said second

position, in combination, a main source of power, an auxiliary source of power, a first power-transfer relay energized from said main source and effective to connect said lamp to said main or said auxiliary source according as the voltage of said main source exceeds or falls below a relatively high value respectively, a second power-transfer relay effective according as it is picked up or released to connect said motor and said magnet to said main or said auxiliary source, a circuit including a contact closed only when said member is in its second position for supplying from said main source to said second power-transfer relay energy effective to maintain said relay picked up as long as the voltage of said main source exceeds a predetermined relatively low value, and a circuit including a front contact of said second power-transfer relay for supplying from said main source to said second power-transfer relay energy effective to maintain said relay picked up as long as the voltage of the main source exceeds a predetermined intermediate value.

3. In apparatus of the class described, in combination, a member biased to a first position, an electric motor for moving said member from said first position to a second position, a magnet effective when energized to maintain said member in said second position, a main and an auxiliary source of power, a power-transfer relay effective according as it is picked up or released to connect said motor and said magnet to said main or said auxiliary source respectively, a circuit including a contact closed only when said member is in said second position for supplying from said main source to said power-transfer relay energy effective to maintain said relay picked up as long as the voltage of said main source exceeds a predetermined relatively low value, and a circuit for supplying from said main source to said power-transfer relay energy effective to maintain said relay picked up as long as the voltage of said main source exceeds a value substantially greater than said low value.

4. In apparatus of the class described, in combination, a member biased to a first position, an electric motor for moving said member to a second position, a magnet effective when energized to maintain said member in said second position, a supply circuit over which energy may be supplied to said motor and to said magnet, a rectifier having its input terminals connected to a source of alternating current, a battery, a power-transfer relay effective according as it is picked up or released to connect said supply circuit to the output terminals of said rectifier or to said battery, a circuit including a contact closed only when said member is in its second position for supplying from said source of alternating current to said power-transfer relay energy effective to maintain said relay picked up as long as the voltage of said source exceeds a predetermined relatively low value, and a circuit for supplying from said source of alternating current to said power-transfer relay energy effective to maintain said relay picked up as long as the voltage of said source exceeds a value substantially higher than said low value.

5. In apparatus of the class described, in combination, a member biased to a first position, an electric motor for moving said member to a second position, a magnet effective when energized to maintain said member in said second position, a supply circuit over which energy may be supplied to said motor and to said magnet,

a rectifier having its input terminals connected to a source of alternating current, a battery, a power-transfer relay effective according as it is picked up or released to connect said supply circuit to the output terminals of said rectifier or to said battery, a first circuit including a contact closed when and only when said member is in its second position for supplying energy from said source of alternating current to said power-transfer relay, and a second circuit including a front contact of said power-transfer relay for also supplying energy from said source of alternating current to said power-transfer relay, the energy supplied over said first circuit being effective to maintain said power-transfer relay picked up as long as the voltage of said source exceeds a predetermined relatively low value, the energy supplied over said second circuit being effective to maintain said power-transfer relay picked up as long as the voltage of said source exceeds a value substantially greater than said low value.

6. In apparatus of the class described, in combination, a movable member biased to a first position, first electrically operated means for moving said member from said first position to a second position in which said first means becomes automatically deenergized, other electrically operated means effective when energized for maintaining said member in said second position, the electrical load due to said first means being substantially greater than that due to said other means, means for deenergizing said other means to release said member to said first position, a main and an auxiliary source of current, a power-transfer relay effective according as it is picked up or released for connecting said first means and said other means with said main or said auxiliary source respectively, a first circuit including a con-

tact closed only when said member is in said second position for supplying sufficient current from said main source to maintain said relay picked up provided the voltage of said main source exceeds a predetermined relatively low value, and a second circuit for supplying current from said main source to maintain said relay picked up provided the voltage of said main source exceeds a value substantially greater than said low value, whereby said relay will transfer the load to said auxiliary source at a higher voltage of the main source when said member is in said first position than when the member is in said second position.

7. In apparatus of the class described, in combination, a movable member biased to a first position, an electrically operated device for moving said member from said first to a second position in which said device becomes automatically deenergized, a normally energized holding device for retaining said member in said second position, means for deenergizing said holding device to release said member to said first position, a main and an auxiliary source of current, a power-transfer relay energized from said main source and effective according as it is picked up or released for connecting said electrically operated device with said main or said auxiliary source respectively, and means controlled by said movable member for altering the release value of said relay in such manner that the relay will release when the voltage of said main source decreases to a given value at a time when said movable member occupies said second position but said relay will release at a value substantially higher than said given value at a time when said member occupies said first position.

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