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RAILWAY LIGHT SIGNAL

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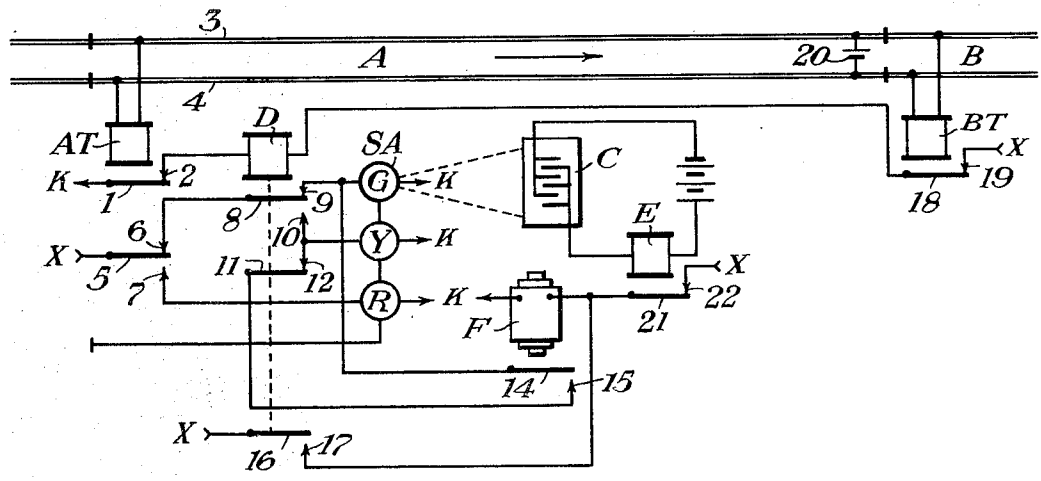

Fig. 1.

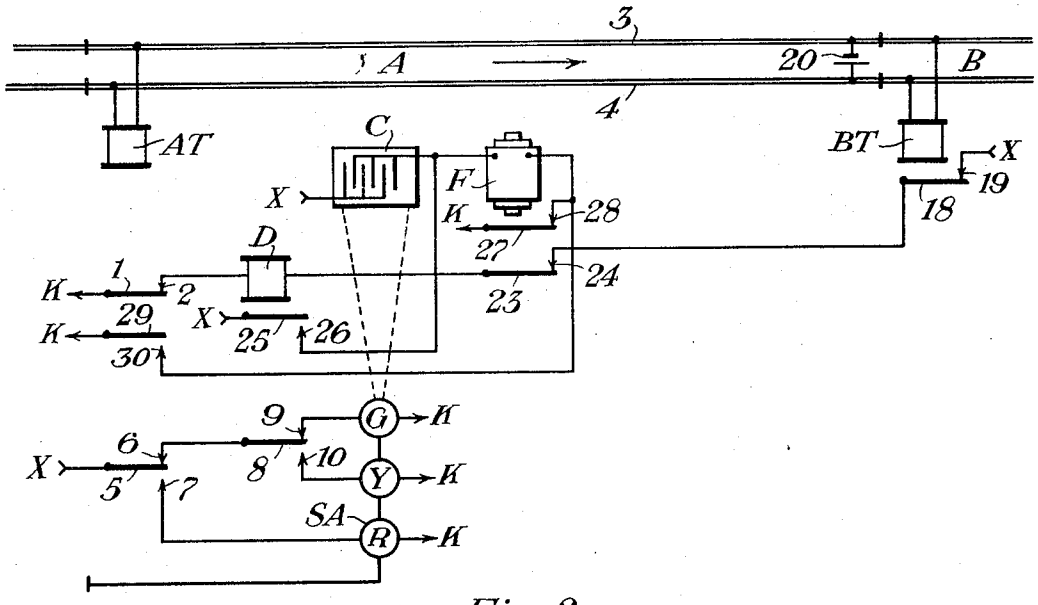

Fig. 2.

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RAILWAY LIGHT SIGNAL

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7 Claims. (Cl. 246—41)

My invention relates to apparatus for the control of railway light signals, and has for an object the provision of novel and improved means for automatically causing a light signal to give a more restrictive indication when traffic conditions warrant a less restrictive indication and the lamp or lamps which should give such less restrictive indication fail.

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

In the accompanying drawing, Fig. 1 is a diagrammatic view showing one form of apparatus embodying my invention. Fig. 2 is a view similar to Fig. 1, but showing a modified form of apparatus also embodying my invention.

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

Referring first to Fig. 1, the reference characters 3 and 4 designate the track rails of a stretch of railway track along which traffic normally moves in the direction indicated by the arrow. These rails are divided in the usual manner by insulated joints to form a plurality of track sections, of which only one complete section A, and the rear portion of the next section B, are shown in the drawing. Section A is provided with the usual track circuit comprising a battery 20 connected across the rails at the forward end of the section, and a track relay AT connected across the rails at the rear end of the section. Section B is provided with a similar track circuit involving a track relay BT.

Section A is also provided with a distant relay D, the circuit for which is from terminal X of a suitable source of current, through front contact 18—19 of track relay BT, winding of relay D, and front contact 1—2 of track relay AT, to terminal K of the same source of current. It follows that the distant relay D will be deenergized whenever either section A or B is occupied by a train.

Located adjacent the entrance end of the section A is a light signal SA, comprising three lamps G, Y and R, which lamps, when lighted, indicate proceed, caution and stop, respectively. In accordance with usual practice, the beam projected from lamp G may be green, the beam projected from lamp Y may be yellow, and the beam projected from lamp R may be red. The indication given by lamp G is, of course, less restrictive than that given by either lamp Y or R, whereas the indication given by lamp R is more restrictive than that given by lamp G.

Lamp G is provided with a circuit which includes front contact 5—6 of relay AT and front contact 8—9 of relay D. Lamp Y is provided with a main circuit which includes front contact 5—6 of relay AT and back contact 8—10 of relay D. Lamp R is provided with a circuit which includes back contact 5—7 of relay AT. It follows that when both sections A and B are unoccupied, lamp G will be lighted; when section A is unoccupied and section B is occupied, lamp Y will be lighted; and when section A is occupied, lamp R will be lighted. The structure and operation of the apparatus thus far described, are in accordance with usual and standard practice, and will be understood without further detailed explanation.

The reference character C designates a light responsive device which is exposed to rays from the proceed lamp G of signal SA. This device is so constructed that its electrical resistance decreases with increase in the intensity of the light to which it is exposed. This device C may, for example, be a photo-electric cell. It is provided with a circuit which includes a relay E, and a source of current the terminals of which are designated X and K. The parts are so proportioned that when the lamp G is lighted, the resistance of the cell C will be decreased to such value that relay E will be effectively energized; whereas, when lamp G is not lighted, the resistance of device C will be increased to such value that relay E will become deenergized, and so will release its front contact 21—22.

A slow-acting relay F is provided with two circuits, one of which includes front contact 21—22 of relay E, and the other of which includes back contact 16—17 of relay D. It follows that relay F will be energized when relay E is energized, and also when relay D is deenergized.

The caution lamp Y of signal SA is provided with an auxiliary circuit which passes from terminal X, through front contact 5—6 of relay AT, front contact 8—9 of relay D, back contact 14—15 of relay F, front contact 11—12 of relay D, and lamp Y to terminal K. It follows that lamp Y will be supplied with current when relays AT and D are both energized and relay F is released.

As illustrated in Fig. 1, lamp G is lighted because both the home relay AT and the distant relay D are energized. Device C is therefore receiving light rays from the lamp G, so that relay E is energized, and relay F is also energized. The auxiliary circuit for caution lamp Y is therefore open at back contact 14—15 of relay F. I will now assume that with the parts in the conditions illustrated in Fig. 1, the proceed lamp G burns out. The resistance of the device C will

then increase so that relay E will become deenergized, and this will result in deenergizing relay F. The auxiliary circuit for lamp Y will then become closed at back contact 14—15 of relay F, so that the caution lamp will become lighted. Instead of giving the proceed indication, then, signal SA will give the more restrictive caution indication.

Relay F is slow-releasing in character, and is provided with the auxiliary circuit through back contact 16—17, in order to avoid a momentary flash of the caution lamp Y when the signal is changing from the caution to the proceed indication. To explain this more in detail, I will assume that a train enters section A, and then proceeds through this section into section B. While the train occupies section B, relay AT will be energized, but relay D will be deenergized, so that the caution lamp Y will be lighted by virtue of its main circuit. Relay F will then be energized by virtue of its auxiliary circuit through its back contact 16—17 of relay D. When the train leaves section B, track relay BT will become energized, thereby energizing distant relay D. This will cause lamp G to become lighted, but an interval of time will elapse before relay E becomes energized, and if relay F were allowed to release during this interval, the auxiliary circuit for lamp Y would be closed, and this lamp would therefore become lighted for a short interval of time. The release period of relay F is at least equal to the time required for contact member 8 to travel from back contact 10 to front contact 9, plus the time required for lamp G to then become lighted, plus the time required for relay E to respond to the light rays supplied to device C. It follows, therefore, that during the transition from a caution to a proceed indication there will be no momentary flash of the caution lamp Y.

The reason for including front contact 11—12 of relay D in the auxiliary circuit for lamp Y is to avoid the possibility of a false proceed indication when the caution indication should be given. Assuming that section A is unoccupied and section B is occupied, so that lamp Y should be lighted; also assuming that lamp Y burns out; and also assuming that relay D fails to be energized; then in the absence of front contact 11—12, current would be supplied to the proceed lamp G through front contact 5—6 of relay AT, back contact 8—10 of relay D, and back contact 14—15 of relay F. By providing front contact 11—12 in the auxiliary circuit for lamp Y, this possible false proceed indication when a caution indication should be given, is prevented.

Referring now to Fig. 2, the track circuits are the same as in Fig. 1, and the control of signal SA by relays AT and D is, likewise, the same as in Fig. 1. In Fig. 2, however, the light sensitive device C controls the distant relay D, thereby eliminating the necessity for the intermediate relay E of Fig. 1.

In Fig. 2 the slow-releasing relay F is provided with a circuit which passes from terminal X, through the light responsive device C, the winding of relay F, and a back contact 29—30 of relay AT to terminal K. This circuit is provided with a branch around the device C, which branch includes a back contact 25—26 of relay D. It is also provided with a branch around contact 29—30, which includes a front contact 27—28 of relay F. A front contact 23—24 of relay F is included in the circuit for distant relay D.

As shown in the drawing, relays AT and D are both energized, so that the proceed lamp G of the signal SA is lighted. The light responsive device C is therefore illuminated, and relay F is energized by virtue of the stick circuit which includes this device and front contact 27—28. If, now, lamp G should burn out, the device C will become darkened, thereby permitting relay F to release, and this will open the circuit for relay D. The release of relay D will result in the supply of current to the caution lamp Y. Relay F will then remain deenergized, because its pick-up circuit is open due to the fact that relay AT is energized.

I will now assume that with the parts in the conditions in which they are shown in the drawing, a train moving toward the right enters section A. This will deenergize track relay AT, thereby causing signal SA to change from the proceed to the stop indication. Relay D will, of course, become deenergized because its circuit will be opened at contact 1—2 of relay AT. Relay F will then be energized by virtue of its circuit which includes back contact 25—26 of relay D and back contact 29—30 of relay AT. When a train passes from section A into section B, relay AT will become energized, but relay D will remain deenergized, because of the fact that its circuit will be open at contact 18—19 of relay BT. Lamp R will then become extinguished and lamp Y will become lighted. Relay F will remain energized by virtue of the circuit which includes back contact 25—26 of relay D, and front contact 27—28 of relay F. When the train passes out of section B, relay D will become energized, so that signal lamp Y will become extinguished and lamp G will become lighted. Relay F will remain energized by virtue of its stick circuit, which includes the light responsive device C and its own contact 27—28. Relay F is made sufficiently slow-releasing to prevent it from opening during the transition from the caution to the proceed indication of signal SA.

With only the apparatus illustrated in Fig. 2, if a new lamp G is inserted in the signal SA while relay AT is energized, this lamp will not become lighted until a train passes through section A, because there is no way of causing relay F to become energized. The new lamp G will become lighted, however, after a train passes through sections A and B. If the immediate lighting of the new lamp G is desired, it can be accomplished by inserting a push button in the circuit of relay F to bridge front contact 27—28 for a sufficient period of time to enable relay D to become energized.

It will be seen from the foregoing, that apparatus embodying my invention provides for automatically giving a caution indication when the proceed indication should be given and the proceed lamp G is burned out. This apparatus also prevents a false indication due to a short circuit or any other fault which will decrease the intensity of the light given by the proceed lamp G below a predetermined value determined by the characteristics of the light sensitive device C. Furthermore, apparatus similar to that shown in the drawing may be associated with the caution lamp Y and the stop lamp R to cause the signal to give a stop indication when a caution indication should be given and the caution lamp is burned out.

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 combination, a home and a distant relay, a light signal having a proceed and a caution lamp, a circuit for said proceed lamp including a front contact of said home relay and a front contact of said distant relay, a circuit for said caution lamp including a front contact of said home relay and a back contact of said distant relay, a light sensitive device exposed to the rays from said proceed lamp, a circuit including said device and an auxiliary relay which is energized when and only when said proceed lamp is lighted, a slow releasing relay, two circuits for said slow-releasing relay one including a front contact of said auxiliary relay and the other including a back contact of said distant relay, and an auxiliary circuit for said caution lamp including a front contact of said home relay and a front contact of said distant relay as well as a back contact of said slow-releasing relay.

2. In combination, a home and a distant relay, a light signal having a proceed and a caution lamp, a circuit for said proceed lamp including a front contact of said home relay and a front contact of said distant relay, a circuit for said caution lamp including a front contact of said home relay and a back contact of said distant relay, a light sensitive device exposed to the rays from said proceed lamp, a circuit including said device and a slow releasing relay as well as a front contact of the latter relay, a shunt for said slow-releasing relay circuit around said device and including a back contact of said distant relay, a second shunt for said slow-releasing relay circuit around the said front contact thereof and including a back contact of said home relay, and a circuit for said distant relay controlled by a front contact of said home relay and a front contact of said slow-releasing relay.

3. In combination, a railway light signal having a lamp which when lighted gives a less restrictive indication and a second lamp which when lighted gives a more restrictive indication, a relay, means including a light responsive device exposed to the rays from said first lamp for energizing said relay when and only when the first lamp is lighted, other means for energizing said relay when said signal should give a more restrictive indication, and means including a back contact of said relay for causing said second lamp to become lighted when said first lamp should be lighted if the first lamp is burned out.

4. In combination, a home relay and a distant relay, a light signal having a proceed lamp and a caution lamp, means for lighting said proceed lamp when both of said relays are energized, means for lighting said caution lamp when said home relay is energized and said distant relay is deenergized, and means including a light responsive device exposed to the rays from said proceed lamp for preventing said distant relay being energized unless the proceed lamp is lighted.

5. In combination, a railway light signal, a main circuit for one lamp of said signal, a light responsive device exposed to the rays from another lamp in said signal, and an auxiliary circuit for said first lamp controlled by said device.

6. A multiple aspect light signal for railroads having lamps controlled according to traffic conditions ahead, and automatic means independent of traffic conditions and involving a light sensitive device responsive to the light emitted by a less restrictive lamp for lighting a more restrictive lamp if the less restrictive lamp fails and traffic conditions are such that the less restrictive lamp should be lighted.

7. A multiple aspect light signal for railroads having lamps controlled according to traffic conditions ahead and giving yellow and green indications respectively, and automatic means independent of traffic conditions and involving a light sensitive device responsive to rays emitted by the green lamp for lighting the yellow lamp if the green lamp fails and traffic conditions are such that the green lamp should be lighted.

CLARENCE W. DALZELL.