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LIGHT SIGNAL SYSTEM FOR RAILROADS

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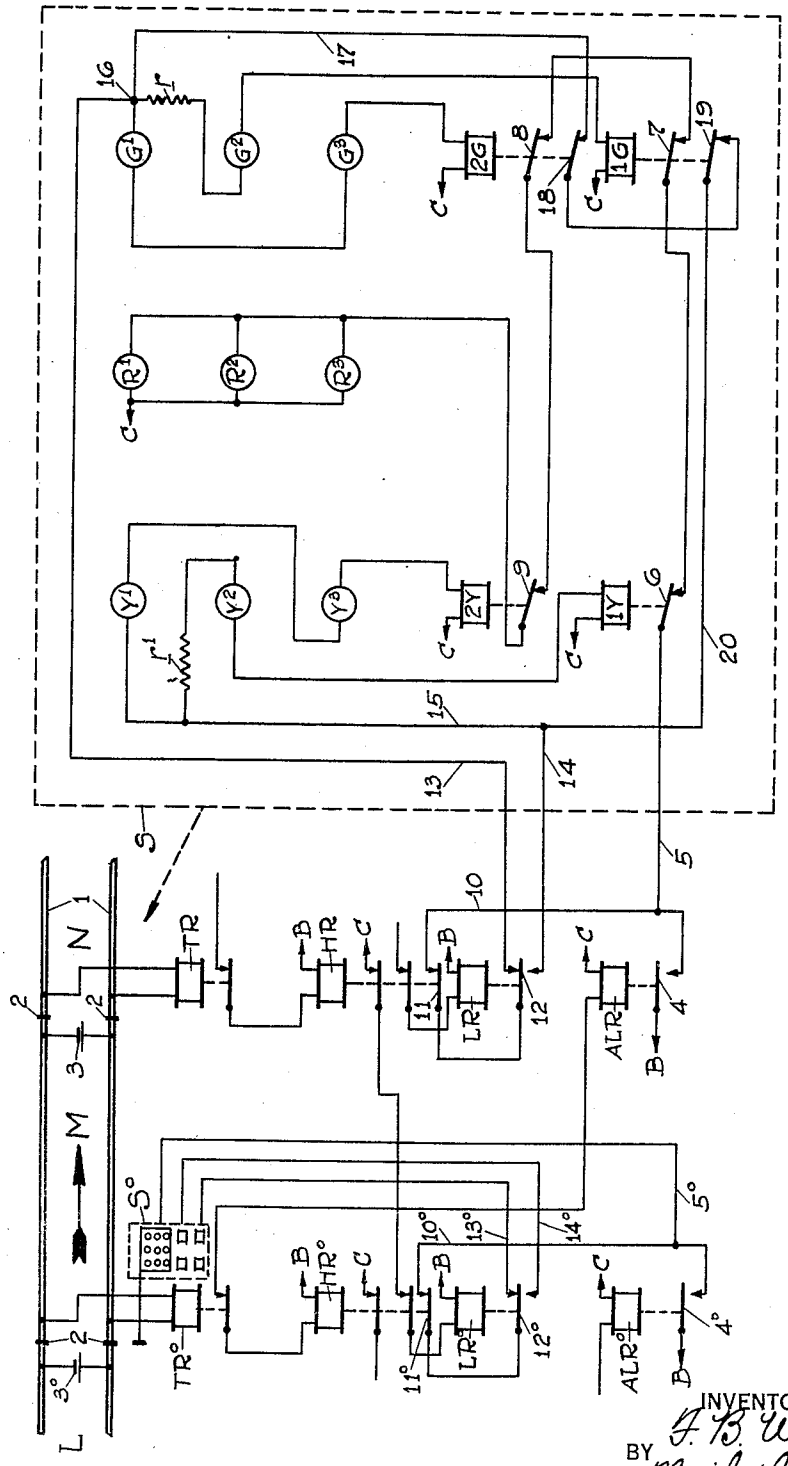


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## LIGHT SIGNAL SYSTEM FOR RAILROADS

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This invention relates in general to a railway signal system, and has more particular reference to a railway light signal system giving a large number of distinctive indications, some of which are set up in accordance with traffic conditions, and others of which are replacement indications set up automatically by the signal itself on failure of other indications.

In light signals as used in railway practice, it is most important that any failure shall result in the display of a signal such as will prevent accident, and not result in a dark signal which very easily can be passed by an engineer, without notice.

The present invention provides a light signal, positioned along the wayside, and giving a large number of aspects of differing restrictiveness. There is provided means for controlling each signal in accordance with traffic conditions, together with supplementary means whereby failure, at certain times, of any of the signal lamps, results in the automatic display of a more restrictive indication.

Further objects, purposes and characteristic features will appear as the description progresses, reference being made to the accompanying single figure of drawing, showing, in a diagrammatic manner, for the purpose of illustration, and in no manner in a limiting sense, one form of the invention. In the drawing:—

The single figure of drawing shows in a wholly diagrammatic manner one form which the invention can assume.

Referring to the drawing, there is shown a stretch of single track constituted by track rails 1, provided with insulating joints 2, for separating the track into usual insulated signal blocks, L, M and N, there being a source of energy such as a battery 3, connected across the track rails at the exit end of each block, and a track relay TR, connected across the track rails at the entrance end of each block, the direction of traffic being as indicated by the arrow.

Since the apparatus employed at the various signal locations is identical, corresponding parts will be designated by like reference characters, with distinctive exponents for the different signal locations.

At each signal location, at the entrance end to each block, is a wayside signal S. Each way side signal includes 9 light sources, such as incandescent lamps, and in the particular embodiment being described three yellow lamps $Y^1$, $Y^2$ and $Y^3$, three red lamps $R^1$, $R^2$ and $R^3$ and three green lamps $G^1$, $G^2$ and $G^3$. For controlling the lamps of each signal, there are included in each signal in the particular embodiment being described, four relays, two for the green lamp control, 1G and 2G, and two for the yellow lamp control, 1Y and 2Y.

Located at each signal location, in addition to the track relay TR, is a home relay HR, a line relay LR and an approach lighting relay ALR.

In the drawing, a signal S has been shown on an enlarged scale, for facility in describing the invention, but it should be understood that the signal S, and the signal $S^0$, are identical, in construction and are similarly positioned along the trackway.

To simplify the tracing of circuits, and the describing of the invention, a usual convention is followed of employing the letters B and C for designating opposite terminals of a source or sources of electrical energy.

As above described, each signal S includes nine separate light sources, three of which are yellow, three of which are green, and three of which are red. The various signal aspects which can be set up by each signal S are the following:—One, two or three reds indicates stop, a single yellow indicates slow speed prepared to stop, two yellows indicates medium speed prepared to stop at the next signal, and three yellows indicates normal speed prepared to stop at the next signal. One green indicates slow speed, two greens indicates medium speed, and three greens indicates normal speed.

It is thus seen that it is possible to set up a plurality of distinctive indications giving various speed controls, the indications being more restrictive for yellow than for green, and more restrictive for red than for yellow. The indication is also more restrictive in speed, with two greens than with three, and

with one green than with two. Likewise the speed is more restrictive under caution conditions, as we pass from three yellows, to two yellows, and finally to one yellow.

The manner in which the various signal aspects are set up will now be described in detail.

With the various parts in the positions and conditions as shown in the drawing, assume that block M is occupied. Relay $TR^0$ releases, to thereby de-energize approach lighting relay ALR, for the signal location next in advance to thus put energy on signal S through contact finger 4 and back point of relay ALR through multiple circuits through signal S. By means of the approach lighting relays ALR, a signal S, for any particular block, receives energy only upon the occupancy of the immediately preceding block. A first circuit includes contact finger 4 and back point of relay ALR, wire 5, contact finger 6 and back point of relay 1Y, contact finger 7 and back point of relay 1G, contact finger 8 and back point of relay 2G, contact finger 9 and back point of relay 2Y, and the three red lamps $R^1$, $R^2$ and $R^3$ in multiple. A second multiple circuit for energy to flow to signal S, includes contact finger 4 and back point of relay ALR, wire 10, contact finger 11 and front point of relay HR, contact finger 12 and front point of relay LR, wire 13, and then through multiple paths, one including resistance $r$, lamp $G^2$, and relay 1G, and the other including lamp $G^1$, lamp $G^3$ and relay 2G.

This results in the signal, with block N unoccupied to thus keep TR and HR energized) and the block in advance unoccupied (to thus keep LR energized), displaying three green lights, designating block N to be a clear block, the red lights not being energized through the red light circuit traced above, since this circuit is broken by the picking up of relays 2G and 1G immediately upon energization of the green lamps. If desired, a current retarding means of any desired character, such as a resistance, can be placed in the red lamp circuit traced above, whereby to give the green lamp circuit sufficient advantage over the red lamp circuit to prevent any momentary energization of the red lamps under the existing conditions.

Assume for the moment, the occupancy of block N and non-occupancy of block M, then relay TR and home relay HR are de-energized which results in the de-energizing of line relay $LR^0$, of the block immediately to the rear, the home relay $HR^0$ of this block immediately to the rear remaining up, to thus set up caution conditions for the block (M) to the rear of an occupied block (N).

Accordingly, for explaining caution conditions, assume all blocks unoccupied, except the block immediately in advance of block N, then line relay LR is de-energized, while track relay TR and home relay HR remain energized, whereby on a train entering block M, energy passing through contact 4 and back point of approach lighting relay ALR, which formerly went to the green lights, now passes through wire 10, contact finger 11 and front point of HR, contact finger 12 and back point of LR, wires 14 and 15, to then divide and in one case pass through resistance $r^1$, lamp $Y^2$ and relay 1Y, and in the other case through lamp $Y^1$, lamp $Y^3$ and relay 2Y. Thus, under caution conditions, signal S normally displays three yellow lights.

Under danger conditions, as, for example, under occupancy of block N, relay TR is de-energized to in turn de-energize relay HR, whereby energy flow to both the yellow and the green lamps, is interrupted, contact finger 11 of relay HR being in released position. As a result, the yellow and green relays 1Y and 2Y, and 1G and 2G, are all de-energized to thereby set up the energizing circuit for the three red lamps $R^1$, $R^2$ and $R^3$, as traced above.

Since, in the case of the yellow and the green lamps, two of each are energized in series, with this series arrangement connected up in multiple with the third lamp of the same color, it is obvious that failure of the green lamp $G^2$ for example, when clear conditions prevail, results in the signal aspect changing from three greens to the above described more restrictive speed aspect of two greens. Also if one or both of the green lamps $G^1$ and $G^3$ should fail under clear conditions, the signal aspect changes from three greens to the still more restrictive speed aspect of one green.

Since the arrangement in connection with the green lamps and the yellow lamps is identical, a like operation takes place in connection with the yellow lamps, on failure of various of such lamps under caution conditions.

If, under clear conditions, all of the green lamps should become extinguished, the two green relays 2G and 1G would become de-energized to thereby transfer energy from the green lamps to the yellow lamps through a circuit which includes the green lamp energizing circuit traced above up through wire 13 to the point 16, and from here, energy not being able to flow through the green lamps, can now flow through wire 17, contact finger 18 and back point of relay 2G, contact finger 19 and back point of relay 1G, wire 20, to wire 15, which is the energizing wire for the yellow lamps, as described above.

In this manner, upon all of the green lamps being extinguished when they should be illuminated, energy is shifted over from the green lamps, through back points of the green relays, to the yellow lamps, so that the yellow lamps function under clear conditions, in exactly the same manner as if they had been energized through contact finger 12 and back

point of relay LR, due to a change in traffic conditions from clear to caution. Thus, failure of the green lamps results in a signal condition exactly the same as if traffic conditions had changed to a more restrictive condition.

In a like manner, under caution conditions, when the three yellow lamps should normally be energized, should these lamps all become extinguished, as by filament failures of $Y^2$ and one or the other or both of lamps $Y^1$ and $Y^3$, the yellow relays 2Y and 1Y are de-energized to thereby complete the energizing circuit for the three red lamps, as described above. It should be remembered that this red lamp energizing circuit passes through contact finger 4 and back point of relay ALR, and then through back points, in series, of the two green relays and the two yellow relays.

From the above it is clear that under normal operating conditions, as traffic conditions in any particular block changes from clear to caution to danger, the wayside signal at the entrance end of such block displays respectively three green lights, three yellow lights, and three red lights.

On any one of the three green lights or of the three yellow lights normally energized at a given time, becoming extinguished, the signal aspect changes to either two lights or one light of the same color, to thereby indicate a more restricted speed.

On failure of all of the green lights under clear conditions, the signal aspect changes automatically to three yellow lights, due to the release of the two green relays, 2G and 1G. In a like manner, on extinguishment of all the yellow lights when they should be illuminated, the signal aspect changes to three red lights, due to the release of the two yellow relays 2Y and 1Y.

With the arrangement of parts as described above, it is therefore clear that a wayside signal has been provided, showing a large number of distinctive indications of varying restrictiveness for indicating various speeds, with means whereby the indications automatically change to more and more restrictive speed indications according as traffic conditions change and also according as certain of the lamps which should be properly energized at a given time, fail for any reason whatsoever.

The above rather specific description of one form of the invention, is given solely by way of example, and is not intended, in any manner whatsoever, in a limiting sense. Obviously, the invention can assume many different physical forms, and is susceptible of numerous modifications, and it is intended to include, in this application, all such forms and modifications as come within the appended claims.

Having described my invention, I now claim:—

1. A railway light signal, comprising, a plurality of proceed, caution, and stop lamps, the proceed and caution lamps being energized, in each case, through multiple circuits, whereby the failure of one proceed or one caution lamp leaves other lamps of its kind energized, and means controlled in accordance with traffic for selectively energizing all of the lamps of a like restrictiveness.

2. A railway light signal, comprising, a plurality of proceed, caution, and stop lamps, the proceed and caution lamps being energized, in each case, through multiple circuits whereby the failure of one proceed or one caution lamp leaves other lamps of its kind energized, means controlled in accordance with traffic for selectively energizing all of the lamps of a like restrictiveness, and relay means in series with certain of the proceed and control lamps, whereby failure of all the lamps of a kind, when they should be energized, causes energization of all of the lamps of a kind giving the next more restrictive indication.

3. In a signal system, a stretch of track divided into signalling blocks, a signal at the entrance to each block, each signal including three green, three yellow, and three red lamps, the green and the yellow lamps, in each case, being arranged in groups of two and one lamps each in series with a control relay, and energized in multiple, traffic controlled means for selectively energizing all lights of a kind, the multiple energizing circuits for the yellow lamps including in series, back points of the two green control relays.

4. In a signal system, a stretch of track divided into signalling blocks, a signal at the entrance to each block, each signal including three green, three yellow, and three red lamps, the green and the yellow lamps, in each case, being arranged in groups of two and one lamps each in series with a control relay and energized in multiple, traffic controlled means for selectively energizing all lights of a kind, the multiple energizing circuits for the yellow lamps including in series, back points of the two green control relays, and an energizing circuit for energizing the red lamps in multiple including, in series a back point of each of the two green control relays and the two yellow control relays.

In testimony whereof I affix my signature.

FREDERICK B. WIEGAND.