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C. E. STAPLES

2,123,753

RAILWAY TRAFFIC CONTROLLING APPARATUS

Filed April 16, 1937

2 Sheets-Sheet 1

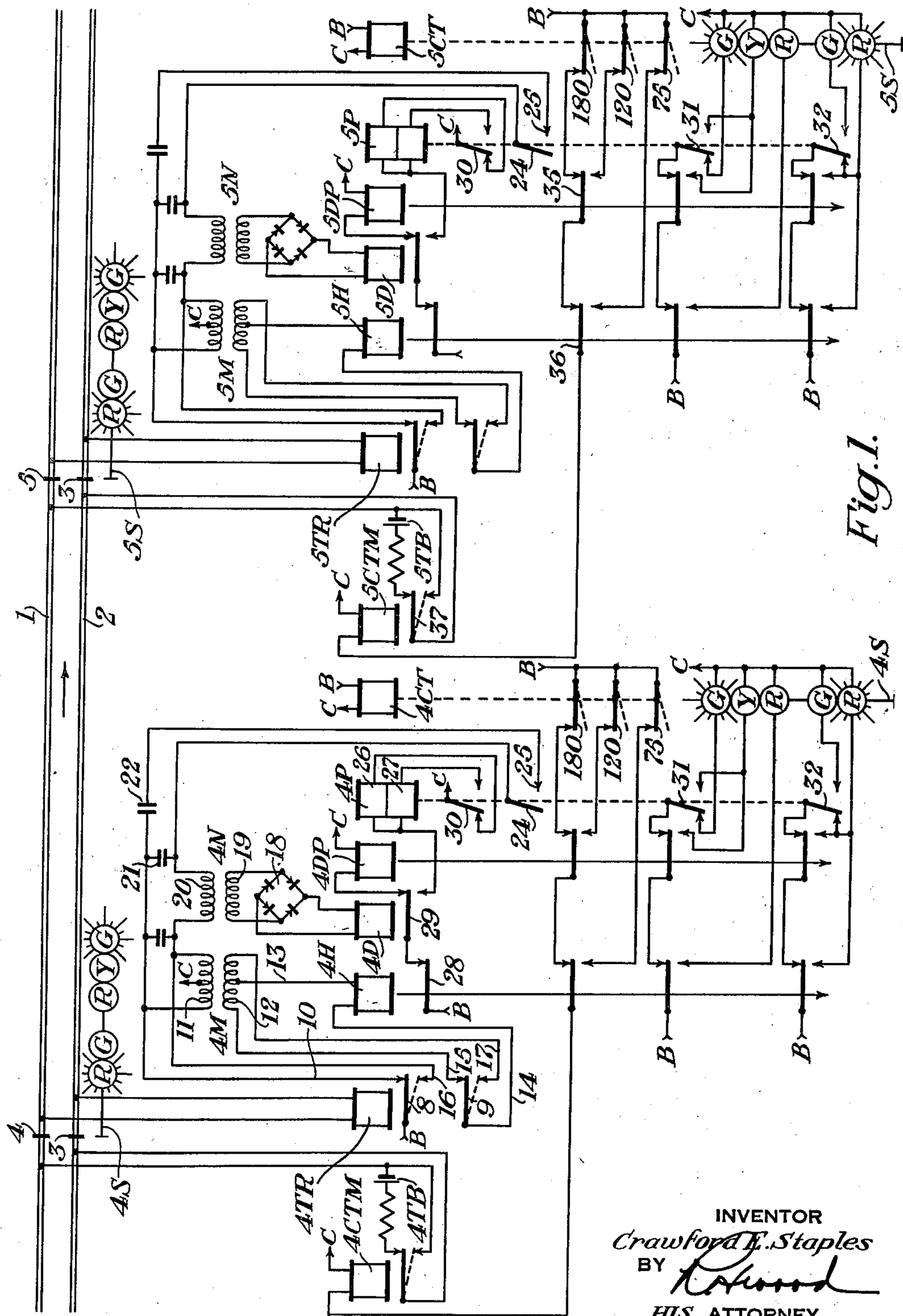


Fig. 1.

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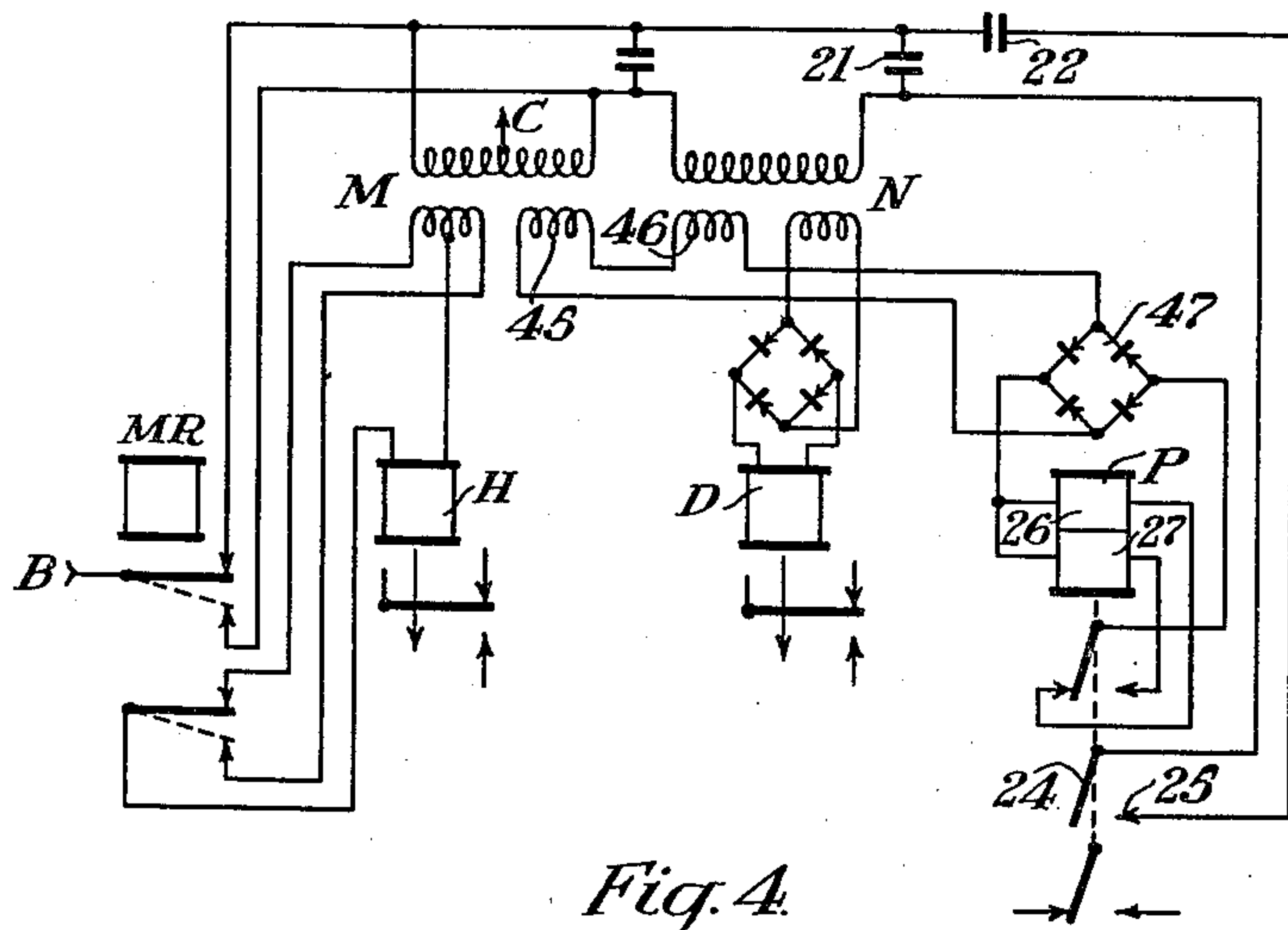
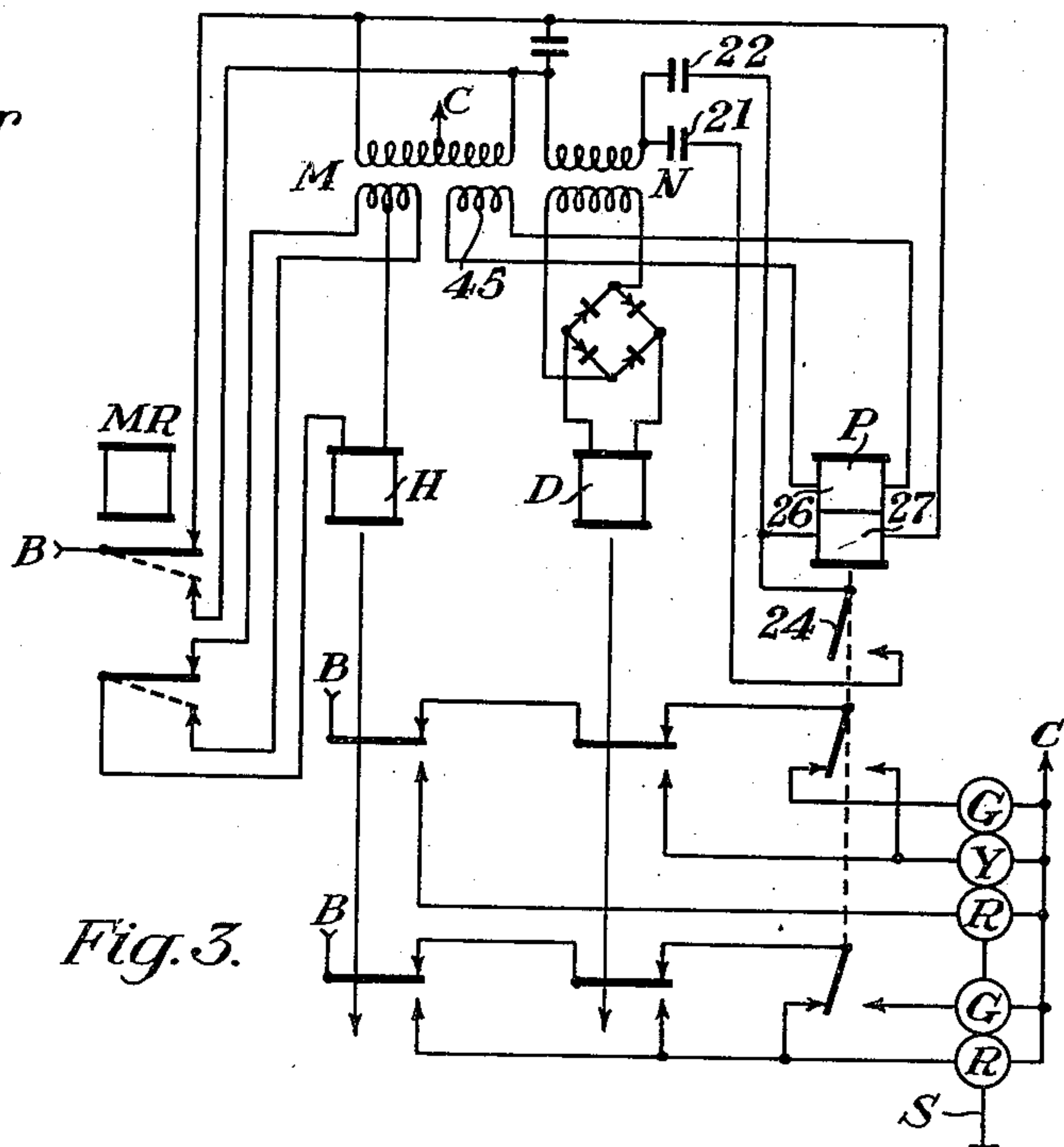
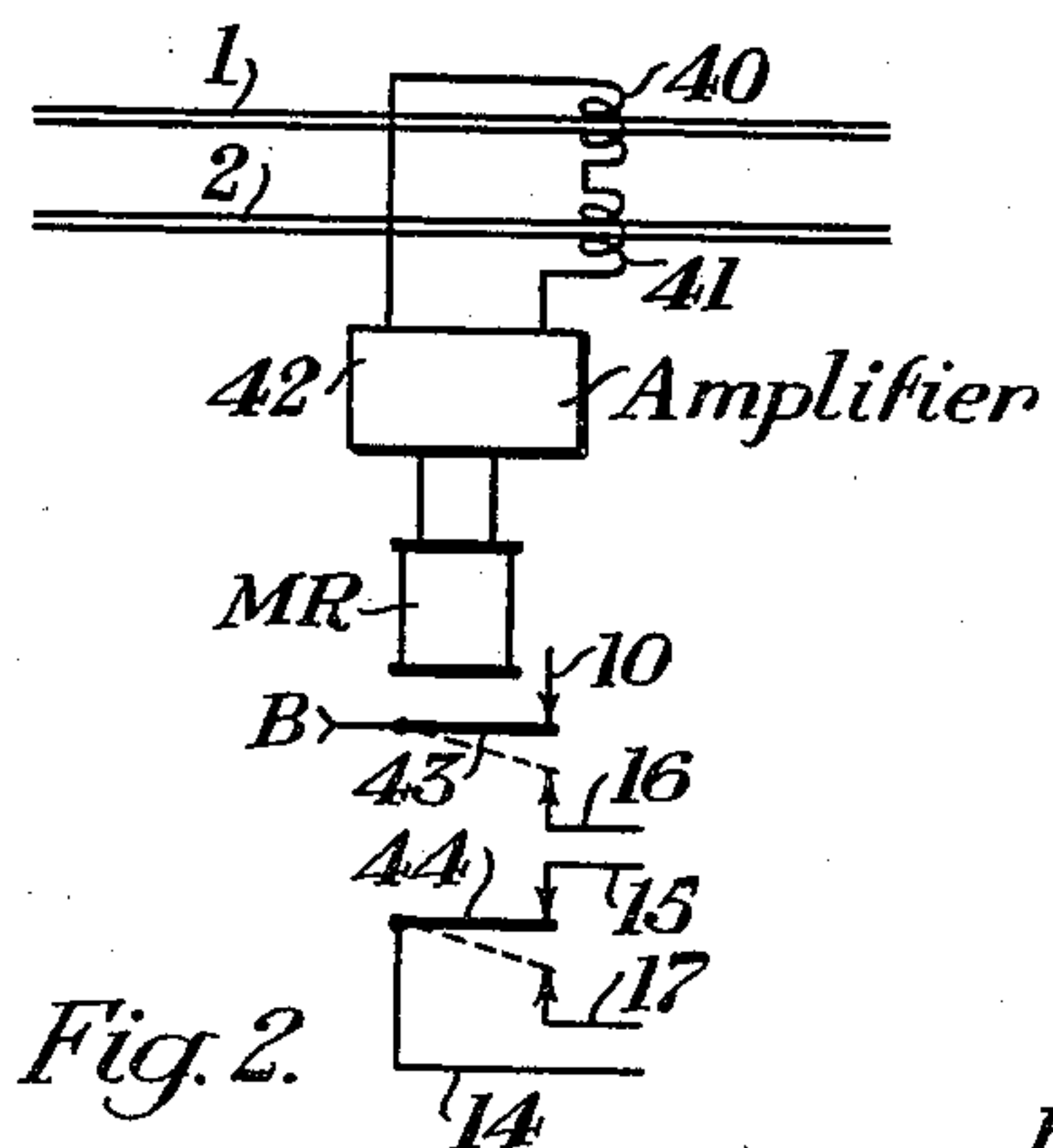
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RAILWAY TRAFFIC CONTROLLING APPARATUS

Filed April 16, 1937

2 Sheets-Sheet 2



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2,123,753

RAILWAY TRAFFIC CONTROLLING
APPARATUSCrawford E. Staples, Wilkinsburg, Pa., assignor to
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Application April 16, 1937, Serial No. 137,293

13 Claims. (Cl. 246—34)

My invention relates to railway traffic controlling apparatus, and more particularly to apparatus for controlling wayside and/or cab signals by means of coded trackway energy. Specifically, my invention relates to the electric tuning of a signal control relay circuit which circuit is supplied with energy of either one or two frequencies to correspond to the rate of operation of a code following relay.

The apparatus shown in this application is an improvement on the apparatus shown and claimed in an application of Frank H. Nicholson and Leslie R. Allison, Serial No. 210,744, filed May 28, 1938, for Railway traffic controlling apparatus.

One object of my invention is to provide means for automatically altering the tuning of the circuit to correspond to the frequency of the energy flowing therein and for indicating which frequency is present.

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

In the accompanying drawings, Fig. 1 is a diagrammatic view illustrating one form of wayside apparatus embodying my invention. Fig. 2 is a diagrammatic view showing a portion of train carried apparatus to illustrate how train carried signal control relays, similar to the wayside control relay shown in Fig. 1, can be utilized to control a cab signal. Fig. 3 is a diagrammatic view illustrating another form of train carried apparatus embodying my invention. Fig. 4 is a diagrammatic view illustrating a modification of a portion of the apparatus shown in Fig. 3 and also embodying my invention.

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

Referring to Fig. 1, the reference characters 1 and 2 designate the rails of a stretch of railway track along which traffic normally moves in the direction indicated by the arrow. The rails 1 and 2 are divided by insulated joints 3 into a plurality of track sections of which section 4—5 is a representative section. Each track section is provided with a code following track relay designated by the reference character TR with a prefix to correspond to the location. Each track section is also provided with a wayside signal designated by the reference character S with a prefix to correspond to the location and here shown as a color light signal. Each section is provided with a home signal control relay, a distant signal control relay, a distant signal control repeating relay, and an auxiliary relay of the

flasher type designated by the reference characters H, D, DP, and P, respectively, each with a prefix to correspond to the location.

The relays H and D are controlled by the associated code following track relay. Considering the apparatus at location 4, for example, the relay 4 in following code alternately closes the front and back points of its contacts 8 and 9. In the system shown herein, the rate of operation of contacts 8 and 9 is, as will be explained more in detail hereinafter, at 75, 120, or 180 times per minute in accordance with traffic conditions in advance. When the front point of contact 8 is closed, energy will flow from terminal B of a convenient source of current through wire 16 and left-hand portion of primary winding 11 of transformer 4M to terminal C of the same source of energy. The front point of contact 9 of relay 4TR being closed simultaneously with the front point of contact 8, energy will flow from one terminal of secondary winding 12 of transformer 4M through wire 13, relay 4H, wire 14, front point of contact 9 of relay 4TR, and wire 15 to the other terminal of the left-hand portion of secondary winding 12. When the back point of contact 8 of relay 4TR is closed, terminal B will be connected with wire 16 so that energy will flow in the opposite direction through the right-hand portion of primary winding 11 of transformer 4M and, since the back point of contact 9 of relay 4TR is also closed, energy will flow from the right-hand portion of secondary winding 12 of transformer 4M through wire 13, relay 4H, wire 14, back point of contact 9, and wire 17 to the other terminal of the right-hand portion of secondary winding 12. In other words, regardless of the particular code which relay 4TR is following, the winding of relay 4H will always be energized in one direction so that that relay will become picked up on any of the codes.

Relay 4D receives energy from a rectifier 18 which is connected to a secondary winding 19 of transformer 4N. Primary winding 20 of transformer 4N is supplied with energy by means of a circuit which includes wires 10 and 16 which circuit may be tuned to pass energy of either one of two frequencies to correspond to the 120 and 180 codes. That is, when condenser 21 only is included in the circuit, the tuning will be such that only energy corresponding to the 180 code will be passed to primary winding 20 whereas, when condenser 22 is connected in multiple with condenser 21, the circuit will pass only energy of a frequency corresponding to the 120 code.

The tuning of the circuit for primary winding 20 is controlled by a contact 24 of the auxiliary relay 4P, that is, when contact 24 is in its normal position as shown in the drawings, condenser 22 is disconnected from the circuit so that energy of a frequency corresponding to the 180 code will be passed freely to primary winding 20 whereas, when contact 24 is in its reverse position so that contact 24—25 is closed, condenser 22 is connected in multiple with condenser 21 to alter the tuning of the circuit to pass only energy of a frequency to correspond to the 120 code.

Relay 4P is provided with a winding 26 and a winding 27 wound in opposition and is controlled by the relays 4H and 4D. In other words, upon a change from 120 code to 180 code or vice versa, the relay 4D will become deenergized to establish a circuit for relay 4P which circuit includes front point of contact 28 of relay 4H and back point of contact 29 of relay 4D. When the circuit for relay 4P is closed, the windings 26 and 27 will be alternately energized over contact 30 of relay 4P so that contacts 24, 30, 31, and 32 of relay 4P will alternate between their normal and reverse positions. When contact 24 is in the proper position to bring correspondence between the tuning of the circuit for primary winding 20 of transformer 4N and the rate of operation of code following relay 4TR, relay 4D will, of course, become energized to disconnect energy from relay 4P. The latter relay is of the type which will remain in its last operated position so that the tuning of the circuit for the primary winding 20 of transformer 4N will be maintained until another change occurs in the operation of code following relays 4TR.

Relay 4DP is provided with a slow releasing characteristic and is controlled by a circuit which includes front point of contact 28 of relay 4H and front point of contact 29 of relay 4D. Relay 4DP will, therefore, become energized or deenergized in accordance with the energization or deenergization of relay 4D since relay 4H remains picked up on any of the codes.

For supplying energy to the rails, each section is provided with a track battery designated by the reference character TB with a prefix corresponding to the location. For periodically interrupting the supply of track circuit energy, each section is provided with a code transmitting relay designated by the reference character CTM with a prefix to correspond to the location. A constantly operating code generating relay designated by the reference character CT with a prefix corresponding to the location is provided with contacts 75, 120, and 180 which contacts operate respectively at 75, 120, and 180 times per minute. As will be explained more in detail hereinafter, the relays CTM are connected with contacts 75, 120, or 180 of the associated relays CT to cause operation of the relays CTM at a corresponding rate in accordance with the condition of the corresponding relays H and DP.

Having described certain elements of the system individually, I shall now describe the operation of the system as a whole. When at least three blocks in advance of location 5 are unoccupied, track relay 5TR will be following 180 code as a result of which relays 5H, 5D, and 5DP will all be energized.

At this time the relay 5H is supplied with current in one direction through the transformer 5M, and as a result the contact operated thereby and corresponding to the contact 28 associated with the relay 4H is held in engagement with its

front contact, thereby completing a circuit through which current may be supplied to the winding of the relay 5DP or to the windings of the relay 5P.

As the track relay 5TR is supplying alternating current of the 180 code to the circuit identified by the numerals 10 and 16 at location 4, current at this code frequency will be supplied to the primary winding of the transformer 5N. If on the initial supply of current of the 180 code frequency to the circuit of the primary winding of the transformer 5N this circuit is not tuned to permit flow of current of this code frequency, no current will flow through the primary winding of the transformer, and no current will be supplied by the secondary of the transformer to the winding of the relay 5D. As a result the movable contact of the relay 5D will remain in engagement with its back contact, thereby establishing a circuit through which current may be supplied to the windings of the relay 5P. The circuits through the windings of the relay 5P are controlled by the movable contact 30 of the relay 5P, while the contact 24 of this relay controls the tuning of the circuit through the primary of the transformer 5N.

At times when the circuit through the primary of transformer 5N is not tuned to permit flow of current of the 180 code frequency, the movable contacts 30 and 24 of the relay 5P are in their reverse positions, instead of their normal positions as shown in Fig. 1 of the drawings. On the supply of current to the circuit leading to the windings of the relay 5P at a time when the contact 30 is in its reverse position, a circuit is established through the lower winding of the relay. Upon energization of this winding of the relay, the movable contacts 24 and 30 are moved to their normal positions as shown in Fig. 1 of the drawings. On movement of the contact 24 to its normal position, the condenser for tuning the circuit of the primary of the transformer 5N to 120 code frequency is removed from the circuit, leaving only the condenser for tuning the circuit for 180 code in the circuit of the transformer primary.

As soon as the circuit of the transformer primary is tuned for the 180 code frequency, current flows through the transformer primary winding and induces a current in the secondary which is supplied through the associated rectifier to the winding of the relay 5D, thereby causing the movable contact of the relay 5D to be moved out of engagement with its back contact and into engagement with its front contact, and interrupting the circuit to the windings of the relay 5P. On the interruption of the supply of current to the winding of the relay 5P, the contacts 30 and 24 remain in the positions to which they have been moved.

The relay 5P is comparatively slow acting so that when the contact 24 is moved to a position to tune the circuit of the transformer 5N to the proper code frequency, it will remain in that position long enough for the winding of the relay 5D to be energized to thereby operate its movable contact and interrupt the circuit to the windings of the relay 5P.

It will be seen therefore that on the supply of current of the 180 code frequency, the relay 5P will be operated to tune the circuit of the primary of the transformer 5N to permit flow of current of the 180 code frequency if the circuit is not already tuned to that frequency.

On movement of the movable contact of the

relay 5D into its engagement with its front contact, a circuit is established through the winding of the relay 5DP so that the movable contact 35 is held in engagement with its front contact, while the movable contact 36 engages its front contact when energy is supplied to the winding of the relay 5H.

Relay 5CTM will be operating on 180 code by virtue of a circuit which passes over a path from terminal B through contact 180 of relay 5CT, front point of contact 35 of relay 5DP, front point of contact 36 of relay 5H, and relay 5CTM to terminal C. The supply of energy from track battery 5TB to the rails of section 4—5 will therefore be periodically interrupted by contact 37 of relay 5CTM at the rate of 180 times per minute.

When relay 5TR is following 180 code, section 4—5 will be supplied with 180 code, as described above, and signal 5S is controlled by relays 5H, 5DP, and 5P will provide an indication corresponding to clear traffic conditions in three advance blocks. The manner in which signal 5S is controlled by the relays 5H, 5DP, and 5P will be obvious from the drawings and it is believed to be unnecessary to trace the signal control circuits in detail.

If the current supplied to the block in advance of station 5 is changed from 180 code to 120 code at a time when the equipment at station 5 is conditioned to respond to current of the 180 code frequency, the code following relay 5TR will operate to supply alternating current to the circuit of the primary winding of the transformer 5N at the 120 code frequency while the relay 5H will be supplied with unidirectional current.

As the circuit of the primary winding of the transformer 5N is tuned to permit only current of the 180 code frequency to flow therein, current of the 120 code frequency cannot flow in this circuit, and accordingly, current will not be supplied to the winding of the relay 5D. The movable contact of the relay 5D therefore will engage its back contact and establish a circuit to the windings of the relay 5P. Current thereupon will flow through this circuit and the polar contact 30 to the upper winding of relay 5P. Upon energization of this winding, the contacts 30 and 24 are moved from their normal positions, as shown in Fig. 1 of the drawings, to their reverse positions. On this movement of the contact 24, the condenser corresponding to that identified by the reference numeral 22 at station 4 is connected in multiple with the other condenser with the result that the circuit of the primary winding of the transformer 5N will be tuned to permit flow of current of the 120 code frequency.

The winding of the relay 5D will thereupon be energized, and will move its movable contact out of engagement with its back contact, thereby interrupting the circuit to the winding of the relay 5P, and into engagement with its front contact, thereby supplying current to the winding of the relay 5DP to cause the movable contact 35 to be held in engagement with its front contact to establish a circuit from the 180 contact of the code generating relay 5CT to the code transmitting relay 5CTM.

If two blocks in advance of location 5 are unoccupied, and the third block in advance is occupied, relay 5TR will be following 120 code with the result that relays 5H, 5D, and 5DP will all be energized, as explained above. Relay 5CT will again be operating on 180 code over the circuit previously described so that the rails of section 4—5 will continue to be supplied with 180 code.

The contacts of relay 5P will, however, be in their reverse position because, during the change from 180 code to 120 code, relay 5D will have become momentarily deenergized to initiate the operation of relay 5P. As previously described, the reversal of contact 24 of relay 5P to close contact 24—25 will change the tuning of the circuit for transformer 5N so that relay 5D will become energized when relay 5TR is operating upon 120 code. The reversal of contacts 31 and 32 of relay 5P will establish circuits so that signal 5S will display an indication corresponding to two clear blocks in advance.

If the block in advance of location 5 is unoccupied and the second block in advance is occupied, relay 5TR will be following 75 code with the result that relay 5H will be energized, but relay 5D will not be energized because, as previously stated, the circuit of the primary 20 of the transformer 4N is tuned to pass energy only of the 120 and 180 code frequencies, and consequently relay 5DP will be deenergized. Relay 5CTM will now be operating on 120 code by virtue of a circuit which passes over a path from terminal B through contact 120 of relay 5CT, back point of contact 35 of relay 5DP, front point of contact 36 of relay 5H, and relay 5CTM to terminal C. The rails of section 4—5 will therefore be supplied with 120 code and signal 5S, due to the deenergization of relay 5DP, will display an indication corresponding to one clear block in advance.

If the block in advance of location 5 is occupied, relay 5TR will be deenergized with the result that relays 5H, 5D, and 5DP will also be deenergized. Under this condition, relay 5CTM will be operating on 75 code over a circuit which includes contact 75 of relay 5CT, back point of contact 36 of relay 5H, and relay 5CTM to terminal C. The rails of section 4—5 will therefore be supplied with 75 code and signal 5S will be displaying a stop indication to indicate that the block immediately in advance of location 5 is occupied.

The relays H are provided with a slow release characteristic so that these relays will not become released during changes in the direction of energization of the associated transformer M. The relays DP are provided with a slow release characteristic so that these relays will not become released when the associated relay D becomes released during periods of change in the frequency of the energy supplied to the associated transformer N. It will be apparent, therefore, that since the relays H and DP control the signal operating circuits and the supply of energy to the section next in rear, the slow releasing characteristic of these relays avoids signal flashing and disturbances in the energization of the track section to the rear.

Referring now to Fig. 2, the reference character MR designates a train carried code following relay which receives energy from the rails 1 and 2 inductively through coils 40 and 41 and amplifier 42. The contacts 43 and 44 of relay MR follow code in a manner similar to that described for the contacts 8 and 9 of the track relays TR. It will be apparent, therefore, that, if contacts 43 and 44 are connected to wires 10, 16, 15, 17, and 14 in a manner similar to that shown in Fig. 1, train carried signal control relays similar to the relays H, D, DP, and P may be utilized to govern a cab signal similar to signal S.

Referring next to Fig. 3, the reference character 45 designates a secondary winding of transformer M which is connected to winding 26 of auxiliary

relay P. Winding 27 of auxiliary relay P is connected in series with the turned circuits for transformer N. When the tuning of the circuit for transformer N corresponds to the frequency of the current flowing therein, energy will flow in winding 27 in a direction opposite to that which flows in winding 26 so that relay P will remain stationary. When, however, a change occurs in the frequency of the energy supplied to transformer N, energy will be prevented from flowing in winding 27 but alternating current energy will be flowing in winding 26 so that contact 24 will alternate between its normal and reverse positions in response to the alternating current supplied to transformer M by code following relay MR. If the frequency of the energy supplied to transformer N corresponds to 180 code, contact 24 will assume and will remain in the position shown in the drawings because winding 27 will be supplied with current equal and opposite to that supplied to winding 26. On the other hand, if the frequency of the energy supplied to transformer N corresponds to 120 code, contact 24 will assume and will remain in its reverse position because condenser 22 will then be connected in multiple with condenser 21 to energize winding 27 in a direction opposite to winding 26.

In operation, on the supply of energy to the code following relay MR of the system shown in Fig. 3 at the 75 code, alternating current is supplied thereby to the primary of the transformer C, while unidirectional current is supplied to the winding of the relay H. On this supply of alternating current to the transformer C, current is induced in the secondary winding 45 and is supplied therefrom to the winding 26 of the relay P.

On the supply of alternating current of the 75 code by the relay MR, current does not flow in appreciable quantity through the primary winding of the transformer N, since as pointed out above, the circuit of the transformer primary winding is tuned to permit flow of current of the 120 and 180 codes only. Accordingly on the supply of current of the 75 code, no current is supplied to the winding of the relay D, while the winding 27 of the relay P remains deenergized. At this time, as previously stated, the winding 26 is supplied with alternating current at the 75 code from the secondary 45, with the result that the polar contact 24 and the other polar contacts will oscillate between their reverse and normal positions. This is without consequence, however, since at this time the relay D is deenergized and its movable contacts engage their back contacts.

On the subsequent supply of current to the relay MR at the 120 code frequency, this relay operates to supply alternating current at this frequency to the primary winding of the transformer M, and to supply unidirectional current to the relay H. On the supply of current to the primary of the transformer M, current is induced in the secondary 45 and is supplied therefrom to the winding 26 to cause the polar contacts of the relay P to oscillate. The contact 24 accordingly is moved into and out of engagement with its reverse polar contact to thereby complete and interrupt a circuit to connect the condenser 21 in multiple with the condenser 22.

When the condenser 21 is connected in multiple with the condenser 22, the circuit is tuned to permit flow of current of the 120 code frequency. Accordingly when current of the 120 code frequency is supplied by the relay MR, the contact 24 of the relay P will be oscillated until it engages its reverse contact, in which it connects the con-

denser 21 in multiple with the condenser 22, thereby tuning the circuit of the primary winding of the transformer N for current of the 120 code frequency with the result that current is caused to flow through the winding 27 of the relay P. On energization of the winding 27, which opposes the winding 26, further movement of the contact 24 is prevented, and this contact remains in engagement with its reverse contact, and so also do the other contacts of the relay P.

On the flow of current in the primary winding of the transformer N subsequent to the tuning of the circuit through this winding for 120 code frequency, current is supplied from the transformer secondary to the relay D, and its movable contacts are moved into engagement with their front contacts as shown in Fig. 3 of the drawings.

On the supply of current of the 180 code frequency to the relay MR, current at this frequency is supplied to the transformer M, while unidirectional current is supplied to the relay H. In addition, current is induced in the secondary 45 and is supplied therefrom to the winding 26 of the relay P with the result that the movable contacts of the relay P will oscillate between their normal and reverse positions.

Assuming that on the initial supply of current of the 180 code frequency by the relay MR, that the circuit of the primary of the transformer N is tuned for the 120 code frequency, current of the 180 code frequency will not initially flow through the primary of the transformer N and through the winding 27 of the relay P. As soon as the contact 24 is moved from its reverse position to its normal position the condenser 21 is disconnected from the circuit of the primary of the transformer N, thereby tuning this circuit for the 180 code frequency. When the circuit is tuned for 180 code frequency, current of this frequency flows through the winding 27 and holds the contact 24 in the normal position to maintain the circuit tuned for 180 code frequency, while current flows through the primary of the transformer N with the result that current is supplied to the winding of the relay D.

With the form of apparatus shown in Fig. 3 the slow releasing relay DP is not required because relay D will not become released during the change from one code to another.

Referring now to Fig. 4, the reference character 46 designates a secondary winding of transformer N which is connected in series with but in opposition to secondary winding 45 of transformer M. Relay P is connected to a rectifier 47 which is in turn connected to secondary windings 45 and 46 in series. When the tuning of the circuit for transformer N corresponds to the frequency of the energy flowing therein, the current induced in secondary winding 46 will be equal and opposite to that induced in secondary winding 45 so that no current will flow to relay P through rectifier 47. When the frequency of the energy supplied to transformer N is out of correspondence with the tuning of the supply circuit for this transformer, relay P will become energized by secondary winding 45 of transformer M because no opposing current will be flowing in secondary winding 46 of transformer N. Under this condition, contact 24 of relay P will assume a position to bring about correspondence between the tuning of the circuit for transformer N and the frequency of the energy flowing therein. That is, with contact 24 in its normal position as shown in the drawings, condenser 21 alone will be connected in the circuit for transformer N whereas, when

contact 24 is in its reverse position so that contact 24—25 is closed, condensers 21 and 22 will be connected in parallel to pass energy of the frequency corresponding to 120 code.

5 In operation of the system shown in Fig. 4, on the supply of current of the 75 code frequency to the relay MR, this relay supplies alternating current of this frequency to the primary of transformer M, while unidirectional current is supplied
10 to the relay H. On the supply of alternating current to the primary of transformer M, current is induced in the secondary 45, and is supplied therefrom through the rectifier 47 to the windings of the relay P. On this supply of alternating current to the windings of the relay P,
15 the movable contacts of this relay are oscillated between their normal and reverse positions.

On the supply of current of the 75 code frequency, current does not flow through the primary of the transformer N since this circuit can
20 only be tuned to permit the flow of current of the 120 or 180 code frequencies. Accordingly current will not be supplied to the winding of the relay D and its movable contacts will remain in engagement with their back contacts.
25

On the supply of current of the 120 code frequency to the relay MR, it supplies alternating current of this frequency to the transformer M, while current of this frequency is supplied by the
30 secondary winding 45 to the relay P through the rectifier 47 with the result that the movable contacts of the relay P oscillate between their normal and reverse positions.

As soon as the movable contacts of the relay P
35 are moved to their reverse positions, the condenser 22 is connected in multiple with the condenser 21, thereby tuning the circuit of the primary of the transformer N for the 120 code frequency. Current of the 120 code frequency therefore
40 will flow through the transformer primary and will induce current in the secondary from which current is supplied to the winding of the relay D.

When current of the 120 code frequency flows
45 through the primary of transformer N, current is induced in the secondary winding 46. This current opposes and neutralizes the current induced in the secondary 45 of transformer M with the result that no current will be supplied through
50 the rectifier 47 to the relay P.

When the circuit of the transformer N is tuned to permit flow of current of the 120 code frequency, the supply of current to the relay P is cut off and the contact 24, therefore, will remain
55 in the position to connect the condenser 22 in multiple with the condenser 21 and maintain the circuit of the transformer tuned to pass energy of the 120 code frequency.

When current of the 180 code frequency is supplied to the relay MR, it supplies alternating current at that frequency to the primary of the
60 transformer M, and current at this code frequency is induced in the secondary winding 45. Assuming that the circuit of the primary winding of the transformer N is tuned to pass energy of the 120 code frequency, then on the supply of current at the 180 code frequency, current will
65 not flow through the transformer N. Accordingly no opposing current will be present in the secondary 46 and current induced in the secondary 45 will be supplied through the rectifier 47 to the relay P. On the supply of current to the relay P, the contacts thereof are oscillated between their reverse and normal positions. As soon as the
70 tact 24 is moved to its normal position, the con-

denser 22 is removed from the circuit of the transformer N, thereby tuning that circuit to pass energy of the 180 code frequency.

When this circuit is tuned to pass energy of the 180 code frequency, current of this frequency
5 will flow through the primary of the transformer N, thereby inducing current in the secondary 46 which opposes and neutralizes the current supplied by the secondary 45. No current will be supplied to the relay P, therefore, and the contact 24 will remain in its normal position and
10 maintain the circuit of the primary winding of the transformer tuned to pass energy of the 180 code frequency.

In addition, on the flow of current of the 180
15 code frequency in the primary of the transformer N, current is induced in the secondary from which current is supplied to the winding of the relay D.

Although the apparatus shown in Figs. 3 and 4 has been described as being of the train carried
20 type for controlling a cab signal, it will be apparent that similar trackway apparatus can also be used to control wayside signals.

Although I have herein shown and described
25 only three 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
30 claim is:

1. In a coded signaling system, a code following relay at times supplied with energy periodically interrupted at one rate and at other times
35 supplied with energy periodically interrupted at another rate, a circuit capable of being tuned to a first condition to pass energy of a first frequency or to a second condition to pass energy of a second frequency, means governed by said code following relay for supplying said circuit with energy of one
40 or the other of said two frequencies in accordance with the rate of operation of said code following relay, a control relay receiving energy from said circuit, and means governed by current supplied to said circuit for alternately adjusting the tuning
45 of said circuit from said one to said other condition at predetermined time intervals until the frequency for which said circuit is tuned corresponds to the rate of operation of said code following relay.

2. In a coded signaling system, a code following
50 relay at times supplied with energy periodically interrupted at one rate and at other times supplied with energy periodically interrupted at another rate, a circuit capable of being tuned to a
55 first condition to pass energy of a first frequency or to a second condition to pass energy of a second frequency, means governed by said code following relay for supplying said circuit with energy of one or the other of said two frequencies in accordance with the rate of operation of said code following relay, a control relay receiving energy from said circuit, another relay which alternates between one condition and another condition when energized and which remains in the condition to
65 which last operated when deenergized, means for energizing or deenergizing said other relay according as said control relay is deenergized or energized respectively, and means effective to tune said circuit to said first or said second condition
70 according as said other relay is in said one or said other condition respectively.

3. In combination, a section of railway track, means for supplying the rails of said section with coded energy of one rate or another rate in ac-
75

cordance with traffic conditions in advance, a code following relay receiving energy from the rails of said section, a circuit capable of being tuned to pass energy of one frequency or to pass energy of another frequency, means governed by said code following relay for supplying said circuit with energy of said one frequency or said other frequency depending upon the rate of operation of the code following relay, a control relay receiving energy from said circuit, an auxiliary relay which alternates between one condition and another condition when energized and which remains in the condition to which last operated when deenergized, means for energizing or deenergizing said auxiliary relay according as said control relay is deenergized or energized respectively, means for tuning said circuit in accordance with the condition of said auxiliary relay, and a traffic governing device controlled by said auxiliary relay and by said control relay.

4. In combination, a section of railway track, means for supplying the rails of said section with coded energy of one rate or another rate in accordance with traffic conditions in advance, a code following relay receiving energy from the rails of said section, a circuit capable of being tuned to pass energy of one frequency or to pass energy of another frequency, means governed by said code following relay for supplying said circuit with energy of said one frequency or said other frequency depending upon the rate of operation of the code following relay, a control relay receiving energy from said circuit, an auxiliary relay, means effective when the frequency of the energy supplied to said circuit is changed to cause said auxiliary relay to assume one condition or another condition to establish correspondence between the tuning of said circuit and the frequency of energy supplied thereto, and a traffic governing device controlled by said auxiliary relay and by said control relay.

5. In combination, a section of railway track, means for supplying the rails of said section with coded energy of one rate or another rate in accordance with traffic conditions in advance, a code following relay receiving energy from the rails of said section, a circuit capable of being tuned to pass energy of one frequency or to pass energy of another frequency, means governed by said code following relay for supplying said circuit with energy of said one frequency or said other frequency depending upon the rate of operation of said code following relay, a control relay receiving energy from said circuit, means including an auxiliary relay governed by flow of current in said circuit for automatically tuning said circuit to correspond to the frequency of the energy supplied thereto, contacts governed by said auxiliary relay for indicating which of said frequencies is present, and a signal for said section governed by said contacts and said control relay.

6. In combination, a section of railway track, means for supplying the rails of said section with coded energy of a first, second, or third rate respectively in accordance with traffic conditions in advance, a code following relay receiving energy from the rails of said section, a circuit capable of being tuned to pass energy of one frequency or to pass energy of another frequency, means governed by said code following relay for supplying said circuit with energy of said one frequency or said other frequency according as said code following relay is supplied with coded energy of said second or said third rates respectively, means including an auxiliary relay for automatically tun-

ing said circuit to correspond to the frequency of the energy supplied thereto and for indicating the frequency present, a first control relay which becomes energized when said code following relay is operating at any of said rates, a second control relay receiving energy from said circuit, and a traffic governing device for said section governed by said first and second control relays as well as by said auxiliary relay.

7. In combination, a code following relay, means for selectively operating said code following relay at one rate or at another rate, a circuit capable of being tuned to pass energy of one frequency or another frequency, means including a contact of said code following relay for supplying said circuit with energy of said one frequency or said other frequency to correspond to the rate of operation of said code following relay, a control relay receiving energy from said circuit, an auxiliary relay having two windings, means effective when said control relay is released to energize said two windings alternately to cause a contact of said auxiliary relay to assume one condition or another condition respectively, means including a contact of said auxiliary relay for automatically tuning said circuit to correspond to the frequency of the energy present therein, a slow releasing repeating relay governed by said control relay, and a signal governed by said repeating relay and a contact of said auxiliary relay.

8. In combination, a code following relay, means for selectively operating said code following relay at one rate or at another rate, a circuit capable of being tuned to pass energy of one frequency or another frequency, means including a contact of said code following relay for supplying said circuit with alternating current energy of said one frequency or said other frequency to correspond to the rate of operation of said code following relay, an auxiliary relay having two windings wound in opposition, means for energizing one of said windings by energy of either frequency supplied by said code following relay to cause a contact of said auxiliary relay to alternate between two different positions, means for altering the tuning of said circuit in accordance with the position of said contact, said other winding being included in said circuit thereby preventing the operation of said auxiliary relay when the tuning of said circuit corresponds to the frequency of the energy flowing therein, and a control relay receiving energy from said circuit.

9. In combination, a code following relay, means for selectively operating said code following relay at one rate or at another rate, a circuit capable of being tuned to pass energy of one frequency or another frequency, means including a contact of said code following relay for supplying said circuit with energy of said one frequency or said other frequency to correspond to the rate of operation of said code following relay, an auxiliary relay having a contact which alternates between two different positions when the auxiliary relay is energized and which remains in the position to which last operated when the auxiliary relay is deenergized, means for tuning said circuit in accordance with the position of said contact, means for energizing said auxiliary relay including one transformer which is energized by energy of either frequency and another transformer which is energized only when the tuning of said circuit corresponds to the frequency of the energy flowing therein, said

two transformers being connected in opposition whereby said auxiliary relay is energized only when the tuning of said circuit is out of correspondence with the frequency of the energy
5 flowing therein, and a control relay receiving energy from said circuit.

10. In a coded signaling system, in combination, a signal, a code following relay at times operating at one rate and at other times operating at another rate, a circuit having an inductive reactance and a capacity connected in series, said capacity including a plurality of separate sections which may be connected in multiple, said circuit being tuned to pass energy at
15 one frequency when all of said capacity is connected in said circuit and being tuned to pass energy at another frequency when a section of said capacity is disconnected from said circuit, a member oscillatable between a position in which it connects said capacity section in said circuit and a position in which said capacity section is disconnected from said circuit, means governed by flow of current in said circuit for oscillating said member and for also controlling
20 said signal, means for supplying current to said circuit at one or the other of said frequencies in accordance with the rate of operation of said code following relay, and means governed by the flow of current in said circuit and by the supply of current by said code following relay for controlling said signal.
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11. In a coded signaling system, in combination, a signal, a code following relay at times operating at one rate and at other times operating at another rate, a circuit having an inductive reactance and a capacity connected in series, said capacity including a plurality of separate sections which may be connected in multiple, said circuit being tuned to pass energy at
30 one predetermined frequency when all of said capacity is connected in said circuit and being tuned to pass energy at another predetermined frequency when a section of said capacity is disconnected from said circuit, means governed by flow of current in said circuit for alternately connecting said capacity section in said circuit and for disconnecting said capacity section from said circuit and for also controlling said signal, means for supplying current to said circuit at
35 one or the other of said frequencies in accordance with the rate of operation of said code following relay, and means governed by the flow
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of current in said circuit and by operation of said code following relay for controlling said signal.

12. In a coded signaling system, in combination, a signal, a code following relay at times operating at one rate and at other times operating at another rate, a circuit having inductive and capacity reactances connected in series therewith, one of said reactances including a plurality of separate sections which may be connected in multiple, said circuit being tuned to pass energy at one frequency when all of said reactance sections are connected in said circuit and being tuned to pass energy at another frequency when a section of said reactance is disconnected from said circuit, means governed by the flow of current in said circuit for alternately connecting said reactance section in said circuit and for disconnecting said reactance section from said circuit and for controlling said signal, means for supplying current to said circuit at one or the other of said frequencies in accordance with the rate of operation of said code following relay, and means governed by flow of current in said circuit for also controlling said signal.
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13. In a coded signaling system, in combination, a signal, a code following relay at times operating at one rate and at other times operating at another rate, a circuit capable of being tuned to pass energy of one frequency or to pass energy of another frequency, a relay having a pair of windings and a movable member oscillatable between spaced positions by said windings, said member being operative in one of its positions to tune said circuit to pass energy of one frequency and being operative in the other of its positions to tune the circuit to pass energy of the other frequency, said member being moved to one of its positions on energization of one of said windings, means associated with said member and operable only on movement of said member to said one position to effect energization of the other of said windings, means operable on energization of the other of said windings to move the member to the other of its positions and to effect the energization of said first named winding, means responsive to the flow of current in said circuit for governing energization of at least one of said windings, and a signal controlled by said relay in accordance with movement of said movable member.
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