

F. P. CREMONA.
ELECTRIC RAILWAY SIGNALING SYSTEM.
APPLICATION FILED APR. 11, 1910.

1,065,114.

Patented June 17, 1913.

2 SHEETS-SHEET 1.

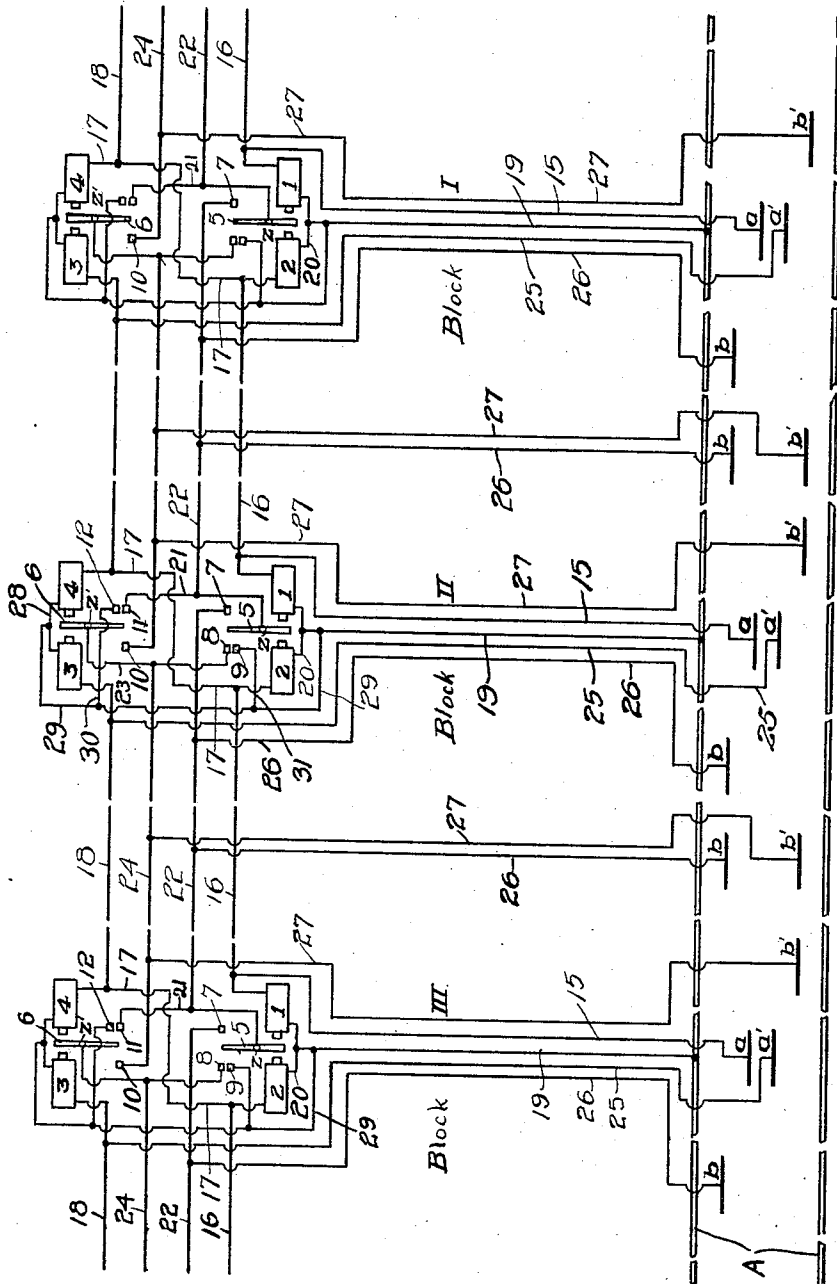


Fig. 1.

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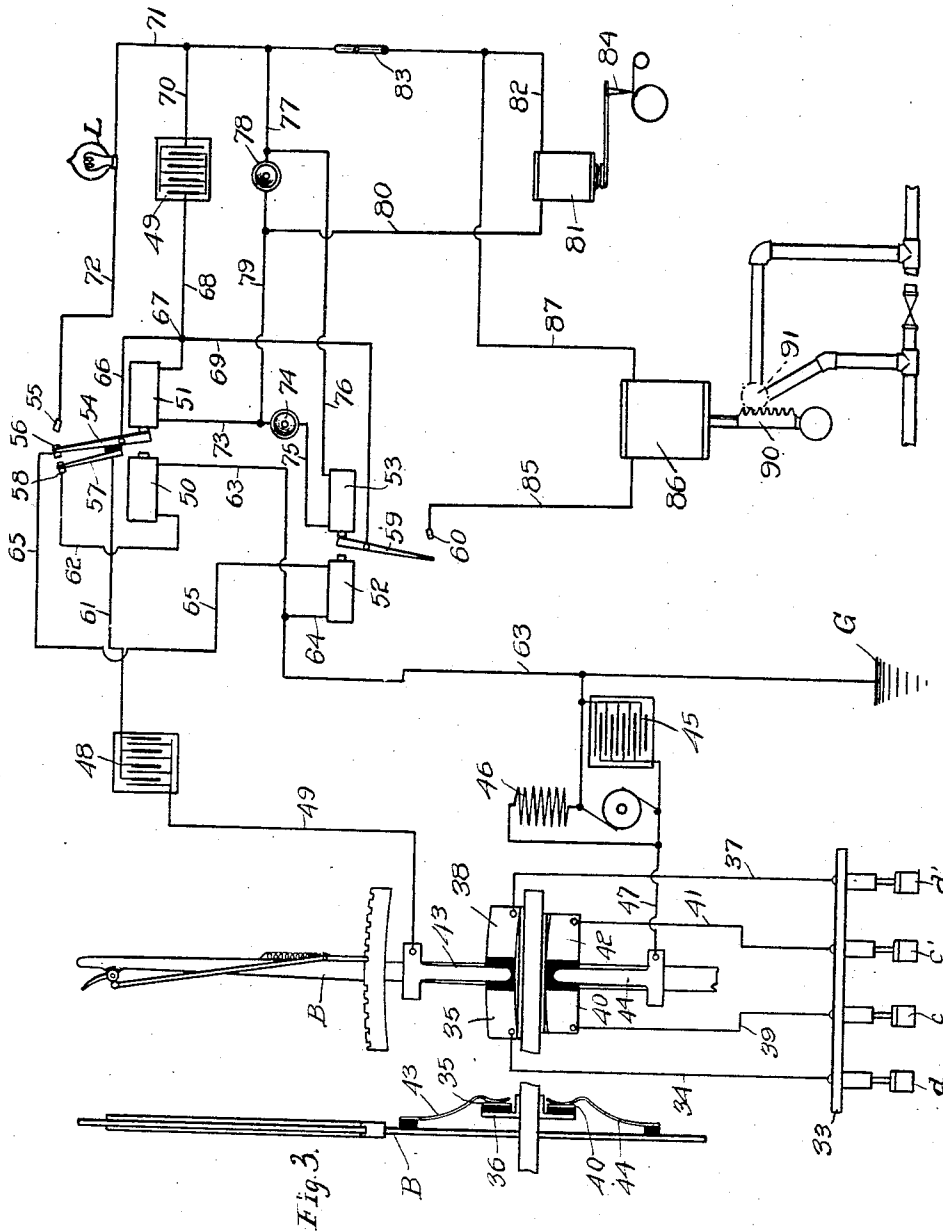


Fig. 2.

Fig. 3.

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ELECTRIC RAILWAY SIGNALING SYSTEM.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRANK P. CREMONA, a citizen of the United States, residing at Baltimore, in the State of Maryland, have
5 invented certain new and useful Improvements in Electric Railway Signaling Systems, of which the following is a specification.

My said invention consists in certain improvements in electric signaling systems for
10 railways, whereby a danger signal will be shown in the cab of the locomotive at a given distance from the point of danger toward which the locomotive is approaching, all as
15 will be hereinafter more fully described and claimed.

Referring to the accompanying drawings which are made a part hereof and on which similar reference characters indicate similar
20 parts, Figure 1 is a diagrammatic view illustrating my signaling system, the same being shown as applied to three blocks, or stations, in the railway system, Fig. 2 is a diagrammatic view showing the apparatus and its
25 arrangement on the locomotive, Fig. 3 an edge view of the reversing lever.

In Fig. 1 the portions marked A indicate the rails of the track, which are bonded, on which trains may run in both directions,
30 while in Fig. 2 the reference letter B indicates the ordinary reversing lever in the cab of a locomotive.

The equipment of each block throughout the system is the same but I have shown
35 three blocks in Fig. 1 to better illustrate the operation of the system. Each block is equipped with two pairs of electro-magnets. Magnets 1 and 2 arranged with their poles adjacent and to operate oppositely constitute
40 one pair. A pointer 5 is pivoted on a central pivot z with one end adapted to vibrate between the poles of said magnets 1 and 2. Magnets 3 and 4 are arranged in a similar
45 manner and constitute the other pair. A pointer 6, like pointer 5, is pivoted on a central pivot z' adjacent to said magnets 3 and 4 with one end adapted to vibrate between the poles thereof. The outer end of
50 lever 5 is adapted to contact when in one position with a contact plate 7 and when in its other position with two contact plates 8 and 9. The outer end of lever 6 is adapted to contact with a contact plate 10 when in
55 one position and when in its other position with contact plates 11 and 12. The contact plates 8 and 9 form two wire terminals and

are located alongside each other. The contact plates 11 and 12 are also wire terminals and are similarly arranged. Contact plates 7 and 10 are also wire terminals located
60 oppositely to the others. Between the rails of the track A, at each block, are located two contact shoes a and a' a short distance apart and alongside each other. At appropriate
65 points between the stations are arranged contact shoes b and b' the shoes b being in line on one side, near one rail, and the shoes b' being in line on the other side. Said
70 contact shoes b and b' are arranged at intervals apart required to secure the frequency of signaling desired on any particular system. A wire 15 runs from contact shoe a to a line wire 16. Said line wire 16
75 is connected in one block to the magnet 1 and it runs to the block in the rear, as from block II to block I, where it is connected to a branch wire 17 which is connected to magnets 2 and 4 of that block. The opposite
80 line wire 18 is also connected to the branch 17 and extends back to the next block where it connects with the magnet 3. A ground wire 19 runs from the rail, or ground, and connects by a branch wire 20 to the adjacent
85 ends of magnets 1 and 2. A branch wire 21 connects signal wire 22 with pointer 5 and terminal plate 11. Another branch wire 23 connects the other signal wire 24 with terminal plate 8 and with pointer 6. Contact
90 shoes a' are each connected by wires 25 with the line wires 18 which are connected in one block with the magnet 3 of that block and in the block in front with the magnets 2 and 4 through the connecting branch 17. The
95 contact shoe a is utilized in the operation of the system when a train is going in one direction and the contact shoe a' is utilized when a train is going in the opposite direction, as will be hereinafter more fully described. Each contact shoe b is connected
100 by a line 26 with the signal wire 22 and each contact shoe b' is connected by a wire 27 with the signal wire 24. The adjacent ends of magnets 3 and 4 are connected by a wire 28 from which a branch wire 29 runs to ground wire 19. A branch wire 30 connects
105 wire 29 with terminal plate 12 and a branch wire 31 connects it with terminal plate 9.

Each locomotive carries a series of four brushes two of which, c and c' , are adapted to contact with the contact shoes a and a'
110 in the blocks, and the other two of which, d and d' , are adapted to contact with the

contact shoes *b* and *b'*. Said brushes may be of any approved form and are carried beneath the locomotive in any approved manner. In Fig. 2 I have illustrated the parts in a diagrammatic manner, it being understood that the location of the different batteries and the wire and other parts will be arranged to suit the convenience of the engineer and the form of cab employed on the locomotive. The several brushes are shown as mounted upon a bar 33 which is carried upon the locomotive in position so that said brushes will contact with the contact shoes as the locomotive passes over them. Said several brushes are insulated from said bar and from each other. The brush *d* is connected by a wire 34 to a contact plate 35 on one corner of a switch plate, or bracket, 36 suitably supported alongside the reversing lever B. Brush *d'* is connected by a wire 37 to a contact plate 38 on the opposite upper corner of said plate 36. Brush *c* is connected by a wire 39 to contact plate 40 on the lower corner opposite plate 35, and brush *c'* is connected by wire 41 with a contact plate 42 on the other lower corner of bracket 36 opposite contact plate 38. Said contact plates 35, 38, 40 and 42 are each insulated from the bracket 36 and from each other. A sliding spring-pressed contact finger 43 is mounted on the reversing lever B above bracket 36 with its lower end adapted to bear upon the face of the contact plate 35, or 38, or the face of the strip of insulating material separating them, according to the position of the lever. Said contact finger 43 is insulated from said reversing lever as best shown in Fig. 3. Another spring-pressed contact finger 44 is mounted on lever B below the bracket 36 with its point adapted to bear upon contact plate 40, or 42, or the strip of insulating material separating them, according to the position of the lever. A storage battery 45 is mounted in any convenient position on the engine and is connected to a suitable generator 46 in the usual, or any approved, manner. Said generator may be run by a small steam turbine located on the locomotive, but not necessarily shown therein. By means of said generator the power of said storage battery 45 is constantly maintained at the voltage necessary to operate the apparatus. Said storage battery 45 is connected by a wire 47 with contact finger 44 on the reversing lever B. Another, smaller, storage battery 48 is connected by wire 49 with contact finger 43 on lever B. A signal light L is located in a convenient place on the locomotive and another storage battery 49 is also located in any convenient position on said locomotive. A pair of electromagnets 50 and 51 are arranged with their poles adjacent and another pair of electromagnets 52 and 53 are similarly arranged.

A lever or pointer 54 is pivoted adjacent to the poles of said magnets 50 and 51, one end of which is adapted to vibrate between said poles and the other end of which is adapted to contact with one or the other of terminal contact plates 55 or 56. Said pointer 54 also has branch 57 mounted on one side thereof, but insulated therefrom, the outer end of which is adapted to contact with the terminal plate 58, or with the terminal plate 56, according to the position of said pointer, as will be presently described. Between magnets 52 and 53 is pivoted a pointer 59 one end of which is adapted to vibrate between the poles of said magnets the outer end of which is adapted when in one position to contact with a terminal contact plate 60. A wire 61 connects storage battery 48 with the branch arm 57 of pointer 54. A wire 62 runs from terminal plate 58 to magnet 50. Another wire 63 runs from the opposite end of magnet 50 to the ground G. A branch 64 connects wire 63 with magnet 52. Another wire 65 connects the opposite end of magnet 52 with contact plate 56. A wire 66 runs from pointer 54 and connects at 67 with wire 68 running to storage battery 49 and with wire 69 running to pointer 59. Wire 68 also connects battery 49 with magnet 51. A wire 70 connects battery 49 to a wire 71 running to one side of lamp L the other side of lamp L being connected by a wire 72 with terminal plate 55. Another wire 73 connects magnet 51 with a push button 74 and an extension 75 runs from said push button to magnet 53. Another wire 76 runs from the opposite end of magnet 53 and connects with wire 77 which connects at one end with wire 71 and at its other end with a push button 78 from which a branch 79 runs and connects with wire 73. A wire 80 runs from branch 79 to a magnet 81 and another wire 82 runs from the opposite side of said magnet 81 to one side of a switch 83 and may be connected by said switch to wire 71. Said magnet 81 is connected to operate a time recorder 84, and wire 85 runs from contact plate 60 to one side of electric solenoid 86 and another wire 87 runs from the opposite side of said solenoid to wire 82. Said solenoid is connected to operate air-brake valve 91.

I will now proceed to describe the operation: Suppose a train, the locomotive of which is equipped with the apparatus shown in Fig. 2, to be running in a certain direction on a track divided into blocks, each block of which is equipped with the apparatus shown in Fig. 1 and connected as there shown. We will first consider the train as coming from block I to block II. Immediately on the contact between brush *c* and contact shoe *a*, as at block II, a circuit is formed through the magnets 1 of block II and magnets 2 and 4 of block I. The ener-

gizing of magnet 1 in block II serves to attract the end of pointer 5 to the pole of said magnet throwing its outer end across the contact plates 8 and 9, connecting said contact plates and forming a connection between signal wire 22 between blocks I and II and the ground through said pointer 5, the branch wire 31, branch wire 29 and the ground wire 19. At the same time magnets 2 and 4 of block I are energized and operate to draw the pointers 5 and 6 into contact with their respective poles, the outer end of said pointers connecting respectively with the terminal plates 7 and 10, thus connecting the signal wire 22 running from block I rearwardly to the signal wire 22 running forward from block I and making the signal wire connection continuous to block II where it is connected in circuit with the ground. The contact of pointer 6 with the contact plate 10 forms a like connection, or bridge, across the break in signal wire 24 at block I so that both signal wires are connected through block I. The reversing lever B, when the locomotive is going forward, will stand in position so that the contact finger 44 will be in electrical contact with plate 40, while finger 43 will be in electrical contact with plate 35. Thus the current from battery 45 will pass through wire 47 and finger 44, from thence to plate 40 and through wire 39 to the brush *c*. From brush *c* it will pass through contact shoe *a* and through the wire connection to the magnet 1 of block II and magnets 2 and 4 of block I and to the ground through the connections previously described, thus completing the circuit and energizing the magnets to attract the pointers, as above described. The train proceeding on its way passes block III and in the same manner energizes magnet 1 of block III and magnets 2 and 4 of block II completing the circuit through signal wires 22 and 24 to the ground and connecting the two branches of said wires in block II. The signal lamp L of an approaching train, or of the train just referred to, is arranged to be connected in circuit with battery 49, but said battery is only of sufficient strength to energize magnet 50 and complete the circuit through battery 49, and light said lamp when the train is within a certain distance, say one and a half blocks, more or less, of the open circuit. The connection is made as follows: Suppose a train having passed blocks I, II and III stops just beyond block III and a second train comes from the same direction behind said first train through block I, the brush *d* will contact with one of the contact shoes *b* and form a circuit through the connections, before described, with the ground at block III. As soon as the brush connects with the contact shoe and closes the circuit battery 48, through the connection formed by wire 61, contact plate 58, wire 62 and ground wire 63 will energize magnet 50 and attract the pointer 54 to its pole throwing the outer end of said pointer into contact with plate 55 and the outer end of branch 57 into contact with plate 56, thus establishing a circuit through wire 72, the lamp and wires 71 and 70 to battery 49 and wires 68 and 66 to the ground. The engineer noticing the light will know that danger is ahead and by operating push button 78 will close the circuit through battery 49 and magnet 51 and energize said magnet, throwing the pointer 54 with its branch 57 into their original positions. The train cautiously proceeding on its way, brush *d* will contact with the next contact shoe *b* and in like manner get another signal from lamp L provided the train ahead is still at block III. If, however, the train has moved on and passed the next block, breaking in the rear the connection between signal wire 22 with the ground and connecting them across said block, the danger will be more than the required distance ahead and the resistance will be too great to enable the battery 48 to energize magnet 59. Consequently the pointer 54 and branch 57 will not be moved and no signal will be given. Each time, however, that the train ahead is within the specified distance of the train in the rear, battery 48 will serve to energize the magnet 50 and the signal will be given. In this way the engineer can locate the distance of the danger ahead and each time the signal is given, by operating push button 78, he throws the parts into their normal positions so that when crossing the next shoe *b* he may get another signal, if the danger is still within the specified distance, and thus may gradually slow down his train and avoid collision. If, however, the danger has moved ahead he is enabled to resume his original speed without losing but little time and thus can keep his train under a headway to secure the highest possible speed consistent with safety. The contact shoes *b* being located at substantially equal distances apart between the blocks so as to divide said blocks into equal divisions, it will be seen that the engineer can be kept constantly and reliably advised of the condition of the track ahead.

This system not only will give the signals to the engineer of the rear train, as above described, but will also give a like signal to the engineer of the train ahead should he reverse his direction. Two trains coming toward each other on the same track will give a signal to each other when within the specified distance, in a like manner.

In case the engineer, after receiving a signal, fails to re-set the pointer 54 by means of the push button 78, as above described, when the train passes the next shoe *b*, or *b'*, according to the direction of travel, the cur-

rent will then pass from battery 48 through wire 61, branch 57, contact plate 56 and wire 65 to the magnet 52 and thence to the ground drawing pointer 59 thereto and throwing the outer end of said pointer into connection with the contact plate 60 and establishing a circuit through the solenoid 86 and the time recorder 81 operating said time recorder to note the time the engineer neglected his duty and at the same time operating the solenoid 86 to operate the rack bar 90 and, through suitable connections, the air-brake valve 91, to set the air-brakes and stop the train automatically.

When the train is running in the direction as from block III toward block I, magnet 3 will be operated through the contact of brush *c'* with contact shoe *a'* and the signaling circuit will be established to the ground through wire 24, contact plate 9, wire 31, wire 29 and wire 19, while magnets 2 and 4 of the block in the rear will be energized in the same manner as described when the train is running in the opposite direction. It will thus be seen that the line wire 16 and its connections are utilized with the train running in the direction from block I to block III, while line wire 18 and its connections are utilized while the train is running in the direction from block III to block I. It will also be seen that the train running from block I toward block III will draw its signal through signal wire 22, while the train running from block III toward block I will draw its signal through signal wire 24.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a block signaling system two pairs of wires one wire of each pair being divided at each station, switches at each station one for the divided wire of each pair, a series of means each connected with the other wire of one pair between two neighboring stations for actuating the switches pertaining to one pair of wires, a corresponding series of means each connected with the other wire of the other pair between two neighboring stations for actuating the switches pertaining to the other pair of wires, means on the train for energizing each of said first named means in turn through its connected wire, the wire connected with the energized means being a member of one pair when the train approaches a given station from one direction and of the other pair when the train approaches said station from the opposite direction, a partial circuit on the train including a ground a signal a source of current and a brush, stationary contacts connected to the wires containing switches and in the path of said brush, said switches each being adapted to connect one of said sections of wire either to the neighboring section of

the same wire or to the ground, the said neighboring section extending in one direction in one pair and in the opposite direction in the other pair, and suitable connections, whereby the signal on the train will be operated at a given distance from another train either to the front or to the rear of the given train, substantially as set forth.

2. An electric block signaling system comprising two pairs of wires one wire of each pair being divided at each block or station, a switch for each divided wire of each pair at each station, grounded electromagnets at each station connected in the other wire of each pair for operating said switches, stationary contacts at each station connected to the respective wires of each pair which are connected with said magnets, other stationary contacts arranged in two lines those in one line connected with the divided wire of one pair and those in the other line connected with the divided wire of the other pair, each switch connecting a section of the divided wire either to the ground or to the adjacent section, a train carried operating means for energizing said switch operating magnets including a grounded battery and a brush in the path of the stationary contacts connected with the magnets in the second named wire of one pair, a signal, a grounded source of current for said signal, suitable connections, and a brush located in the path of the stationary contacts connected to the divided wire of the same pair all located on the train, whereby said switches will be operated to connect each section of said respective divided wires in turn either to the neighboring section of the same wire or to the ground, substantially as set forth.

3. An electric block signaling system comprising two pairs of wires one wire of each pair being divided at each station, a switch for each divided wire at each station, grounded means including the other wire of each pair for operating said switches in turn, stationary contacts at each station one connected to the switch operating means of one pair and one to the switch operating means of the other pair, other stationary contacts connected to the sections of the divided wire of the respective pairs, an appropriate ground for each section of the divided wires of the respective pairs at each station and removed from the connection with said stationary contact, each of said switches connecting a section of the divided wire either to the ground or to the adjacent section, the section so connected extending from the switch in one direction for one pair and in the opposite direction for the other pair, means on the train for energizing said switch operating means, said means including appropriate connections and a brush arranged in the path of the stationary contacts connected to said switch operating means,

and a signaling apparatus on the train including a ground, a source of current, and brushes located in the path of the respective stationary contacts connected with the respective divided wires, and suitable connections, whereby said signaling apparatus will be operated at a given distance from another train either in front or in the rear of the given train, substantially as set forth.

In witness whereof, I have hereunto set my hand and seal at Washington, District of Columbia this 5th day of April, A. D. nineteen hundred and ten.

FRANK P. CREMONA. [L. s.]

Witnesses:

E. W. BRADFORD,

J. D. YOAKLEY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."