

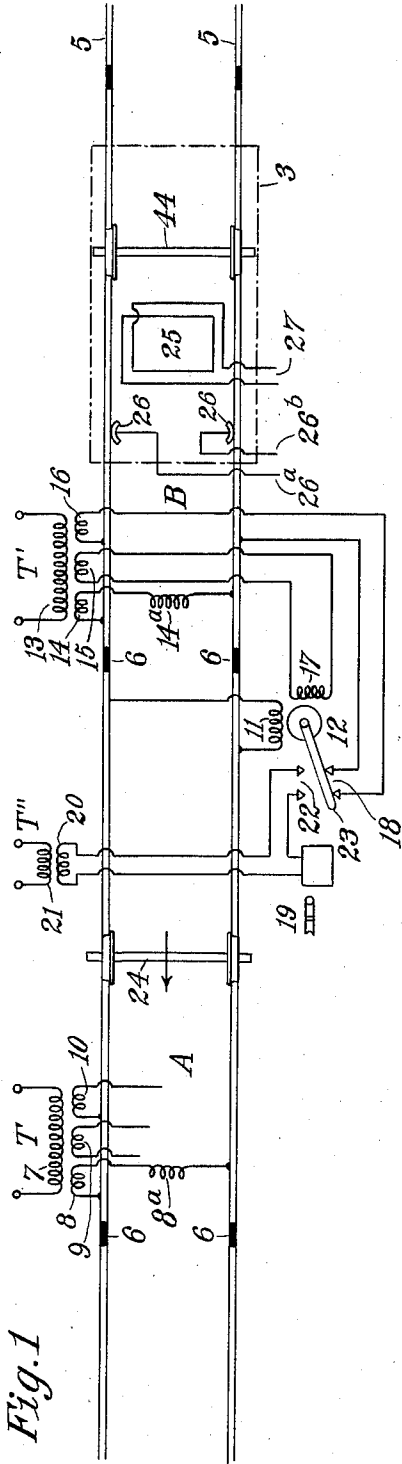
## AUTOMATIC SAFETY STOP SYSTEM FOR RAILWAYS.

APPLICATION FILED JULY 14, 1911.

**1,058,638.**

Patented Apr. 8, 1913.

2 SHEETS—SHEET 1.



*Fig. 1*

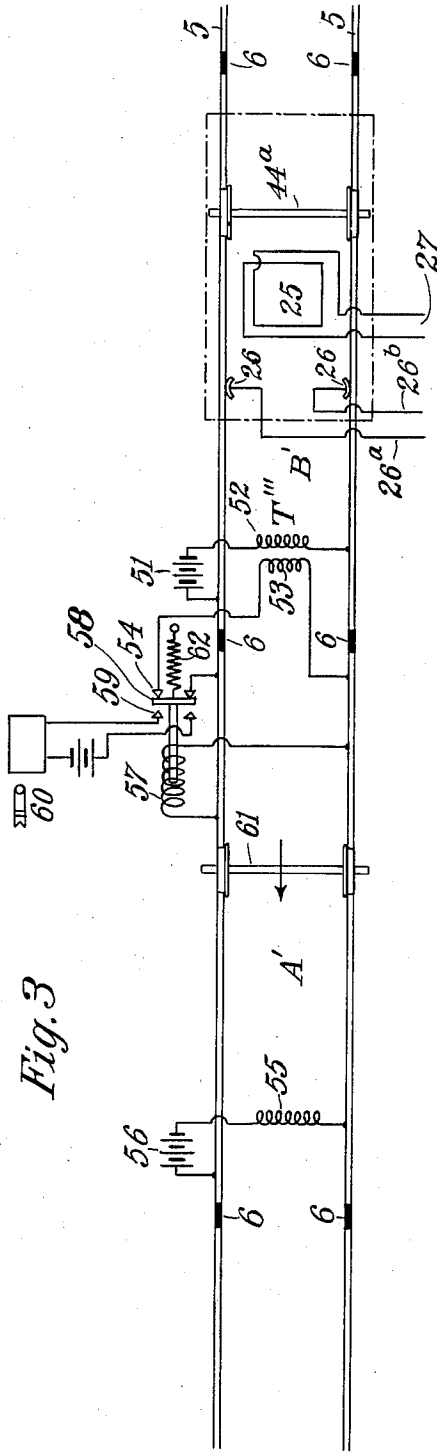


Fig. 3

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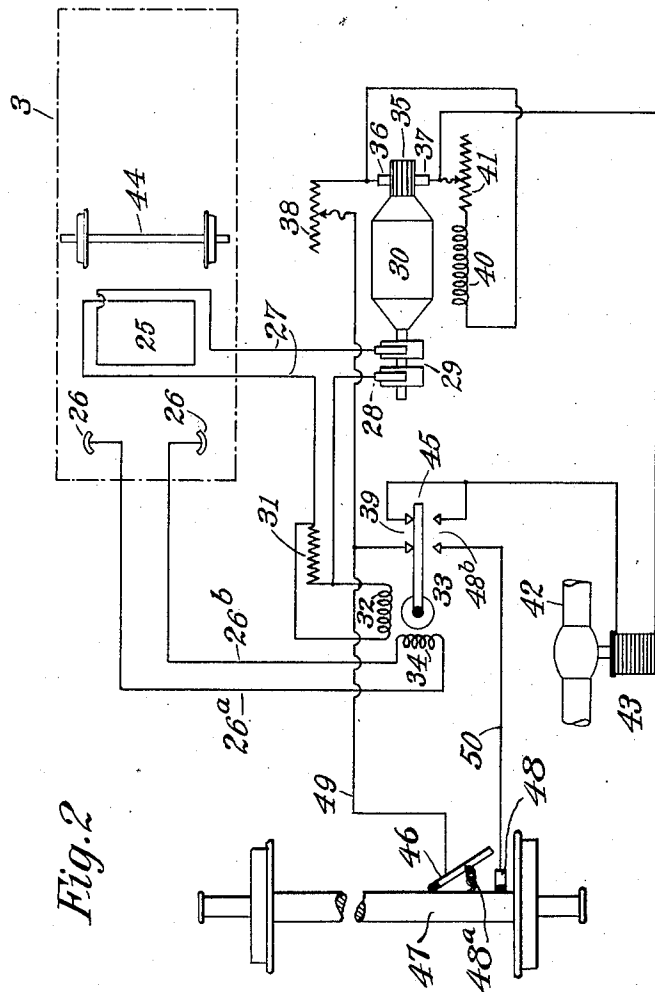


Fig. 2

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# UNITED STATES PATENT OFFICE.

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## AUTOMATIC SAFETY STOP SYSTEM FOR RAILWAYS.

1,058,638.

Specification of Letters Patent.

Patented Apr. 8, 1913.

Application filed July 14, 1911. Serial No. 638,563.

*To all whom it may concern:*

Be it known that we, MAURICE L. SINDEBAND and CHARLES B. WOTICKY, both citizens of the United States, and residents of New York, in the county and State of New York, have invented certain new and useful Improvements in Automatic Safety Stop Systems for Railways, of which the following is a full, clear, and exact description.

This invention relates to automatic stop-systems for railways, that is, systems for preventing collisions and like accidents by bringing the vehicle to a stop or reducing its speed to a safe rate independently of the will of the motorman or engineer when danger exists.

The chief object of the invention is to provide an electrical system of simple character for this purpose, which shall operate with certainty.

A further object is to provide a system which can be employed on railways equipped with modern signaling systems, with but slight if any modification thereof or addition thereto.

To these and other ends the invention consists in the novel features and combinations hereinafter described, and more particularly set forth in the appended claims.

The nature of the invention will be readily understood from the following description of a convenient and effective embodiment. Inasmuch as the precise nature of the signaling system employed by the railway is unimportant we have confined the description to systems in which the track or tracks are divided into insulated blocks; though we have described both an alternating current and a direct current signaling system, merely to show more clearly that our safety stop system can be used with either.

The embodiment referred to above is illustrated diagrammatically in the accompanying drawings, in which—

Figure 1 shows a familiar signaling system operated by alternating current. Fig. 2 shows the circuits and apparatus with which the vehicle is provided to equip it with our automatic safety stop system. Fig. 3 shows a direct current signaling system with which the circuits and apparatus illustrated in Fig. 2 may be used.

In the alternating current signaling system shown in Fig. 1 the running rails are

divided into blocks insulated from each other at the points 6. Only two blocks, A, B, are shown equipped, but it is to be remembered that similar equipment is provided for all the blocks in the system. At the forward end of block A is a transformer T having a primary 7 supplied with alternating current from any suitable source not shown. The transformer has three secondaries, 8, 9, 10, the first of which is connected across the rails and provides current for the track-phase winding 11 of the polyphase relay 12. The block B also has a transformer shown at T', with a primary 13, and secondaries 14, 15, 16, the first of which secondaries provides current for the track-phase winding of the polyphase relay, not shown, belonging to block B. The secondary 15 provides current for the line-phase winding 17 of the relay 12 (belonging to block A), while the secondary 16 is connected across the rails of block B and in series with a pair of contacts 18. The semaphore 19 is operated by electromagnet devices (not shown) which are supplied with current from the secondary 20 of a transformer T'' whose primary 21 is connected with a suitable source of alternating current not shown, as for example the source to which transformers T and T' are connected. The secondary 20 is in series with a pair of contacts 22 associated with the relay arm 23.

When the block A is empty the phase windings 11 and 17 of relay 12 are energized, the first by current from the secondary 8 of transformer T and the other by current from the secondary 15 of transformer T', thereby holding the arm 23 against contacts 22. The semaphore circuit through transformer T'' is thus closed and the semaphore held at "clear." When, however, a train or car enters the block A, as indicated diagrammatically at 24, the secondary 8 of transformer T is short-circuited, thereby depriving the track-phase winding 11 of current; whereupon the arm 23 drops, breaking the semaphore circuit at contacts 22 and causing the signal to show danger, and closing the circuit of secondary 16 of transformer T' through contacts 18. To prevent too heavy a current flowing through the secondary 8 when the same is short-circuited by a vehicle in the block A, the said secondary has in series with it a suitable in-

ductance 8<sup>a</sup>. For a similar purpose an inductance 14<sup>a</sup> is included in the circuit of secondary 14.

The train or car equipment of our automatic safety-stop system includes a coil 25 carried by the vehicle adjacent to the track and preferably in front of the first pair of wheels, as indicated in Figs. 1 and 2, in which the vehicle is indicated diagrammatically at 3 and the wheels and axle at 44. The said equipment also includes means for taking current from the rails, preferably by direct contact therewith instead of by induction therefrom, the means shown in the present instance being the shoes or contacts 26, carried by the vehicle and engaging the rails as the vehicle travels. The current-taking devices are mounted in front of the coil 25. The coil 25 is connected by leads 27 to a pair of brushes 28 taking current from slip rings 29 on the shaft of an alternator 30 carried by the vehicle and driven by any suitable means, not shown. Being thus energized, and being adjacent to the rails, the coil 25 constitutes the primary of a transformer of which the rails form the secondary.

In series with one of the leads 27 is a resistance 31, and across the latter is connected one phase winding, 32, of a polyphase relay 33 carried by the vehicle. The track-phase winding 34 of this relay is connected with the traveling contacts or shoes 26, by leads 26<sup>a</sup>, 26<sup>b</sup>. The generator 30 is also provided with a commutator 35 having brushes 36, 37, the first of which is connected through a variable resistance 38 to one of a pair of contacts 39 at the relay 33 and to one terminal of the field winding 40, while the brush 37 is connected to the other terminal of the field winding through a variable resistance 41. The brush 37 and one of the contacts 39 are also connected to suitable electromagnetic mechanism for operating any one or more of the devices with which the vehicle may be equipped to control its travel, as for example the air brake system. In the present instance the air brakes are controlled by our safety stop system, and we have indicated the fact by showing a section of the train pipe at 42, with an electromagnetically operated valve 43 having its terminals connected to the brush 37 and to one of the contacts 39.

Suppose, now, that the vehicle is traveling with a clear track ahead. The coil 25 induces current in the secondary circuit composed of the track-phase winding 34 of the polyphase relay 33, leads 26<sup>a</sup>, 26<sup>b</sup>, the leading axle and wheels 44, of the vehicle, and the rails between such wheels and the shoes 26; the inductance 14<sup>a</sup> preventing short-circuiting of the shoes 26 by the circuit of the secondary 14. The phase winding 34 is thus energized, while the other phase winding 32,

is also energized, being in series with the coil 25. This energization of the relay holds the relay arm 45 against contacts 39 and keeps the circuit controlling the train-pipe valve 43, and thereby the valve itself, closed. But suppose the vehicle enters the block immediately in rear of one which is occupied, as in Fig. 1 for example. The short-circuiting of track-phase winding 11 of the relay 12, as previously explained, causes the relay to close the circuit of secondary 16 of transformer T', as previously explained, shunting this secondary across the rails of block B. This deprives the track-phase winding 34 of voltage, since the current induced in the rails by coil 25 will now flow through the low-resistance circuit of which the secondary 16 is a part; instead of through the phase-winding 34, which has a higher resistance. The relay 33 being de-energized, the arm 45 drops and breaks the circuit of valve 43 at the contacts 39, causing the valve to open the train-pipe 42 to the atmosphere, which operation causes the brakes to be applied.

If desired, provision may be made by which the vehicle will be allowed to "creep up" to the rear end of the occupied block ahead. For this purpose a centrifugal switch 46 is provided, mounted on one of the vehicle wheels 47 and coöperating with a contact 48. When the vehicle is traveling at a speed above a predetermined limit and the wheel therefore revolving rapidly, the switch member 46 is thrown out and away from the contact by centrifugal force; but when the speed is reduced to or below such limit the switch member is retracted into engagement with the contact by the spring 48<sup>a</sup>, thereby establishing the valve circuit through wires 49, 50, and contacts 48<sup>b</sup>, which are bridged by the arm 45.

The invention can also be used on a railway employing a signaling system operated by direct current, as for example the system illustrated in Fig. 3. In this figure the rails 5 are divided into blocks insulated at the points 6, two blocks, A', B', being shown. As in Fig. 1, each block is equipped like those now to be described.

Across the rails of block B' at the forward end thereof is a source of direct current, as for example a battery 51, in series with the primary 52 of a transformer T'', the secondary 53 of which is connected across the rails of block A' and in series with a pair of contacts 54. Across the forward end of block A' and in rear of the block ahead of the same is a similar transformer, of which only the primary 55, in series with a battery 56, is shown. This battery 56 energizes a direct current relay 57 across the block A' and causes the armature 58 to be held against the contacts 59 in the circuit of the semaphore 60. So long as the block

A' is unoccupied the relay is energized and the semaphore circuit closed, thereby holding the signal at clear. When, however, a vehicle enters the block, as indicated diagrammatically at 61, which represents one of the axles and its wheels, the battery 56 is short-circuited, thereby deenergizing relay 57 and permitting the spring 62 to draw the armature toward the right. This breaks the semaphore circuit at contacts 59 and sets the signal at danger.

Now suppose that a vehicle, indicated at 44<sup>a</sup>, equipped with the apparatus illustrated in Fig. 2, enters block B'. If block A' were unoccupied the secondary circuit of transformer T''' would be open at contacts 54, and consequently the current induced, by the coil 25, in the rails of block B' through the shoes 26, leads 26<sup>a</sup>, 26<sup>b</sup>, track-phase winding 34 of relay 33, and the wheels and axle 44<sup>a</sup>, has a sufficiently high value to keep such track-phase winding energized; it being understood that the inductance of the primary 52 is high enough to prevent shunting of the winding 34. But block A' being occupied, the circuit through secondary 53, rails of block A', and wheels and axle 61, is short-circuited at contacts 54 by the armature 58, thereby loading the transformer composed of the winding 52 and 53. The current through the primary 52 is therefore increased, and the effect is equivalent to short-circuiting the shoes or contacts 26, thus depriving track-phase winding 34 in relay 33 of current. The relay then allows the arm 45 to drop, with resultant operation of the valve 43 as previously described.

It is to be understood that the system herein specifically described is merely the preferred embodiment of the invention, and that the invention may be embodied in other forms without departure from its proper spirit and scope as defined by the following claims.

We claim:

1. In an automatic safety-stop system for railways, the combination with the running rails, and a vehicle adapted to travel thereon and provided with means for controlling its travel, of a coil carried by the vehicle in inductive relation to the rails, means traveling with the vehicle to energize said coil whereby to induce current in the rails, means traveling with the vehicle to take from the rails current induced therein, and mechanism under the control of such induced current to operate the said means for controlling the travel of the vehicle.

2. In an automatic safety stop system for railways, the combination with the running rails, and a vehicle adapted to travel thereon and provided with means for controlling its travel, of means traveling with the vehicle for inducing current in the rails, means traveling with the vehicle to take from the

rails current induced therein, and mechanism under the control of such induced current to operate the said means for controlling the travel of the vehicle.

3. In an automatic safety stop system for railways, the combination with the running rails, and a vehicle adapted to travel thereon and provided with means for controlling its travel, of means traveling with the vehicle for inducing current in the rails, means traveling with the vehicle for taking from the rails current induced therein, mechanism under the control of such induced current to operate the said means for controlling the travel of the vehicle, and means dependent upon the presence of a vehicle on the rails ahead of the first named vehicle to vary the current induced in the rails, whereby the operation of said mechanism depends ultimately upon the presence of a vehicle ahead.

4. In an automatic safety stop system for railways, the combination with the running rails, and a vehicle adapted to travel thereon and provided with means for controlling its travel, of a primary coil carried by the vehicle in inductive relation to the rails to induce current therein, means carried by the vehicle to supply primary current to said coil, and electromagnetic means carried by the vehicle to control said travel-controlling means, the electromagnetic means being electrically connected with the primary coil and the rails and dependent for energization conjointly upon current in the primary coil and current induced in the rails.

5. In an automatic safety stop system for railways, the combination with the running rails, and a vehicle adapted to travel thereon and provided with means for controlling its travel, of a primary coil carried by the vehicle in inductive relation to the rails to induce current therein, and devices carried by the vehicle to control said travel-controlling means, said devices including a polyphase relay having a winding connected with the primary coil and a winding connected with the rails to receive induced current therefrom.

6. In an automatic safety stop system for railways, the combination with the running rails, and a vehicle adapted to travel thereon, of a primary coil carried by the vehicle in inductive relation to the rails to induce current therein, electromagnetic means carried by the vehicle and dependent for energization upon current in the primary coil and upon induced current in the rails, travel-controlling means carried by the vehicle and controlled by said electromagnetic means, and means, dependent for operation upon the presence of a vehicle ahead of the first-named vehicle and on the same rails, to vary the current induced in the rails.

7. In an automatic safety stop system for

4  
 railways, the combination with the running rails, and a vehicle adapted to travel thereon, of a primary coil carried by the vehicle in inductive relation to the rails to induce  
 5 current therein, a polyphase relay carried by the vehicle, having a winding connected with the primary coil and a winding connected with the rails, and means carried by the vehicle and controlled by said relay to control the travel of the vehicle.

8. In an automatic safety stop system for railways, the combination of a vehicle, means carried thereby to induce current in the rails on which the vehicle is to travel,  
 15 contact devices carried by the vehicle and adapted to bear on the rails to take induced current therefrom, a relay carried by the vehicle and connected with said contact members, and travel-controlling means carried by the vehicle and controlled by said  
 20 relay.

9. In an automatic safety stop system for railways, the combination of a vehicle, means carried thereby to induce current in the rails on which the vehicle is to travel,  
 25 travel-controlling means carried by the vehicle, and electromagnetic mechanism carried by the vehicle, including means for tak-

ing induced current from the rails, and connected with said travel-controlling mechanism to operate the same.

10. In an automatic safety stop system for railways, the combination with the running rails, and a vehicle adapted to travel thereon, of means carried by the vehicle to induce  
 3 current in the rails, travel-controlling means carried by the vehicle, electromagnetic means carried by the vehicle and electrically connected with the rails to control said  
 4 travel-controlling means, means dependent upon the presence of another vehicle on the rails ahead of the first named vehicle to vary the current induced in the rails, and means  
 4 to prevent the travel-controlling means being affected by said electromagnetic means while the vehicle is traveling at a speed below a predetermined rate.

In testimony whereof we affix our signatures in the presence of two subscribing witnesses.

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 CHARLES B. WOTICKY.

Witnesses:

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