Jan. 19, 1926. 1,570,530

J. SHOECRAFT

TRAIN CONTROL SYSTEM

Original Filed May 7, 1924

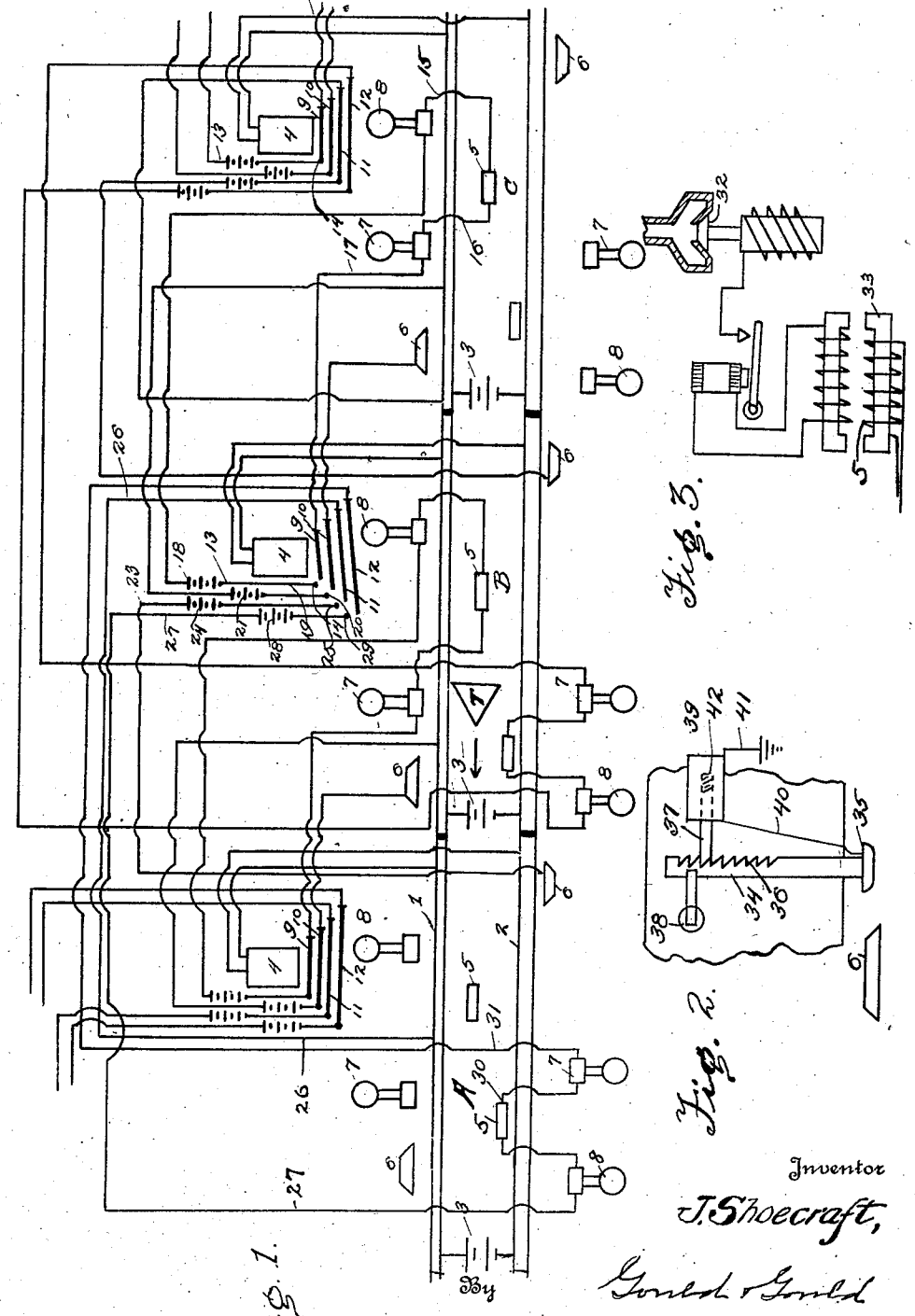

Fig. 1.



Fig. 3.



Fig. 2.

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Patented Jan. 19, 1926. 1,570,530

# UNITED STATES PATENT OFFICE.

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## TRAIN-CONTROL SYSTEM.

Continuation of application Serial No. 711,712, filed May 7, 1924. This application filed November 1, 1924. Serial No. 747,265.

*To all whom it may concern:*

Be it known that I, JUDSON SHOECRAFT, a citizen of the United States, residing at Eskridge, in the county of Wabaunsee and State of Kansas, have invented certain new and useful Improvements in Train-Control Systems, of which the following is a specification.

This invention is directed to block signalling systems for railroads, wherein means are provided to enable a train in one block to absolutely control the travel of a following train in a block in the rear and the travel of an approaching or opposing train in the block ahead.

It is highly desirable, particularly in single track systems to provide a cautionary control of the following or opposing train as a prelude to a complete stop or danger control of such train, as with a train travelling at high speeds a sudden stop is dangerous, particularly to passengers. However, the provision of means for the automatic cautionary control, or reduction in train speed, with a following danger control or complete stop, has heretofore proven of great practical difficulty, owing to the track and train limitations as to placement of the contacting parts, and the fact that trains travel in both directions over the track, and would thus be differently influenced by the track contacts when travelling in different directions.

The present invention is designed to overcome these practical difficulties, by arranging a cautionary control and danger control of different types, considered electrically, in that the cautionary control is arranged to influence the engine-carried mechanisms through induction, while the danger control is arranged to influence the engine-carried mechanisms by direct contact.

The invention also provides, as a material part thereof, the association of the cautionary and danger controls with the wayside signals, so that as such signals are moved to indicate caution and danger, the control parts become immediately effective for their control functions. Of course, as in approved railroad signalling, the system is circuited to cover possible defect or breakage on the side of safety, that is as long as the circuits are intact and current flowing, the wayside signals are held at clear and the train controls ineffective, but on cessation of current from any cause, as by the presence of a controlling train in an advance block, or breakage of wires or similar defect, the signals gravitate to their signalling positions and the train controls are made effective.

In the drawings:

Fig. 1 is a diagrammatic view of the improved system, a train being shown in the central block illustrated.

Fig. 2 is a view of a detail showing the ramp control or emergency brake operation parts on the locomotive.

Fig. 3 is a similar view showing a conventional induction or service brake control parts on the locomotive.

The track rails 1 and 2 are as usual divided into relatively insulated sections or blocks, three being indicated at A, B, and C. Each block has a track circuit, including a source of energy 3, connected to the rails 1 and 2, and a relay 4, in circuit with the source of energy 3 through the rails. Thus with the track clear, the relay 4 is energized, while with a train travelling over the rails of a block, the source of energy is short circuited relative to the relay, and the latter is de-energized. As a train enters the respective blocks, the relay 4 of each block will remain de-energized while the train is travelling through that block, and will immediately become energized as the train leaves the block.

In each block, preferably near the entrance end is arranged what I term a cautionary control 5, which may be generally described as an induction control, as such is known in the art. Near the end where the train leaves the block, there is arranged a danger control 6, which may be generally described as a contact control or ramp, as such is known in the art. The induction control may be of any preferred type, such for example as a permanent magnet, suitably wound to neutralize the magnetism when the current is flowing; while the ramp or contact control may be of any desired type, such for example as shown in my Patents Nos. 548,469 dated October 22, 1895, or 1,311,718 dated July 29, 1919.

In series with the cautionary control 5 are the wayside home and distant or danger and caution signals 7 and 8, and these signals may be of any desired type so long as they are controlled electrically, with the effect to maintain the signals at clear so long as the

circuit is energized, and permit such signals to operate to signalling positions when the circuit is interrupted or de-energized.

The relay 4 of each block controls four armature contacts, 9, 10, 11, and 12, the first two, 9 and 10 of which control circuits leading to the signals and track controls for the block as C, in rear of the block, as B, in which the train is travelling. The last two contacts 11 and 12 control circuits leading to the block, as A, in advance of that in which the train is travelling, the latter signals and train controls being of course for an oncoming train.

The circuit controlled by contact 9 of block B includes a conductor 13 leading from the contact point 14 to the caution signal 8 of block C, from such caution signal by conductor 15 to the induction control 5 of such block, from such induction control 5 through a conductor 16 to the danger signal of such block, and then to the armature contact 9 by conductor 17. This circuit includes a source of energy 18, so that while the relay 4 of block B is energized, the circuit is closed, the induction control 5 of block C is neutralized, and the caution and danger signals of block C remain at clear.

The armature contact 10 is in circuit with the ramp 6 of block C, that is to say a conductor 19 leads from contact point 20 of relay 4 of block B to one rail of block C, this conductor including a source of energy 21. A conductor 22 of this circuit leads from the ramp of block C to the contact 10. Thus the ramp is normally in an open circuit having a relay controlled break at the contact 10. When the locomotive reaches the ramp, with the relay-controlled break closed, that is with the relay energized, the wheel and axle of the locomotive closes a circuit through the locomotive-carried brake control, to be later described, and energizes a magnet or coil of such brake control to prevent application of an emergency braking action. When the relay 4 of block B is de-energized, however, the ramp is not energized by the contact with the locomotive-carried part, the magnet of such part is not energized, and the emergency brake application results and is sustained, as will later appear.

The armature contact 11, through conductor 23, including a source of energy 24, leads from contact point 25 to the ramp 6 of the block A, that is the block in advance, and a conductor 26 leads from the rail to the armature contact 11. The armature contact 12 is in circuit with the induction control 5 of the block C, a conductor 27, including a source of energy 28, leading from contact point 29 to the caution signal 8 of such block A, and such signal being in circuit with the induction control 5 of such block A. A conductor 30 leads from the induction control 5 to the danger signal 7 of such block A, a conductor 31 leading from the latter to the armature contact 12. These circuits including the armature contacts 11 and 12 are exactly similar to the circuits from armature contacts 9 and 10, the latter leading to the block in rear of the travelling train, while the former lead to the block in advance of the travelling train, and govern the travel of on-coming or aproaching trains.

The locomotive-carried apparatus to be operated by the induction controls 5 is illustrated in Fig. 3, wherein 32 represents a valve of any desired form, adapted when operated to give a service or limited application of the air brakes, the valve of course being included in the train-pipe system. The illustration of the cab-carried means is merely a conventional showing, and one well known and understood, requiring no detailed explanation. The induction control 5 of the track includes a permanent magnet 33, which, when the locomotive passes thereover, is of sufficient strength to operate the valve 32. When the induction control circuits are energized, however, that is when the relays 4 controlling such circuits are energized, the circuiting wire about such permanent magnet 33 neutralizes the magnetism thereof, and there is no operation of the magnetically-operated valve 32. With a particular induction control circuit de-energized, however, the permanent magnet 33 will operate the valve 32 and apply the service operation of the brakes.

The ramp 6 is in open circuit, incuding, however, a source of energy. On the locomotive is carried a sliding bar 34 having a shoe 35, adapted to engage and be elevated in passing over the ramp. This bar is formed with notches or teeth 36, and a latch or dog 37 is arranged to engage the teeth and hold the bar elevated, under certain conditions. The bar is connected to operate a valve 38 arranged in the train-pipe system, and acting to permit an emergency application of the brakes. The latch 37 is controlled by a solenoid or magnet 39, in circuit through a conductor 40 with the shoe 35, with the other side of the magnet grounded to the rail through a conductor 41. Thus with the ramp circuit closed through the controlling relay 4, the shoe 35 when raised completes a circuit through the magnet 39, and the magnet acts to hold the latch out of engagement with the bar teeth 36, and the bar simply raises and falls. If, however, the particular ramp circuit is broken by de-energizing the particular controlling relay, the magnet 39 will not be energized, and the spring 42 will hold the latch in position to engage the teeth of the bar as it is raised, and hold such bar raised to thereby operate the valve 38 for an emergency application of the brakes.

As before described, the de-energizing of the relay of track block B, as illustrated, breaks the circuits of the induction controls 5 of the block C for the following train, and of block A for an on-coming train, at the same time permitting the caution and danger signals for such trains to gravitate to signaling positions against these trains. The ramps 6 of blocks C and A are also disconnected from their particular energizing sources. If the signals are disregarded, the train will first have its brakes set with a service application through the induction controls, to slow the train, and failing to stop, will have its brakes set with an emergency application on meeting the ramp.

Of course it is understood that the description here given is to be carried out throughout the protected length of trackage, and that the presence of a train in any one block will protect the block in rear against following trains and the block in front against on-coming trains. Of course, as a particular train leaves a block, the relay 4 thereof is immediately re-energized, and all circuits controlled thereby return to normal.

This application is filed as a continuation of my application filed May 7, 1924, Serial Number 711,712.

What is claimed as new, is:—

1. In a train control system, the combination of a cautionary inductive control and an emergency contact control, with means for simultaneously governing both controls.

2. In a train control system, the combination of a cautionary inductive control and an emergency contact control, and circuits for governing both controls simultaneously.

3. In a train control system, the combination of a cautionary inductive control and an emergency contact control, and remotely-controlled circuits for governing both controls.

4. In a train control system, the combination of a cautionary inductive control and an emergency contact control, and electrical circuits serving when energized to render both controls ineffective.

5. In a train control system, the combination of an inductive control and a contact control, and a series circuit arrangement whereby both controls are rendered ineffective when the circuits are energized.

6. In a train control system, the combination of an inductive control for inducing service application of the brakes of a train, a contact control for inducing emergency application of the brakes of a train, and a remotely-controlled series of circuits including both controls and holding same ineffective when the circuits are energized.

7. In a train control system, a cautionary inductive control, a contact emergency control, a caution signal, a danger signal, and a series of circuits including said controls and the signals and maintaining the controls ineffective while the signals remain at clear.

In testimony whereof, I affix my signature.

JUDSON SHOECRAFT.