Nov. 10, 1925. 1,561,429

E. J. GILDERSLEEVE

AUTOMATIC TRAIN CONTROL DEVICE

Filed Nov. 22, 1921 2 Sheets-Sheet 1

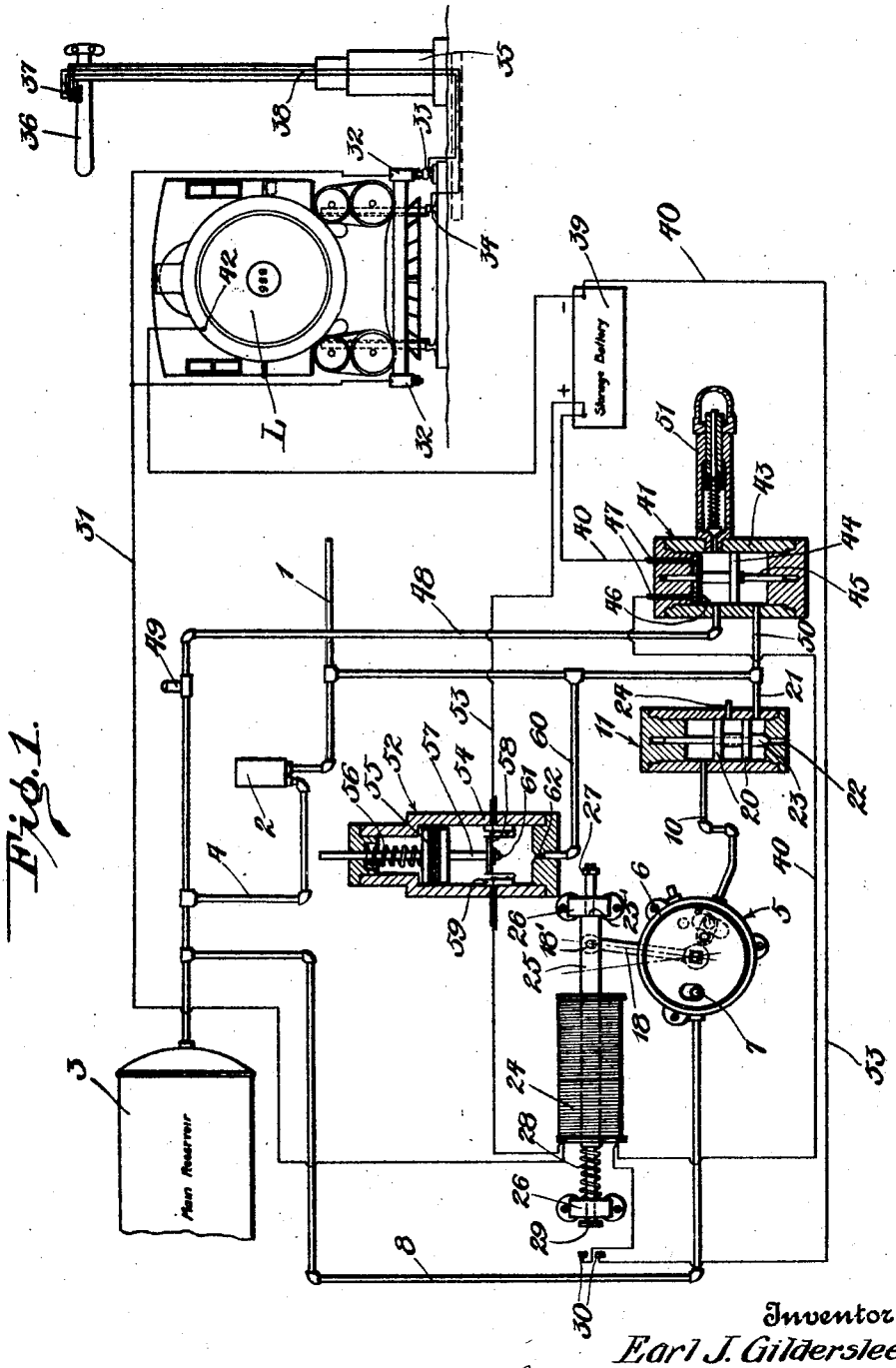



Fig. 1.

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Fig. 4.

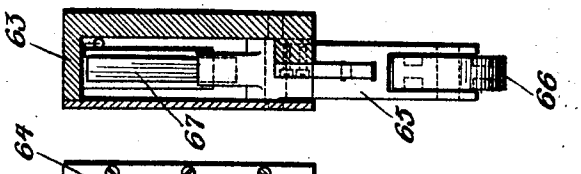



Fig. 3.

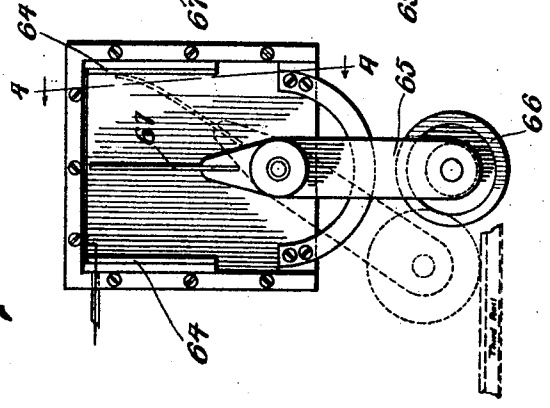
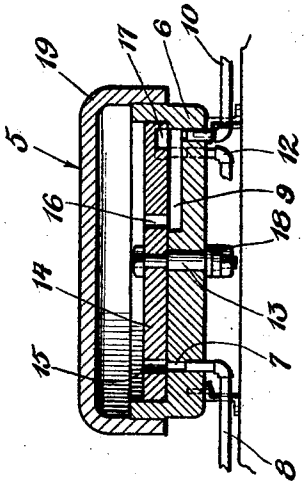



Fig. 2.




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# UNITED STATES PATENT OFFICE.

EARL JACOB GILDERSLEEVE, OF MAYBROOK, NEW YORK, ASSIGNOR OF ONE-FOURTH TO ALFRED H. BAWDEN, JR., OF PARK RIDGE, NEW JERSEY.

## AUTOMATIC TRAIN-CONTROL DEVICE.

Application filed November 22, 1921. Serial No. 516,994.

*To all whom it may concern:*

Be it known that I, EARL JACOB GILDERSLEEVE, a citizen of the United States, residing at Maybrook, in the county of Orange and State of New York, have invented certain new and useful Improvements in Automatic Train-Control Devices, of which the following is a specification.

This invention relates to improvements in automatic train control devices and particularly to a device for automatically applying the brakes on a train in case the operator of the train ignores a stop signal.

The invention includes an electrically operated valve adapted to release the air in the train line and permit the brakes to be applied, independently of the engineer's valve, when the circuit through the valve operating means is closed which occurs when a signal is in the stop position. A time element is interposed in an auxiliary circuit through the electrically operated valve for holding the valve in operative position for permitting the application of the brakes and which automatically breaks the circuit after the train has stopped to permit the parts to be returned to the inoperative or position permitting the release of the brakes.

The invention further includes a means interposed in the main circuit through the electrically operated valve for opening the circuit and preventing operation of the device when the engineer's valve is operated at the proper time.

The invention is entirely automatic in operation, is simple in construction and operation, and may be located in any convenient place on the locomotive.

Other features and objects and the details of construction are particularly pointed out in the following description and claims.

In the drawings:

Fig. 1 is a view showing several of the devices in section and showing diagrammatically the connections between them, the parts being in the position when the train is in motion.

Fig. 2 is a sectional view of the three-way valve for controlling the apparatus.

Fig. 3 is a side elevation of the contact device carried on the locomotive.

Fig. 4 is a sectional view of the contact device taken on line 4—4 of Fig. 3.

1 indicates the train line pipe which runs throughout the train and is directly connected with the brake operating means (not shown) and through which the air governing the operation of the brakes passes, controlled by the engineer's valve 2. The main reservoir for supplying air to the train line is indicated generally at 3 and is connected by a pipe 4 with the engineer's valve to admit air to the train line pipe for releasing the brakes. This structure is the usual structure now in use on railroad trains and forms no part of the present invention. As is usual the pressure in the main reservoir is always in excess of the pressure in the train line pipe.

5 indicates a three-way valve, having a body portion 6 formed with an inlet passage 7 connected with the main reservoir by a pipe 8, a radial passage 9 connected by a pipe 10 to a train line control valve 11, and an exhaust passage 12 open to the atmosphere. A stem 13 is rotatably mounted in the body and carries the valve disk 14 provided with port 15 always open to permit air from the main reservoir to pass through and hold the plate against the body. In one position of the valve plate the port 16 formed therein permits the passage of air to the pipe 10 and train line control valve 11, and in the other position of the valve plate a recessed portion 17 establishing communication between the radial passage and the exhaust to permit the exhaust of air in pipe 10 and valve 11 as will be described. A lever 18 is secured to the stem for operating valve disk and a cover 19 permits access to said disk.

The train line control valve 11 is of any desired construction, here shown as a cylinder having a double piston 20 adapted to reciprocate therein. The pipe 10 enters the cylinder at one end thereof permitting the air passing therethrough to act against one end of the piston. A branch pipe 21 connects the other end of the cyinder with the train line pipe 1 so that the air in this pipe will act against the opposite end of the piston. The end of the cylinder adjacent pipe 21 is provided with an exhaust opening 22 closed by a valve projection 23 on the piston. A vent port 24 permits the exhaust of air leaking between the double piston.

When the three-way valve is in the first position above mentioned, air will pass to the valve 11 and force the double piston 20 down so that the valve projection 23 will

hold the exhaust opening 22 closed, so that air pressure may be maintained in the train line pipe for releasing the brakes. In the second position the three-way valve opens the upper end of the cylinder to the atmosphere and the pressure in the train line pipe pushes piston 20 up allowing the train line air to exhaust for applying the brakes of the train.

The operation of the three-way valve is controlled automatically. A solenoid 24 is mounted adjacent the three-way valve and the core 25 has reduced end portions mounted for reciprocating movement in bearings 26, and lever 18 is connected as indicated at 18′ with the core and adapted to be moved thereby. The shoulder 25′ formed by the reduced portion at one end and a collar 27 which may be adjustably secured on the reduced end provide stops to limit the movement of the core by engagement with the bearing. A coil spring 28 is mounted on the other reduced end, engages between the shoulder formed by the reduced end and the bearing for normally forcing shoulder 25′ against the bearing, which operates the three-way valve so that the main reservoir pressure will act on piston 20 of the train line control valve. When the solenoid is energized the valve is held in the second-mentioned position permitting the air in pipe 10 and against upper end of the piston to exhaust. In this position a contact arm 29 closes a pair of contacts 30 in a circuit to be described.

One terminal of the solenoid is connected by a circuit 31 to contact makers 32 which may be mounted in any convenient manner on the locomotive, one contact maker being mounted on each side thereof as shown and adapted to engage a third rail 33 mounted parallel to the track 34 near a signal tower 35. The signal arm 36 is adapted to close contacts 37 when in the "stop" signaling position which completes the circuit 38 from the third rail 33 to the track 34. The other terminal of the solenoid is connected to one terminal of a battery 39 by a circuit 40 through the circuit breaker 41, the operation of which will be described. The other terminal of the battery is grounded on the engine as indicated at 42. When the signal 36 is in the "stop" position and the contact maker 32 passes over the third rail 33 making contact therewith the solenoid will be energized if the circuit breaker 41 is closed.

Circuit breaker 41 is of the fluid operated type, a cylinder 43 having a piston 44 mounted on the piston rod 45 slidable in the end walls of the cylinder and carrying a contact plate 46 adapted to close the circuit through a pair of contact points 47 mounted in one end wall of the cylinder and governing the circuit 40 from the solenoid to the battery. A pipe 48 connects the end of the cylinder adjacent the contact points through a reducing valve 49 with the main reservoir 3 for admitting a predetermined reduced pressure of air to the cylinder. The other end of the cylinder is connected by a branch pipe 50 with the train line pipe 1. The pressure in the train line pipe and against the piston 44 is greater than the reduced pressure on the other side of the piston when the brakes are "off", so that the piston will be moved and held by the train line pressure to hold the contact plate 46 against the contact points 47 keeping the circuit closed. If the engineer operates valve 2, to exhaust the train line pressure for applying the brakes, the reduced pressure will then be greater than the train line pressure and piston 44 will be moved so that plate 46 will move away from contacts 47 and prevent operation of the whole device as will be presently described. A valve 51 is placed on the side of the piston containing reduced pressure air for permitting the excess pressure developed during the return movement of the piston to close the contacts, to escape, the valve being adjustable, so the pressure may be set slightly above the pressure of the reduced pressure air.

A timed circuit breaking device 52 governs an auxiliary circuit 53 which is closed primarily by the contact arm 29 engaging contacts 30, which keeps the solenoid energized after the main circuit above described is broken by the contact maker leaving the third rail or the circuit breaker 41 breaking the circuit. This timed circuit breaker has a cylinder 54 in which a piston 55 is mounted for reciprocating movement, adapted to be moved downwardly by a coil spring 56 encircling the piston rod 57 which carries at the lower end an insulated plate 58. A pair of contacts 59 are engaged by the plate in its upper position and for a certain distance in the downward movement thereof and having the wires of circuit 53 secured thereto. A branch pipe 60 from the train line pipe 1 is connected to the bottom of the cylinder for admitting train line pressure for pushing the piston up against the action of the spring. When the train line air is permitted to exhaust for applying the brakes the decrease in air pressure allows this piston to be forced down by the spring which will open the auxiliary circuit 53. By providing a valve for governing the exhaust of air from this piston the movement thereof may be timed and the circuit 53 opened at a predetermined time as desired. A projection 61 is adapted to close the passage 62 to the pipe 60 and prevent a complete exhaust of the air from the cylinder. The purpose of providing this timed circuit is to maintain the operation of the device automatically until the train has been

brought to a complete standstill, the time to compel the stopping varying on different trains, it taking passenger trains which travel at a high speed a longer time to be stopped than freight trains, for instance. It is to be understood that the auxiliary circuit and the timed circuit breaker will not function unless the main circuit functions first to primarily operate the solenoid so that contacts 30 will be closed.

The contact maker 32 above described is shown in detail in Fig. 3. A casing 63 having a cover removably secured thereto carries insulated contacts 64 with which circuit 31 is connected and protects the contacts against injury or short circuiting on the engine. A contact arm 65 is insulated from and pivotally mounted in the casing, carrying a roller 66 in the lower bifurcated end adapted to engage the third rail, and the upper end has a spring contact member 67 thereon adapted to engage one of the contact plates 64 when the roller rides on the third rail. The contact arm will operate with the engine going either way which is obvious from the construction, and variations in the height of the third rail will be compensated for by the spring contact 67.

Most trains of the present day carry a complete electrical generating outfit and battery 39 is adapted to be "floated in" on the generator which will keep it fully charged, but in the event of the generator being disconnected, the battery insures the operation of the device. As the generator system and the manner of floating a battery in on the line is well known and commonly used no illustration is deemed necessary in connection with this invention.

When the engineer of a train running along the track and approaching a "stop" signal, seeing the signal, operates the valve 2 to release the train line air pressure, the brakes will be applied, the releasing of the train line air pressure will reduce the pressure in circuit breaker 41 so that the reduced pressure air will force the piston down and break the main circuit to the solenoid. As the contact maker 32 engages the third rail, which is preferably located near the signal tower, closing the circuit from the signal, the circuit breaker 41 being open prevents operation of the device.

But when the engineer fails to observe or disobeys the signal, circuit breaker 41 is in closed position, so that when the contact maker engages the third rail the main circuit through the solenoid 24 is energized, operating core 25 and lever 18, which rotates the valve plate, connecting pipe 10 with the exhaust thus permitting piston 20 to move up and the train line air pressure to exhaust applying the brakes. As the core moves to the limit of the stop collar, plate 29 closes the contacts 30, closing the auxiliary circuit through the timed circuit breaker which holds the three-way valve in the second position until the air exhausts from the bottom portion of cylinder 54 allowing spring 56 to push the piston down far enough to break the circuit.

By this time the train will have come to a full stop, the engineer having no control over the operation of the device.

The main circuit is broken when the contact maker leaves the third rail.

When the auxiliary circuit is broken, core 25 will be returned to its normal position by spring 23 operating the three-way valve, and air from the main reservoir will operate piston 20 to close the outlet opening to the train line air. To start the train again the engineer operates valve 2 to permit air from the main reservoir to enter the train line pipes for releasing the brakes. This air will enter cylinder 54, push piston 55 up against the tension of the spring, and cylinder 43 pushing piston 44 up so that plate 46 engages contact points 47, resetting the apparatus automatically ready for a repeated operation.

Thus it will be seen that a simple efficient and automatic device is provided which occupy but little space and can easily be applied to any locomotive now in use.

It is also to be observed that changes in the details of construction may be made without departing from the spirit and scope of this invention.

What I claim is:

1. A train stopping device including a train line control valve communicating with and governing an exhaust from the train line pipe, a three-way valve for controlling the operation of the first-mentioned valve, having communication with a main air reservoir and the first-mentioned valve and normally admitting main reservoir air to said valve, a solenoid having a movable core connected with the three-way valve, normally held in one position, and adapted to move the three-way valve to permit the exhaust of air in the first-mentioned valve and allow the operation thereof to open the exhaust from the train line when the solenoid is energized, a main circuit, adapted to be closed for energizing the solenoid at a predetermined time, and an auxiliary circuit adapted to be closed subsequent to the operation of the main circuit to maintain the solenoid energized a predetermined period of time.

2. A train stopping device including a train line control valve communicating with and governing an exhaust from the train line pipe, a three-way valve for controlling the operation of the first-mentioned valve having communication with a main air reservoir and the first-mentioned valve and normally admitting main reservoir air to

said valve, a solenoid adapted to operate said three-way valve when energized, to connect the first-mentioned valve with an exhaust for allowing the said valve to open the exhaust from the train line, a main circuit connecting the solenoid and adapted to be closed for energizing said solenoid under predetermined conditions, an auxiliary circuit through the solenoid adapted to be energized subsequent to the initial energization of the main circuit, and a time element interposed in said circuit for maintaining the circuit closed and the solenoid energized for a predetermined length of time.

3. A train stopping device including a train line control valve communicating with and governing an exhaust from the train line pipe, a three-way valve for controlling the operation of the first-mentioned valve having communication with a main air reservoir and the first-mentioned valve and normally admitting main reservoir air to said valve, a solenoid adapted to operate said three-way valve when energized, to connect the first-mentioned valve with an exhaust for allowing the said valve to open the exhaust from the train line, a main circuit connecting the solenoid and adapted to be closed for energizing said solenoid under predetermined conditions, an auxiliary circuit through the solenoid adapted to be energized subsequent to the initial energization of the main circuit, a timed circuit breaker interposed in said auxiliary circuit, and a connection between the train line pipe and the timed circuit breaker for admitting air from the train line thereto to effect the timing thereof.

4. A train stopping device including a train line control valve communicating with and governing an exhaust from the train line pipe, a three-way valve for controlling the operation of the first-mentioned valve, having communication with a main air reservoir and the first-mentioned valve and normally admitting main reservoir air to said valve, a solenoid having a movable core connected with the three-way valve, normally held in one position, and adapted to move the three-way valve to permit the exhaust of air in the first-mentioned valve and allow the operation thereof to open the exhaust from the train line when the solenoid is energized, a main circuit connecting the solenoid and adapted to be closed for energizing said solenoid under predetermined conditions, an auxiliary circuit through the solenoid, a pair of contacts in said auxiliary circuit adapted to be closed by the core upon its initial movement by the solenoid after the solenoid is energized for closing the auxiliary circuit, and a timed circuit breaker for maintaining the solenoid energized for a predetermined length of time.

5. A train stopping device including a train line control valve communicating with and governing an exhaust from the train line pipe, a solenoid adapted when energized to operate said valve to open the exhaust from the train line, a main circuit connecting the solenoid and adapted to be closed under predetermined conditions for initially energizing the solenoid, and an auxiliary circuit having a time-controlled circuit breaker therein for maintaining the solenoid energized a predetermined length of time.

6. A train stopping apparatus including a train line control valve governing an exhaust from the train line pipe, electrical means for operating said valve to open the exhaust from the train line under predetermined conditions, means controlled by train line air pressure for maintaining the operation of said electrical means until a predetermined reduction of pressure in the train line is reached, and an engineer's brake valve independently governing the train line air pressure, whereby the operation of the engineer's valve subsequent to the operation of the train line control valve by said electrical means will restore the train line air pressure for resetting said electrical means and said controlling means for subsequent operation.

7. A train stopping apparatus including a train line control valve governing an exhaust from the train line pipe, a solenoid operated under predetermined conditions for opening said valve, a circuit breaker in circuit with said solenoid and directly governed by train line air pressure for maintaining the operation of said solenoid until a predetermined reduction in said air pressure is reached, and a second circuit breaker in circuit with said solenoid governed by train line air pressure for preventing operation of said solenoid when a reduction of said air pressure has occurred previous to the existence of said conditions.

In testimony whereof I affix my signature.

EARL JACOB GILDERSLEEVE.