No. 863,540. PATENTED AUG. 13, 1907.

J. L. JONES.

TRAIN CONTROLLING APPARATUS.

APPLICATION FILED DEC. 10, 1906.

2 SHEETS—SHEET 1.

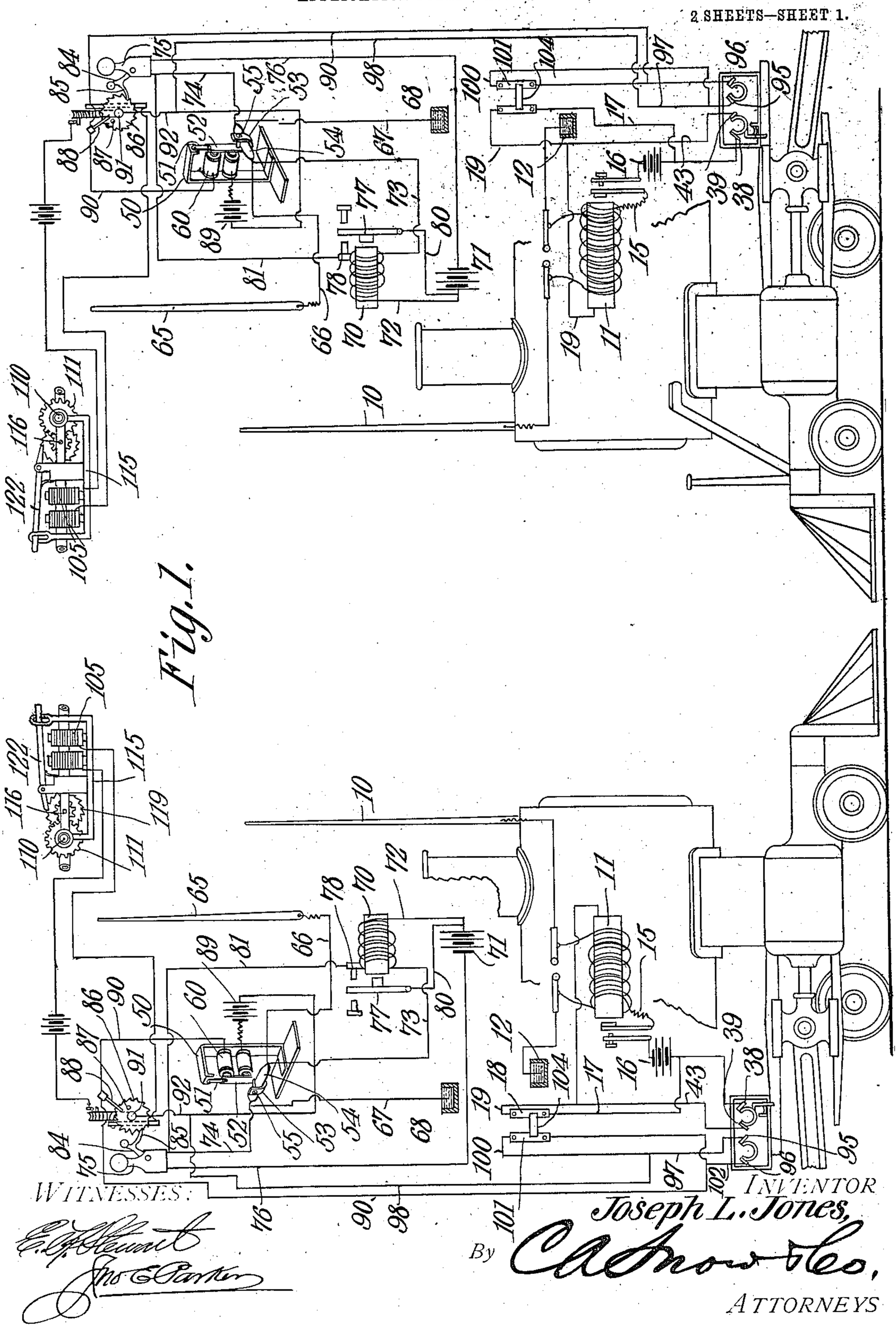

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 3.

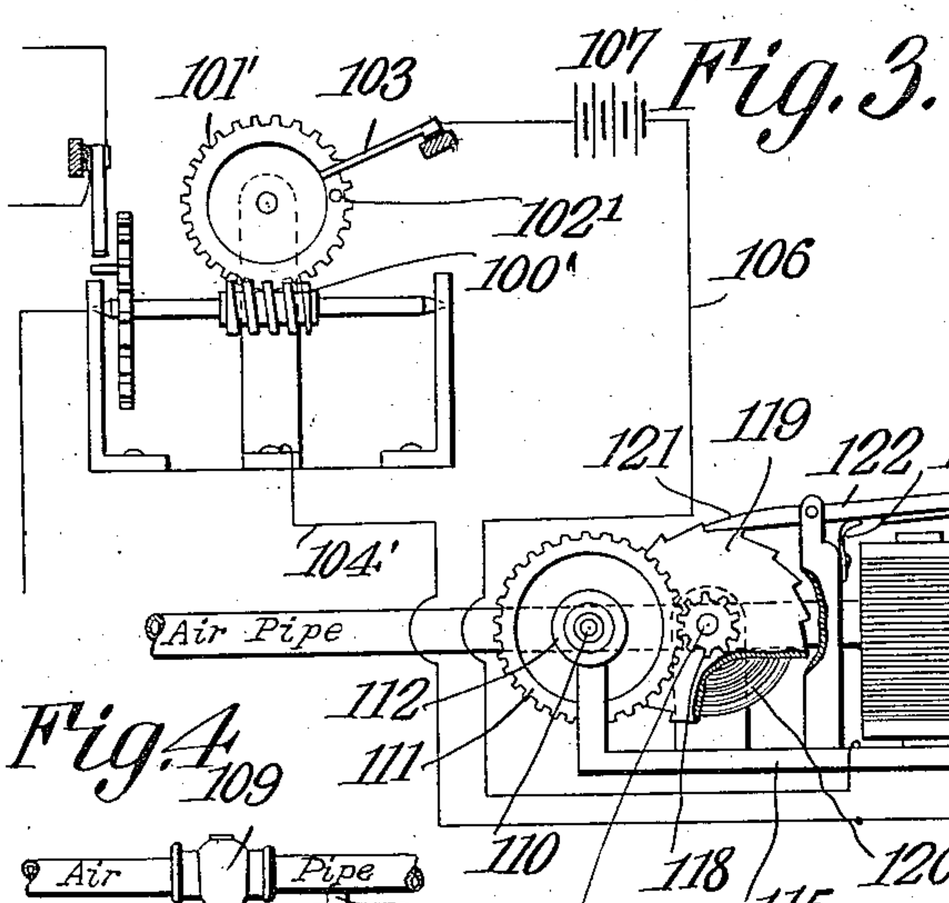


Fig. 2.

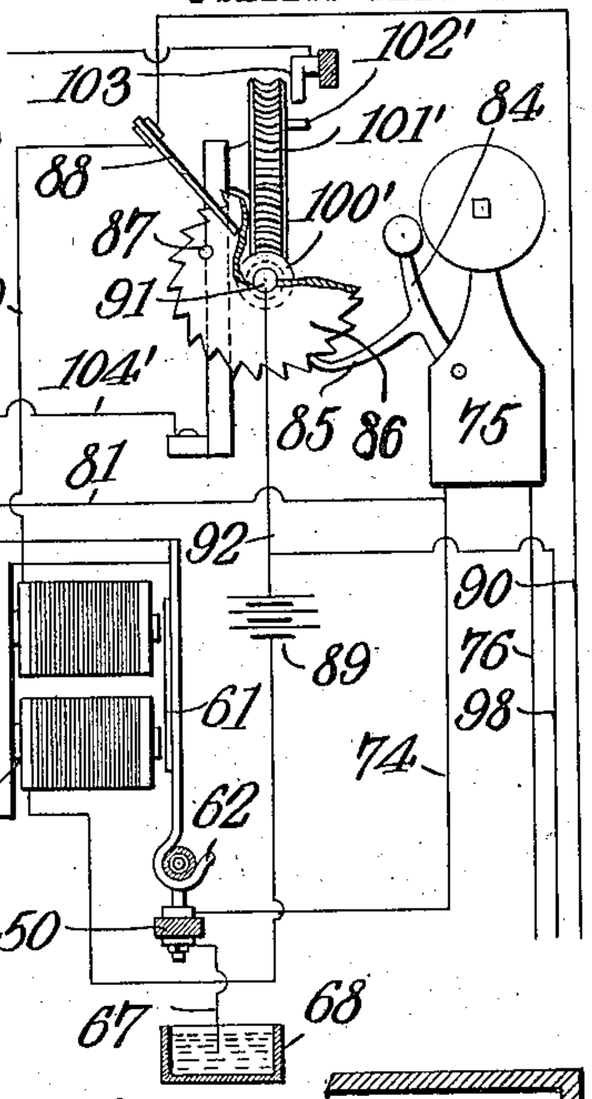


Fig. 4.

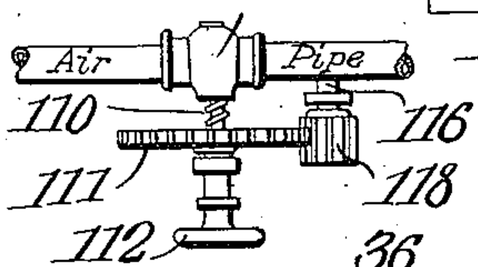


Fig. 5.

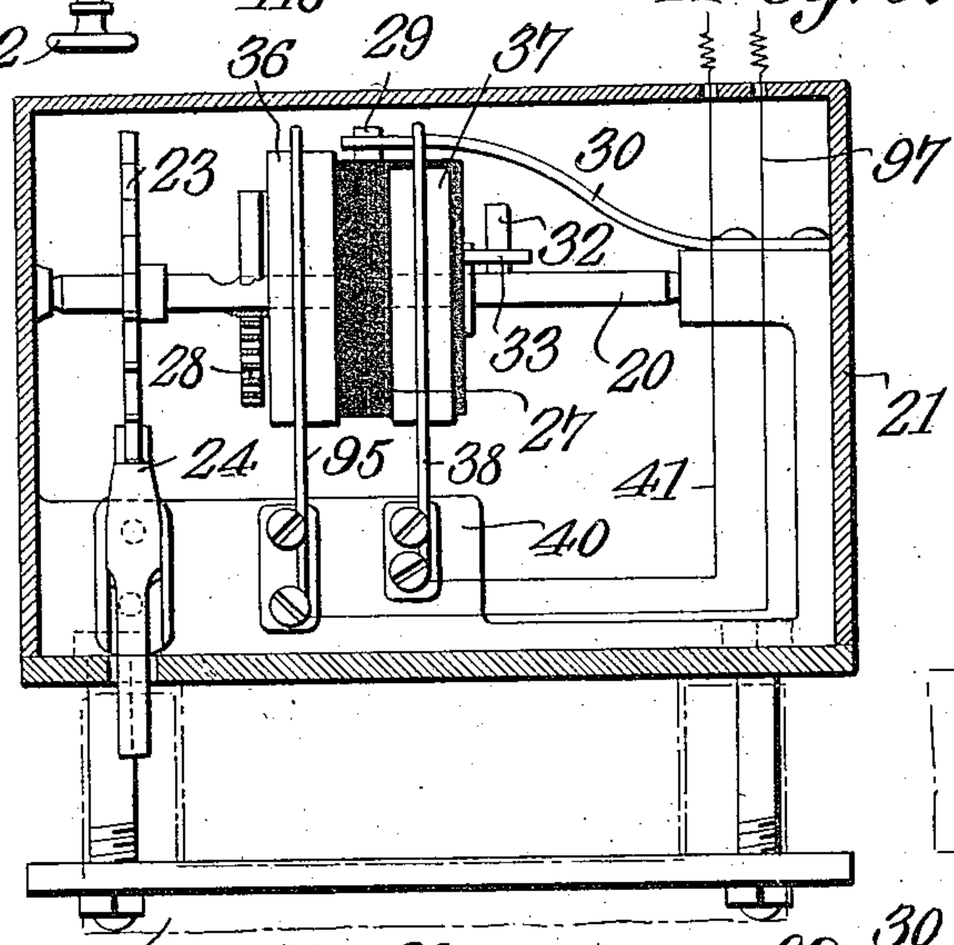


Fig. 6.

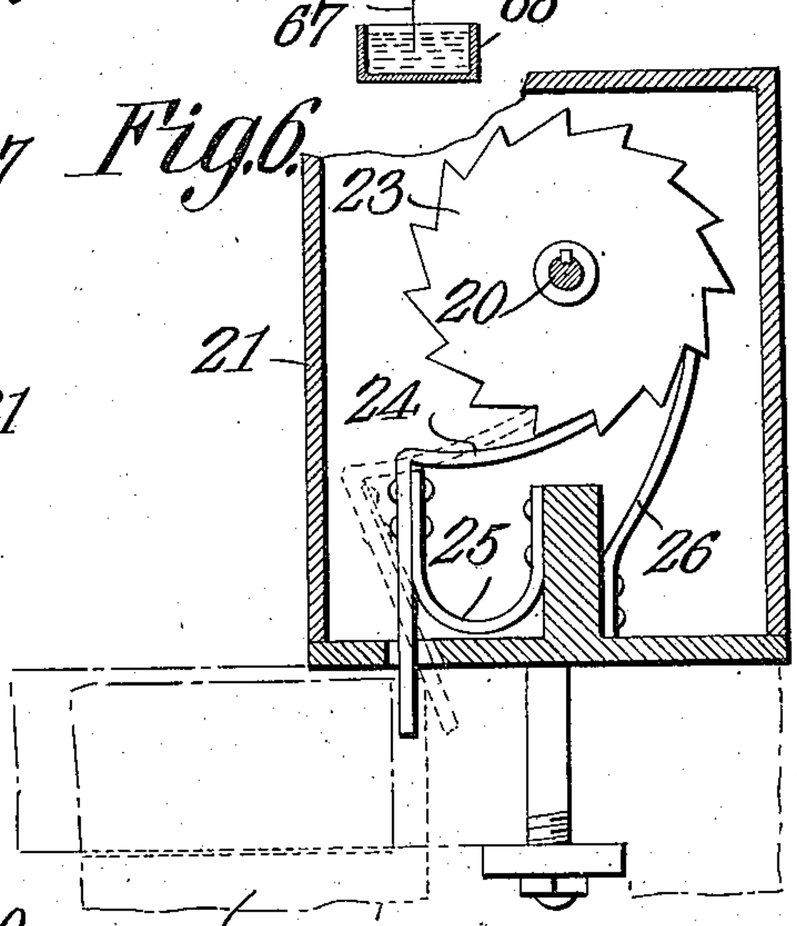


Fig. 7.

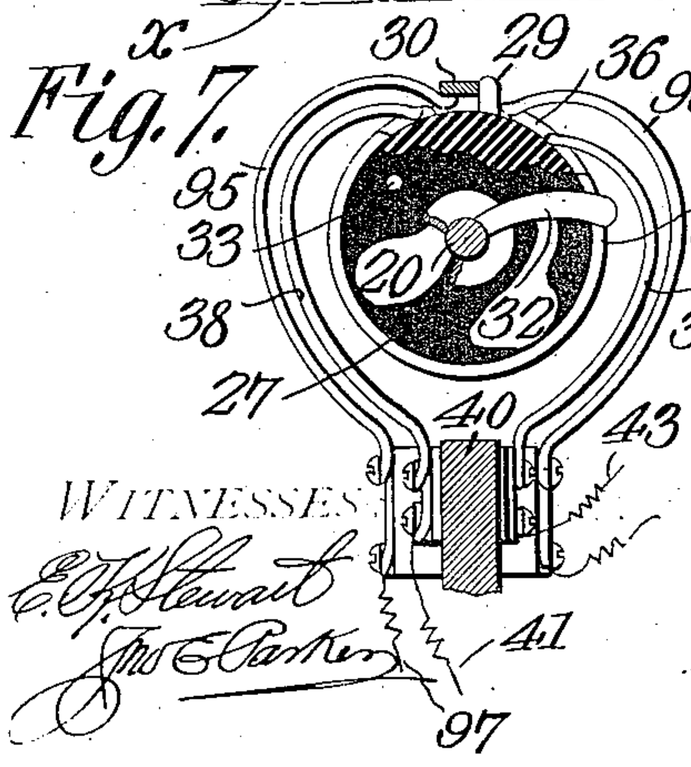


Fig. 8.

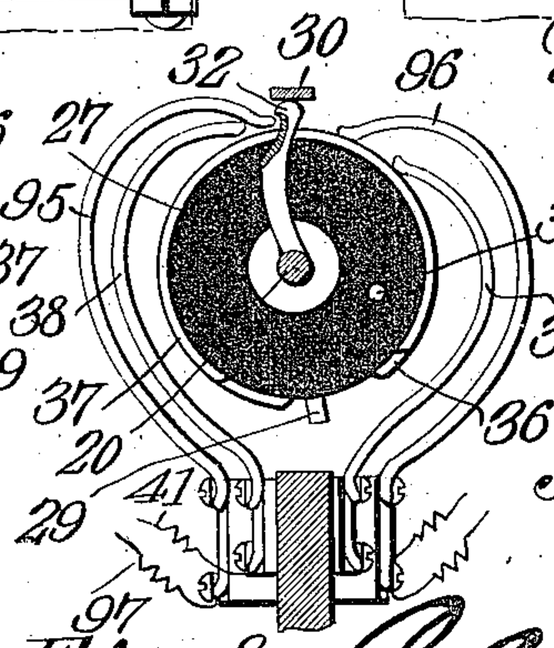
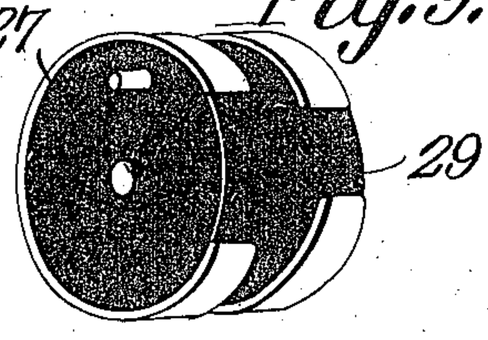


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOSEPH L. JONES, OF KIZER, TENNESSEE.

TRAIN-CONTROLLING APPARATUS.

No. 863,540. Specification of Letters Patent. Patented Aug. 13, 1907.

Application filed December 10, 1906. Serial No. 347,122.

To all whom it may concern:

Be it known that I, JOSEPH L. JONES, a citizen of the United States, residing at Kizer, in the county of Blount and State of Tennessee, have invented a new and useful Train-Controlling Apparatus, of which the following is a specification.

This invention relates to train signaling and controlling means, and has for its principal object to provide a wireless system whereby trains approaching within a danger limit may be warned, or when the trains continue to travel after receiving one or more warnings, the brakes or controlling mechanism on both trains will be actuated and the trains automatically stopped before a collision can occur.

A still further object of the invention is to provide a system of this class in which trains approaching within a danger zone will receive warnings at regular intervals, and after a predetermined number of warnings have been flashed or sounded, the brakes or other controlling mechanism will be actuated.

A still further object of the invention is to provide a system of this class which may also be used as a means for inter-communication between the trains or between the trains and stations.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1 is a general diagram showing the application of the invention to two approaching trains. Fig. 2 is an elevation of the mechanism for timing the operation of the decoherer, and for setting into motion the mechanism for applying the brakes or other train controlling devices. Fig. 3 illustrates the brake applying mechanism and its connections. Fig. 4 is a partial plan view of the same. Fig. 5 is an elevation, partly in section, of the circuit controlling device operated by the engine. Fig. 6 is a transverse sectional view of the same. Figs. 7 and 8 are detail views showing the operation of the circuit closing device. Fig. 9 is a detail perspective view of the insulating drum which carries the contact.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

On each locomotive, and at each station along the line are sending and receiving devices, together with two aerial poles, one for sending and the other for receiving, these being generally in the form of metallic rods about one-fourth of an inch in diameter and as high as the tunnels, bridges and the like will permit.

The sending apparatus includes a vertical pole or conductor 10 and Ruhmkorff coil 11, one of the sparking poles being connected to the aerial conductor and the other to a ground 12 which in the present instance takes the form of a zinc box containing water. The primary of the coil is connected by a wire 15 to one pole of a source of energy 16, and the opposite pole of this source of energy is connected by a wire 17 to a contact immediately under a switch blade 18, the switch blade being normally out of engagement with the contact. From the fixed end of the switch blade runs a wire 19 to the primary, the interrupter being arranged in the circuit as usual, and a condenser being employed if necessary.

The present apparatus is designed to send a signal automatically as the train advances, that is to say, the primary circuit of the induction coil will be closed every predetermined number of revolutions of the driving wheels, for instance, fifteen revolutions, which would mean from fifteen to twenty signals every mile, in accordance with the diameter of the driving wheels. For this purpose, an automatic circuit closer is arranged adjacent to the cross head or other movable part of the engine, and receives a step by step movement as the cross head reciprocates. This circuit closer includes a revoluble shaft 20 that is mounted in a suitable bearing inclosed in a casing 21 and secured to the shaft is a ratchet wheel 23 with which engages a pawl 24. The pawl is supported by a spring 25 and has one end projecting through an opening in the wall of the casing in position to be engaged by the cross head *x*, indicated by dotted lines in Fig. 5, the cross head moving the pawl from the full line to the dotted line position, and the return movement being accomplished by the spring 25, so that the ratchet wheel will be advanced a single step at each complete reciprocatory movement of said cross head. When so advanced the ratchet wheel is held by a spring pawl 26.

Mounted loosely on the shaft is a circuit closing drum 27, preferably formed of insulating material and connected to the shaft by a spiral spring 28. This drum carries on its periphery a radially projecting pin 29 which is engaged by a locking spring 30 that tends to hold it from movement under stress of the spring. As the ratchet wheel is turned, the spring is wound up, and if the locking member 30 is released, the drum is allowed to make one complete rotative movement as the spring unwinds.

Mounted on the shaft is a radially projecting arm 32 having a cam-shaped outer end that engages under the locking member and raises such member 30 from engagement with the pin 29, whereupon the drum revolves rapidly in the direction indicated by the arrow

in Fig. 7, until a stop pin 33 projecting from the end of the drum engages against the cam arm 32 and stops further movement of said drum, this occurring in advance of the arrival of the pin 29 at the initial position and the contact of the pin 33 with the arm 32 will move said arm from below the stop member 30, so that the latter will be in position to be engaged by the pin 29 and check the movement of the circuit closer when it has made a single complete revolution.

Mounted on the drum 27 are two bands 36 and 37, formed of good conducting material, the band 37 being a trifle shorter than band 36 for a purpose hereinafter described. This band 36 is engaged by two spring contacts 38 and 39, that are carried by a portion 40 of the fixed frame, while the drum is rotating. When the drum is at rest they bear on the surface of the insulating material of which the drum is formed, and hence no circuit is closed between them. The contact 38 is connected by a wire 41 to that pole of the battery opposite the connection of said battery with the primary of the coil, while contact 39 is connected by wire 43 with the end of switch blade 18, so that if the drum is rotated, the circuit is closed the same as it would be by depressing blade 18 of the switch, and the primary of the coil will be energized, and it may here be remarked that the function of the switch is to enable the engineer to send a signal when the train is stopped, or to allow the sending of readable messages.

The coherer and decoherer are carried by a standard 50, having a spring 51 carrying an armature 52, and at the end of the armature is a hook 53 in which the coherer 54 is confined by screw 55. The standard 50 also carries an electro-magnet 60 which when energized, will attract the armature, and the coherer will be agitated for the purpose of loosening the metal in the coherer.

The aerial receiving rod 65 is connected by a wire 66 to one end of the coherer tube, and the opposite end thereof is connected by a wire 67 to a ground 68 which in this case is preferably in the form of a zinc box containing water.

The receiving apparatus further includes a delicate relay 70, the coils of the relay being included in a circuit which may be traced from a battery 71 through a wire 72 to the relay coil, from thence through a wire 73 to the rod 51 of the coherer, the coherer, the wire 74, an electric bell 75, through the coils of the bell and back through a wire 76 to the battery 71. This latter energizes the relay coil when the particles of metal in the coherer cling together when subjected to the action of the wave, and the armature 77 of the relay will be attracted against the stop 78, thereupon closing a circuit which may be traced from the battery 71 through a wire 80, the relay armature 77, stop 78, wire 81, the bell 75, and wire 76 back to battery. The bell will thereafter continue to ring so long as the primary of the Ruhmkorff coil is connected to the sending battery, and in order that it may be stopped after a certain number of taps, the clapper rod 84 of the bell is provided with a pawl 85 which engages a ratchet wheel 86 mounted at one side of the bell and carrying a circuit closing pin 87 which, when the ratchet wheel has moved to the extent of a complete revolution, is adapted to engage a spring contact 88. This contact 88 is arranged in a circuit which may be traced from a battery 89 to electro-magnet of the decoherer, wire 90, contact 88, pin 87, the ratchet wheel, the ratchet wheel arbor 91, a wire 92, to battery 89, so that after a certain number of taps of the bell depending on the number of teeth of the ratchet wheel 86, the decoherer will be set into operation and the message will be stopped.

In order to prevent the reception of an alarm by the bell of the sending station, the strip 37 of the drum 27 is utilized. It will be seen by reference to Figs. 6 and 7 that this strip is engaged by two contacts 95 and 96, which normally rest in the space between the ends of the current conducting strip. When the drum is turning, however, these contacts will both be in engagement with the strip, and a circuit will be closed between them. The contact 95 is connected by a wire 97 to a wire 98 which leads to a wire 92, while the contact 96 is connected to the wire 90, so that as soon as the drum starts to rotate, the circuit of the decoherer will be closed with its battery and the decoherer will start into operation, shaking the coherer and preventing the reception of the signal. By making the strip 36 a trifle longer than the sending strip 37, the non-reception of a message is positively prevented.

In order that the decoherer of the sending station may be set into operation when a message is being sent manually, the contact 95 is connected by a wire 100 to the fixed end of a switch blade 101, and the opposite contact 96 is connected by a wire 102 to a contact immediately under such switch blade 101 and normally out of engagement therewith. The two switch blades are connected by a cross bar 104 formed of non-conducting material and carrying a suitable handle, so that both may be moved to closed position or to open position at the same time, so that whenever the switch is depressed for the purpose of energizing the primary circuit of the Ruhmkorff coil, and sending a message, the decoherer will be placed in circuit with its battery and the coherer of the sending station will be prevented from responding to the message so sent.

On the shaft or arbor 91 is arranged a worm 100′ which engages with a worm wheel 101′ having a shaft mounted in suitable bearings on the frame and carrying a contact pin 102′ which as the worm is turned, is brought into engagement with a contact strip 103. Connected electrically to the frame and to the worm wheel is a wire 104′ leading to a pair of electro-magnets 105, and these are connected by a wire 106 to a battery 107, and the contact spring 103′. After the ratchet wheel 86 has been turned a predetermined number of times and the engineer has received a corresponding number of signals, the pin 102′ will engage the contact 103, and the electro-magnets 105 will be energized.

Adjacent to the electro-magnet is a valve 109 which, in the present instance is shown as connected in the train pipe of the air brake system, although it may represent any train controlling device, such, for instance, as a means for operating the reversing lever for closing the throttle valve or the like. The stem of this valve is in the form of an arbor or shaft 110 on which is secured a gear wheel 111, and a hand wheel 112. The shaft 110 is mounted in bearings in a suitable frame 115 which, also, serves as a support for a shaft 116 carrying a pinion 118 in mesh with the gear 111 and a ratchet wheel 119. Secured to the ratchet

wheel is one end of a coiled spring 120, the opposite end of said spring being secured to the frame. This spring is placed under stress when the hand wheel 112 is turned for the purpose of closing the valve or other controlling device 109, and is held under stress by a pawl 121 which engages the teeth of the ratchet wheel. The pawl is carried by a pivoted lever 122 and is held in operative position by a spring 123. On this lever is an armature 124 that is arranged within the field of force of the electro-magnets 105.

After the sending of a predetermined number of signals, the electro-magnets 105 will be energized, and the armature 124 will be attracted, moving the pawl 121 to release position, whereupon the spring will unwind, and will transmit rotative movement through the gearing connections to the stem 110, turning the valve to open position in order to bleed the train pipe and permit the application of the brakes in the usual manner, or, as before described, movement may be transmitted to a throttle valve, reversing mechanism, or any other train controlling device.

After the brakes have been applied, the engineer may turn the hand wheel 112 for the purpose of closing the valve, and at the same time winding up the spring and restoring the parts to initial position in readiness for another operation.

It will be seen that as soon as the trains approach within a danger limit, the signals will commence to sound and will be sounded at regular intervals as the trains near each other. After the sounding of a predetermined number of signals, the brakes will be applied or the trains otherwise brought to a standstill before a collision can occur.

The apparatus may be installed at low cost and all of the parts may be placed within a suitable box or casing in order to protect them from exposure.

I claim:—

1. In a wireless system of electric train control, means on the trains for propagating electric waves at predetermined successive intervals to constitute a danger zone radiating from each train, a signal actuating apparatus on each train sensitive to the propagated waves, and means carried upon each train for actuating a train controlling device subsequent to a predetermined number of operations of the signal mechanism.

2. In a wireless system of electric train control, means on each train for propagating electric waves to constitute a danger zone, means on each train and actuated by the movement of the train for setting the electric wave propagating apparatus in action at predetermined intervals, a signal actuating means on each train sensitive to the propagated electric waves, and means on each train for operating a train-controlling device subsequent to a number of actuations of the signal device.

3. In a wireless system of electric train control, means upon each train for propagating electric waves, a train-controlling device on each train, and means for setting the same in operation through the action of the emanated electric waves after the train has traveled a predetermined distance within the influence of said emanated waves.

4. In a wireless system of electric train control, means for propagating electric waves, a train-controlling device on each train, and means sensitive to the emanated waves for operating said controlling devices after the trains have moved a predetermined distance within the influence of said emanated waves.

5. In a wireless system of electric train control, means upon each train for propagating electric waves at predetermined regular intervals to constitute a zone of electric emanation traveling with said train, signal operating means upon each train sensitive to the electric emanations, and train-controlling means upon each train set in operation by the signal mechanism subsequent to a predetermined number of operations of the latter under the influence of the emanated waves.

6. In a wireless system of train control, an alarm on each engine, a train actuated circuit closing device for permitting operation of the alarm at regular intervals after the aproach of the trains within a danger limit, an alarm actuated means for automatically breaking the alarm circuit and including a pawl and ratchet, a train controlling device, an electro-magnetically actuated means controlling its operation, and a circuit extending through said means and having its terminals under the control of the pawl and ratchet mechanism.

7. In apparatus of the class described, a pawl and ratchet mechanism arranged to be set into operation when the trains approach within a danger limit, a shaft carrying the ratchet wheel, a worm on said shaft, a worm wheel intermeshing with the worm, contacts under the control of the worm wheel, an air brake valve, a gear wheel on the stem of said valve, a hand wheel also carried by the stem and serving as a means for closing the valve, a shaft, a pinion arranged thereon and intermeshing with the gear-wheel, a ratchet wheel also mounted on the shaft, a spring tending to turn the shaft and impart opening movement to the valve, a pawl engaging the ratchet wheel, a pawl carrying lever, an armature thereon, an electro-magnet for said armature, and a circuit extending from the electro-magnets to the contacts of the worm wheel.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JOSEPH L. JONES.

Witnesses:
J. H. BRICUT, Jr.,
B. H. BORING.