No. 873,605. PATENTED DEC. 10, 1907.

E. RENAUD.

TRAIN CONTROLLING MEANS.

APPLICATION FILED FEB. 19, 1907.

6 SHEETS—SHEET 1.

Fig. 1.

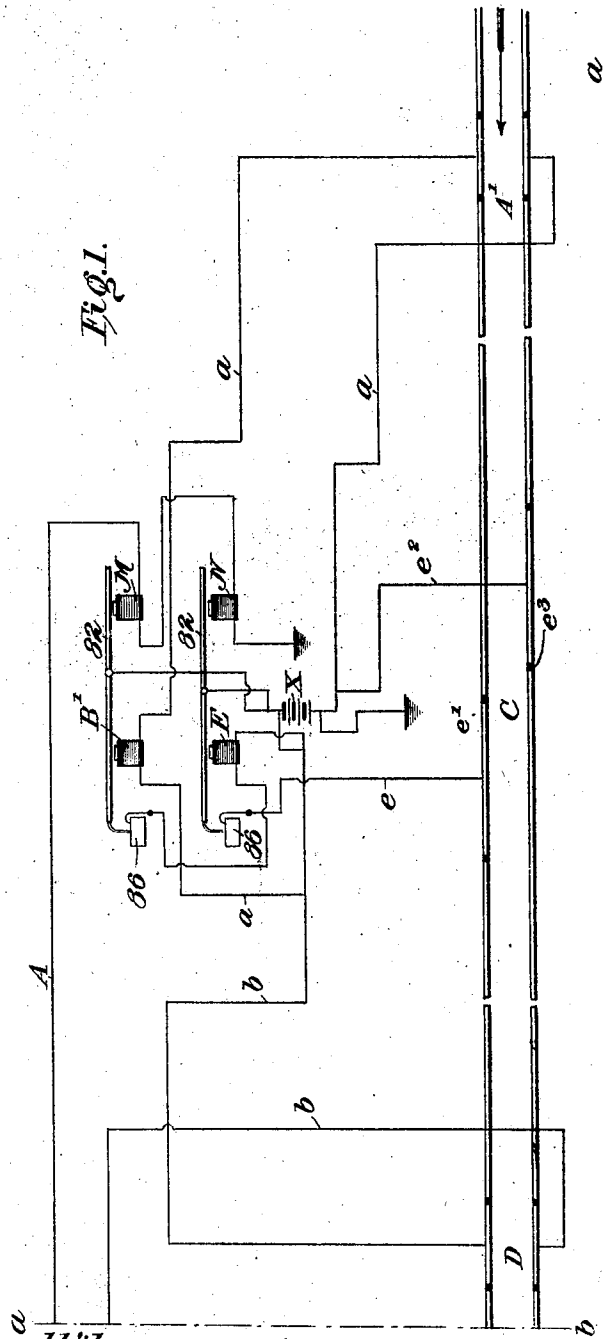
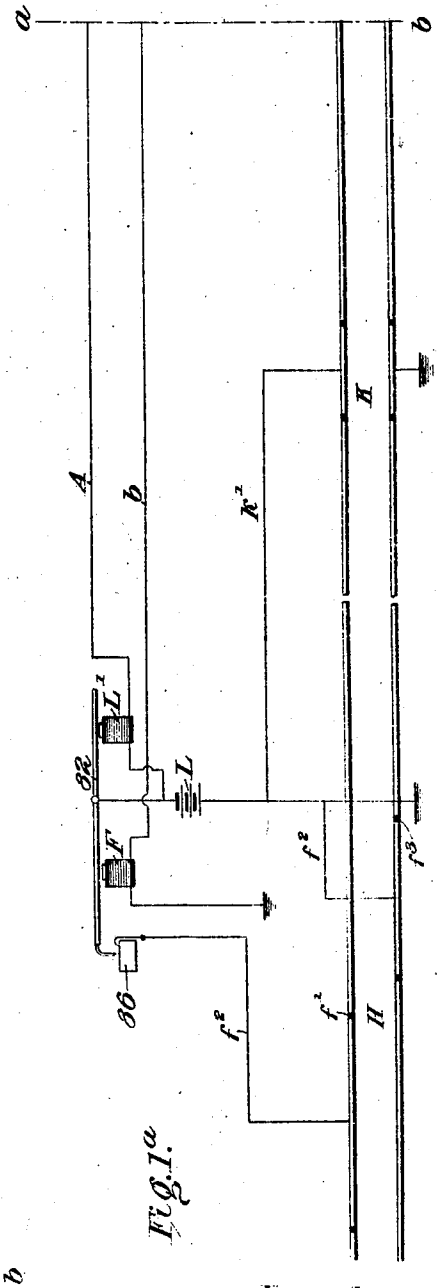


Fig. 1.a



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6 SHEETS—SHEET 2.

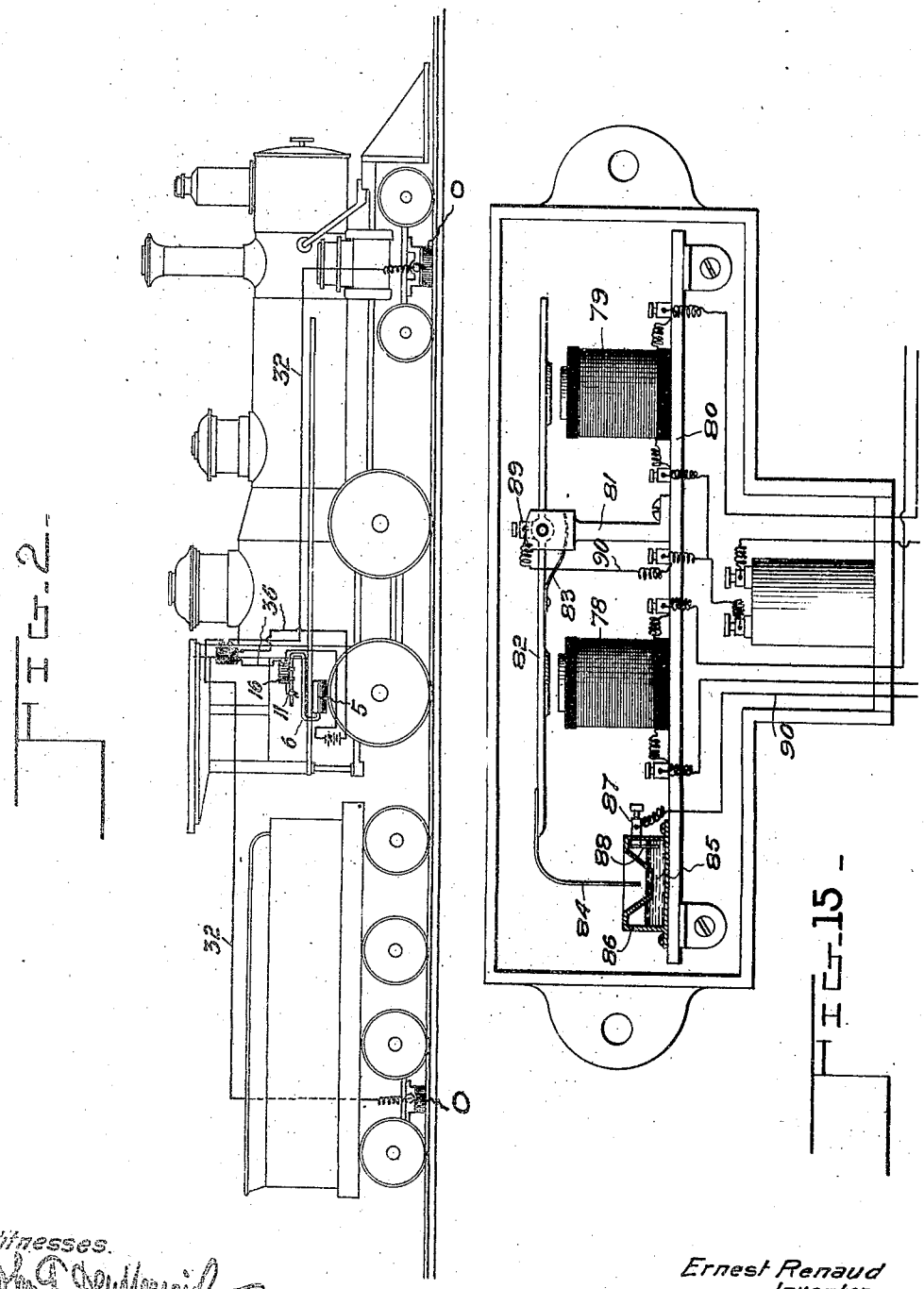

FIG. 2.

FIG. 15.

Witnesses.
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6 SHEETS—SHEET 3.

FIG. 4.

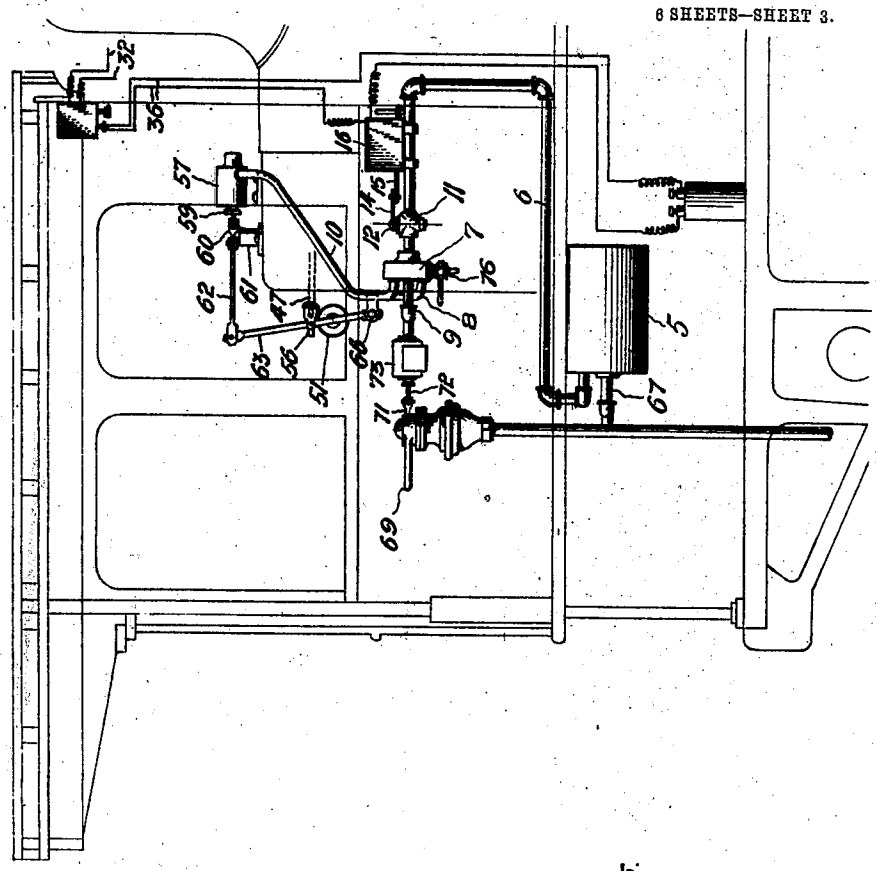
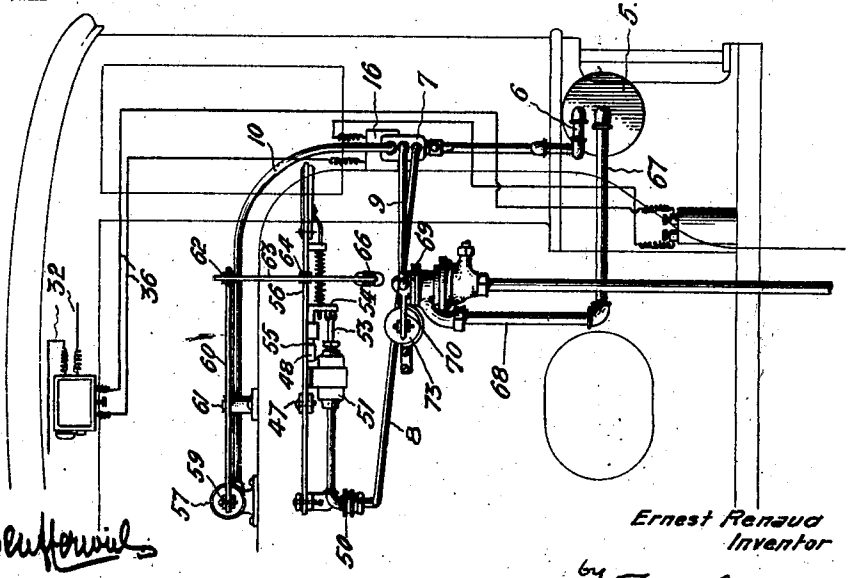


FIG. 3.



Witnesses.
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6 SHEETS—SHEET 4.

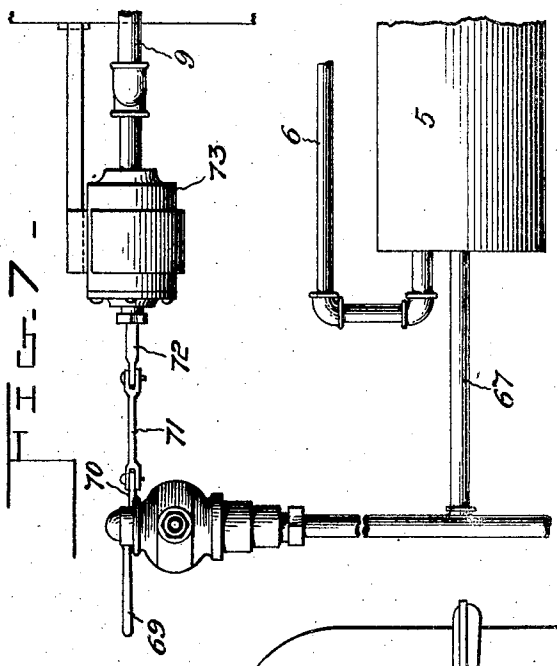

FIG. 7.

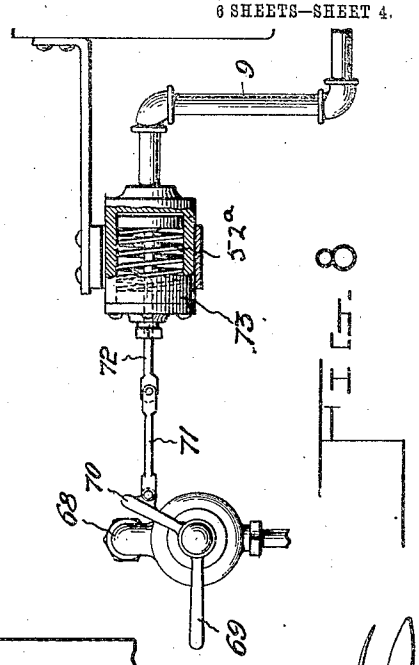

FIG. 8.

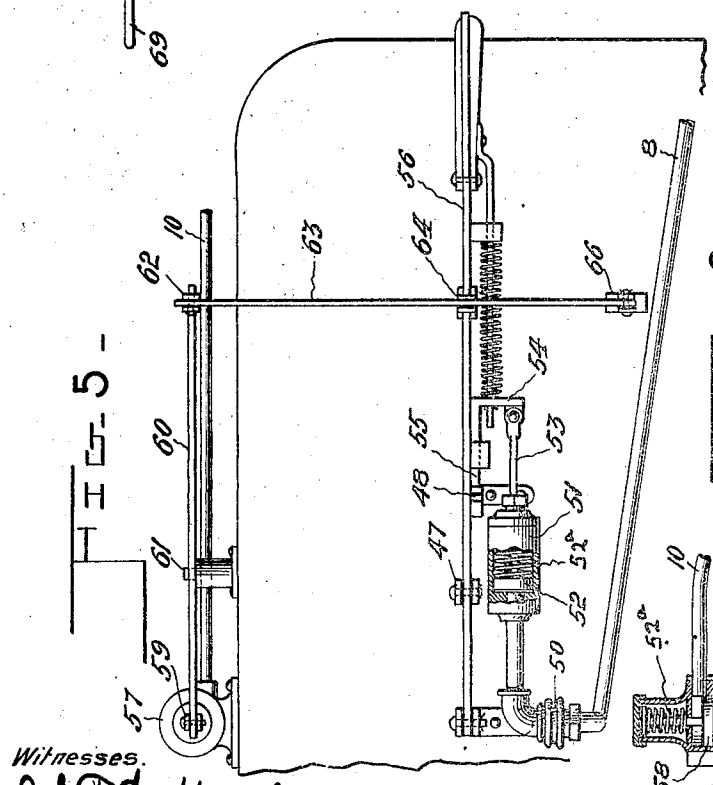

FIG. 5.

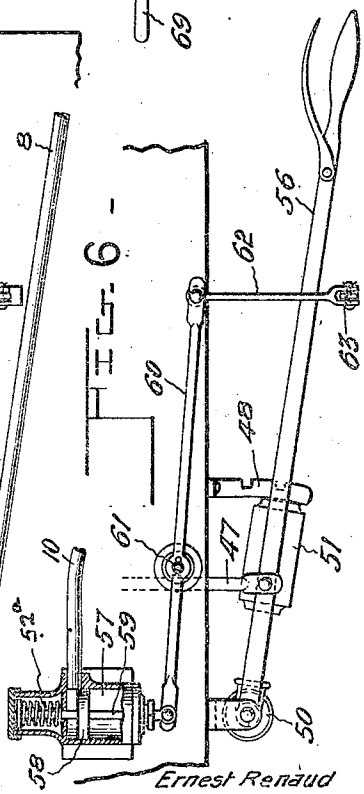

FIG. 6.

Witnesses.

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6 SHEETS—SHEET 5.

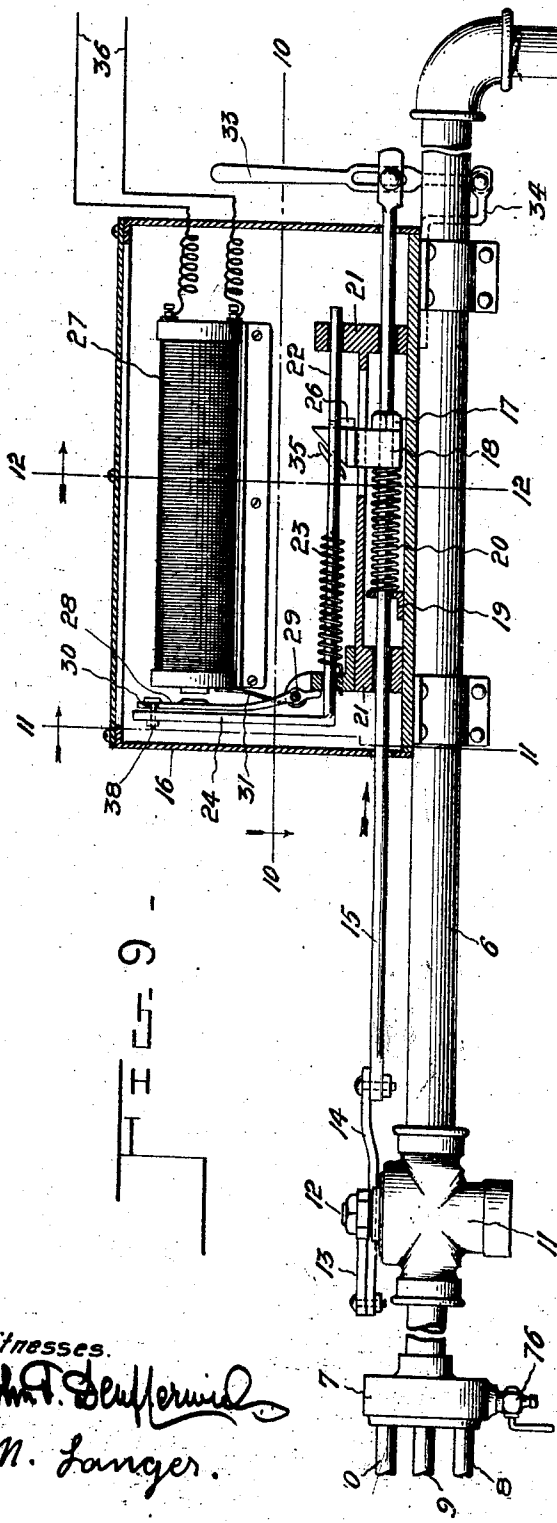

FIG. 9.

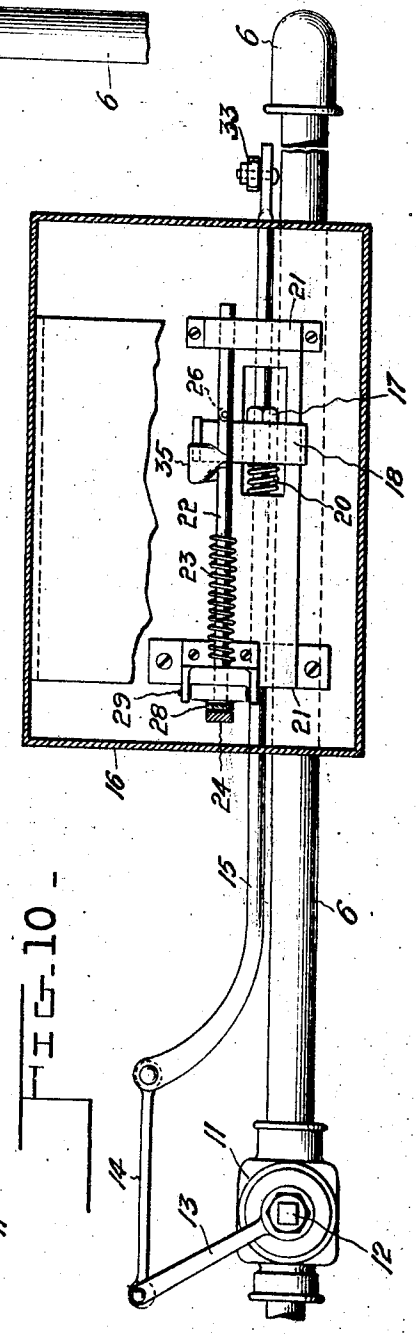

FIG. 10.

Witnesses.
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TRAIN CONTROLLING MEANS.

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6 SHEETS—SHEET 6.

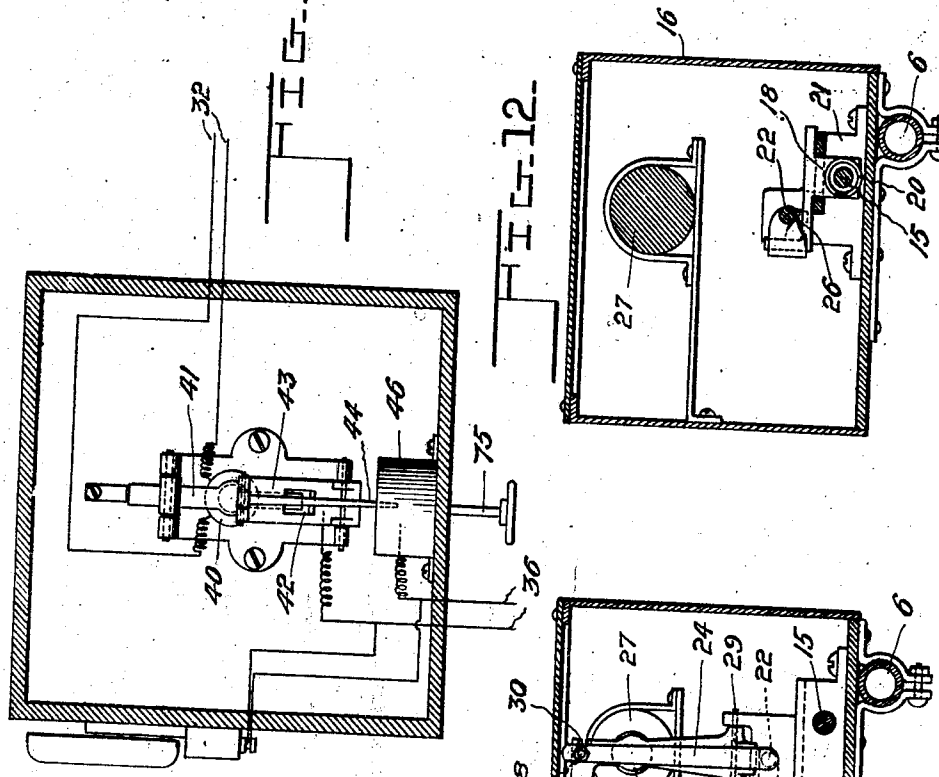

FIG. 14.

FIG. 12.

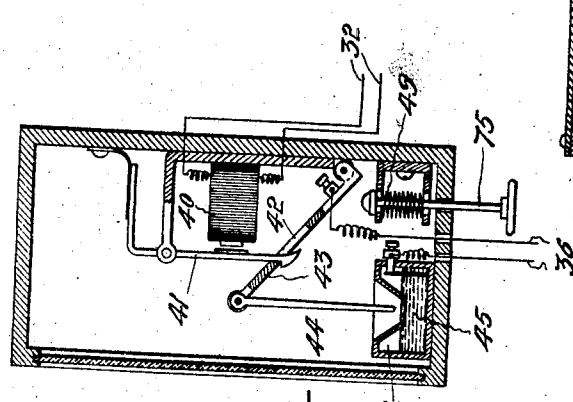

FIG. 13.

FIG. 11.

Witnesses.

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UNITED STATES PATENT OFFICE.

ERNEST RENAUD, OF MONTREAL, QUEBEC, CANADA, ASSIGNOR TO J. B. DUPUIS, OF MONTREAL, CANADA.

TRAIN-CONTROLLING MEANS.

No. 873,605. Specification of Letters Patent. Patented Dec. 10, 1907.

Application filed February 19, 1907. Serial No. 358,325.

To all whom it may concern:

Be it known that I, ERNEST RENAUD, of the city of Montreal, Province of Quebec, Dominion of Canada, and being a subject of the King of England, have invented certain new and useful Improvements in Train-Controlling Means, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details of construction shown and described, as it is obvious that various modifications thereof will occur to persons skilled in the art.

This invention relates to new and useful means adapted for use in stopping trains and contemplates an automatic system of control which is entirely independent of the action of the engine driver in the event of his train passing into a track zone which is occupied by another train and the object of the invention is to provide automatic electro-mechanically operated means for stopping trains under circumstances as specified.

In the drawings similar characters of reference denote corresponding parts in all the views in which:

Figures 1 and 1ª illustrate, diagrammatically, a system of electrical track connections adapted to coöperate with the mechanism carried by the train, and preferably by the engine, for the purpose of establishing lines of electrical communication from said track system to electro-mechanically operable means on said engine. In considering said electrical diagram, which is illustrated in connection with a single line of track, it is to be observed that only one track zone is shown for convenience of illustration, and to avoid a multiplicity of drawings, but it will be readily understood that by suitable connecting lines, within the skill of an electrical engineer, amplifications of said system may be arranged to adapt it to a series of track zones or to a double track system as well. Fig. 2 shows a locomotive and tender which is equipped with the invention, illustrating the relative location of coöperating parts. Fig. 3 is a rear interior fragmentary view of an engine cab with the electro-mechanical parts of the invention shown in position therein. Fig. 4 is a side elevation of the cab with the near wall removed. Fig. 5 is a fragmentary enlarged detail illustrating the position of the throttle lever releasing and actuating mechanism. Fig. 6 is a top plan view of the parts shown in elevation in Fig. 5. Fig. 7 illustrates the connection with the air reservoir and shows the means for opening the pressure valve to the air brake system. Fig. 8 is a partial plan broken view of the parts shown in Fig. 7. Fig. 9 is an elevational view showing partly in full lines and partly in section the electro-mechanical means for operating the valve which controls the automatic pressure supply. Fig. 10 is a plan view of the parts shown in Fig. 9 with parts broken away for clearness of illustration. Fig. 11 is a sectional view, the section being taken on line 11—11 of Fig. 9. Fig. 12 is a similar view taken on line 12—12 of said Fig. 9. Fig. 13 is a sectional view taken vertically through the case of what is herein called the pilot magnet looking from the side. Fig. 14 is a rear elevational view taken in section through the said pilot magnet-case. Fig. 15 illustrates in detail means employed for making and breaking circuit hereinafter explained.

Referring to the mechanical parts: 5 is a cylinder adapted to contain compressed air, to be supplied from any suitable source, and, connected with this cylinder is a conduit 6 which leads to a chamber 7 which chamber is tapped by three tubes numbered respectively 8, 9 and 10.

In convenient proximity to the chamber 7 is a valve 11 having a stem 12 which is connected by the lever 13 and link 14 with the rod 15 which rod is positioned in the lower portion of the case 16 and adapted to reciprocate therein as hereinafter described. Secured on this rod 15 is a nut or collar 17 against which rests a block 18 held on a non-circular portion of said rod, or keyed thereto, to prevent rotation of said block independent of the rod.

Secured to the bottom of the case 16 is an angle 19 between which angle and said block 18 is held an expansion spring 20 normally under compression.

Carried in the guides 21, in which the rod 15 is held, is a second rod 22 with which is connected a torsion spring 23 at one end while the opposite end of said spring is connected with one of the blocks 21. The tendency of this spring 23 is to rotate the rod so

as to throw the lever 24 to the position shown in dotted lines in Fig. 11, where said lever will strike on a pad supported on the angle 25 so as to withdraw the lock 26 from the path of movement of the stop 18 on said rod 15. When this lock is removed from engagement with said stop the pressure of the spring 20 will project the rod 15 and its stop in the direction indicated by the arrows in the upper part of Fig. 9 and open the valve 11 in the conduit 6, but the normal position of the parts being at rest it is necessary to consider the parts associated therewith.

Supported in convenient proximity to, and immediately above, the rod 15 is an electro-magnet 27 having an armature 28 which is pivoted at 29 to a lug projecting upwardly from the guide 21 near said armature, and said armature is slotted at 30 for the reception of a pin on the rockable lever 24 so as to normally hold the said lever in locked position, vertically, and thereby hold the stop 26 in the path of movement of said block 18. This armature is held in position by means of a spring 31 bearing against the spool of the said magnet at one end and against the said armature at its opposite end, so that the tendency of said armature is normally outward and into engagement with the said rockable lever referred to, but when the magnet 27 is energized, the said armature will be retracted and will release the said pin from the slot in said rockable lever, whereupon the torsional force of the spring 23 will throw the said rockable lever into the position shown by dotted lines in Fig. 11 and remove the stop 26 from the path of movement of said block, and the pressure of the spring 20 will at once project the rod in the direction indicated by the said arrows and will open the valve 11 to admit pressure from the reservoir 5 to the chamber 7, and from said chamber to the mechanism therebeyond, as hereinafter more fully described.

Connected with the outer end of the rod 15 is a slotted lever 33 which may be utilized in resetting the mechanism just described, and it will be noted that said lever 33 is pivotally supported on the angle member 34 projecting downwardly from the case 16 so that rearward movement of said lever 33 will retract the said rod 15, but in retracting said rod the cam face on the inner portion of the block 18 will come into contact with the cam 35 on the rod 22 and, by means of the contact of the two said cam faces, will rock the rod 22 against the stress of the spring 23, thereby causing the rockable lever 24 to rise to vertical position, where the cam shaped lip 37 on said rockable lever will come into contact with the upper end of the armature 28 and retract said armature against the pressure of the spring 31 so as to permit the pin 30 to ride easily into the slot in said armature and insure locking the said lever in its vertical position when elevated. When circuit is closed through the pairs of staggered insulated rail sections by means of a train, which will close the circuit 32 to the pilot magnet, said pilot magnet 40 will be energized, thereby drawing its armature 41 toward said magnet and withdrawing the hook shaped lower end of said armature from the position shown in Fig. 13, wherein said hooked portion is projected through the slot 42 in the arm 43, and will permit said arm and the contact pin 44 carried thereby to drop into the mercury 45 in the cup 46, thereby closing circuit 36 to the larger magnet 27 before referred to, with the result stated. When this occurs the valve 11 will be opened and pressure will flow through the tubes 8, 9 10. The tube 8 leads, through the swing joint 50, to the cylinder 51 in which is a piston 52 to which is connected the piston rod 53 which rod is connected to the angular member 54 which carries the pawl 55 used to secure the throttle lever 56 in place. Secured at a suitable elevation above said throttle lever is a second cylinder 57 communicating with the tube 10 and in said cylinder is a piston 58 with which is connected a short piston rod 59 connected in turn with the lever 60 which is pivoted at 61. Projecting at right angles, preferably, from this lever is a link 62 which is connected with the rockable lever 63 and said last mentioned lever is guided in a perforated member 64 carried upon the said throttle lever 56, while the lower end of said lever 63 is pivotally mounted in the block 66, as best shown in Fig. 5.

From the pressure cylinder 5 extends a conduit 67 which taps the emergency brake pressure pipe 68 and below the connection of the pipes or conduits 67 and 68 is the usual valve (not shown) which is operated by means of the hand lever 69 and the automatically operable lever 70 to admit pressure to the pipes of the emergency brakes. To the said lever 70 is connected a link 71, pivotally connected to the piston rod 72 cooperating with a piston in the cylinder 73 which latter is supplied with pressure from the pipe or conduit 9. Thus when circuit is completed through the brushes to the pilot magnet 40 said magnet will be energized, thereby closing circuit to the larger magnet 27 and releasing the lock which controls the spring actuated reciprocatory rod 15 and said rod will be projected forwardly by the spring thereon to open the valve 11 and admit pressure from conduit 6 to the auxiliary pipes or conduits 8, 9, 10 and through said latter conduits to the cylinders 51 57 and 73, thereby actuating the pistons in said cylinders and, first, releasing the pawl 55, then throwing the throttle lever 56 to shut off steam by means of the throttle rod 47, at the same time admitting air pressure through the stand-pipe

or conduit 68 leading to the emergency brake pipes, and effectually stopping the train.

In case a train is automatically stopped as herein described it will be impossible for the engine driver to throw the throttle lever into position to again start the train until the circuit to pilot magnet is broken by pushing up on the rod 75 and opening the air-cock 76 to permit exhaust of pressure to atmosphere, owing to the fact that the forward positions of the pistons referred to will be maintained by the pressure behind them. For example, until this pressure ceases, if the throttle lever 56 is moved outwardly against the pressure in cylinder 57 the locking pawl 55, carried by said throttle lever will not engage with the notches in its coöperating rack or segment 48 owing to the fact that said pawl will remain retracted under pressure of the air in cylinder 51 and, if it were possible to throw the said lever manually against the pressure in cylinder 57, it will be impossible to lock said throttle lever to hold the throttle valve open, consequently, as soon as said throttle lever is released it will immediately fly back to position to shut off steam supply.

If the engine driver should rock the lever 33 in an attempt to shut the valve 11 the cam face of block 18 will rock the cam 35 to raise the rockable lever 24, but the magnet 27, being energized, will hold its slotted armature 28 in such close relation to the core of said magnet that the end of the short pin 38 will not enter the slot 39 in said armature and, as soon as pressure is removed from the lever 33, the member 24 will be forced by the torsional spring 23, into the horizontal position shown in dotted lines in Fig. 11 whereupon the stress of the spring 20 will again open the valve 11 as before described.

If the engine driver should attempt to deënergize the magnet 27 by breaking circuit through the mercury cup 46, by pressing upwardly the push pin 75, the circuit 32 will only remain broken while he holds said push pin in an elevated position and the upper end of said pin is in contact with the hanger 42 because as soon as he releases said push pin its spring 49 will force the pin downwardly, thereby permitting the pin 44 to drop and again close circuit through said mercury cup as before described. Thus it will be evident that it will be practically impossible to start a train equipped with the present invention when once it has been automatically stopped, while it is on the insulated rail section from which current is supplied to the pilot magnet and to the larger magnet 27 until circuit to said insulated rail section is broken as described in connection with the diagram shown in Figs. 1 1ª.

While the conduit 6 is shown and described as an air pressure conduit it is to be understood that said conduit may be connected with the steam supply and steam pressure be used instead of air pressure with equally good results.

In Fig. 15 is illustrated the detail construction of one pair of magnets and associated parts which may be used with the electrical track arrangement shown in Figs. 1—1ª and while it is to be understood that any convenient means for accomplishing the object of this particular apparatus may be substituted therefor a brief description thereof follows:

The magnets 78 and 79 are supported upon a suitable base 80 and wired as shown in connection with either pair of associated magnets as illustrated in the diagram. Between said magnets is a post 81 on which is pivotally supported a double rockable armature 82, the pivot whereof passes through a bifurcated upward extension of the post 81 while a spring 83 is positioned so as to normally hold the curved contact pin 84 carried by said armature out of the mercury 85 in the cup 86 and connected with the said cup is a binding post 87 which carries a metal plate 88 to complete circuit to said binding post and a line connected therewith. A second wire runs to the binding post 89 and said latter post is in electrical circuit with the armature 82. Thus circuit to magnet 78 will energize said magnet, draw down the pin 84 into mercury and close circuit through the line 90 while circuit to magnet —79— will, with the aid of spring 83, break said circuit by rocking the armature to elevate said pin 84 from said mercury thereby destroying the circuit established through the mercury cup. When air pressure is cut off the expansion springs 52ª will automatically restore the pistons in the several cylinders 51 57 and 73 to their normal positions. Coöperating with said mechanism is an electrical track arrangement adapted to close the circuit 32 to pilot magnet 40 and while said track arrangement may be varied, one diagram is shown herewith.

Referring to the diagram shown in Figs. 1 1ª, and considering a train moving from east to west (right to left), it will be observed that when the train reaches A′ the circuit X —*a*—*a*— will be closed to magnet —B′— thereby drawing down the left hand portion of its armature and partly closing circuit through its associated mercury cup 86 to insulated rail section —D— through the line —*b*— and magnet E, but as there is nothing to bridge the gap between the companion insulated rail members of the section —D— the magnet —E— is not yet energized, nor will it be until a train reaches this section —D—. When the first train passes over section —C— no result follows. When, however, this train reaches section —D— circuit will be completed through the trucks of the train and the magnets —E— and —F— will

be energized, thus closing circuit to the opposite rail members of both sections —C— and —H—. In the one case the circuit will be: battery —X—, to armature 82 of magnet —E— on one side through mercury cup 86, through line —e— to rail member —e'—; and the opposite side the line will run from the battery —X—, through line —e^2— direct to the rail member —e^3— of section —C—. For section —H— the circuit will be from rail member —f'— through line —f^2— to mercury cup 86 at magnet —F—, through the armature of magnet —F— to battery —L— and the opposite end of line —f^2— to the rail member —f^3— thereby establishing two circuits which may be closed by a passing train, through its trucks at either insulated section —C— or —H—. When this condition exists and a passing train reaches one of the staggered rail sections —C— or —H— circuit will be closed through the brushes —O— O— on the tender to line 32 of the tender circuit and will energize the pilot magnet 40 located in the upper part of the cab of the engine, and thereby close circuit to the magnet 27 with the result hereinbefore specified. When a train reaches —K— circuit is completed through its trucks from ground through rail sections —k'—, battery —L—, magnet —L'— to restore its armature 82 and break the circuit to —f^2— at the mercury cup of magnet —F— and also closes circuit through the magnets —M— and —N— to restore their armatures to normal position, thereby breaking circuit to rail members at —C— and —H— and leaving the track free for a train following in that particular track zone.

While the invention has been described in connection with a locomotive, it is evident that it is equally applicable to any well known type of motor car, the application of power for which is controlled by a rockable lever which serves the function of the well known throttle lever on a locomotive. For example the controller lever of an electric tram-car may be operated by the mechanism shown in substantially the same manner and be within the spirit of the present invention, the term throttle lever in the following claims wherever used being intended to cover the said controlling lever.

1. In an apparatus for stopping trains, a movable throttle lever, a locking segment, a pawl adapted to engage said segment, pressure actuated pawl releasing means movable with said lever, pressure operated means for moving said lever and pressure operated means for operating emergency brakes, in combination with electro-mechanically operable means adapted to control a pressure supply therefor.

2. In an apparatus for stopping trains, a movable throttle lever, means for locking said lever, pressure operable means carried by said lever and adapted to release the lever, a rockable lever adapted to throw said throttle lever, pressure operable means adapted to actuate said rockable lever, pressure supply conduits connected with said pressure operable means, a valve adapted to control the supply of pressure to said conduits and electro-mechanical means adapted to actuate said valve.

3. In a device of the character described, power operable emergency brake and steam supply regulating means, in combination with an electro-mechanically controlled torsional lock, a reciprocatory rod adapted to engage said lock, a power conduit, a valve therein connected with said rod, means for releasing said lock and a plurality of conduits for conducting pressure to the brake and steam supply regulating means.

4. In a device for stopping trains, separate pressure actuated means for simultaneously releasing and actuating a throttle lever and for supplying pressure to emergency brakes, in combination with a source of pressure supply, a single conduit leading therefrom, a pressure chamber, a plurality of conduits leading therefrom to said throttle lever and brakes, electro-mechanical means for supplying pressure to said plural conduits, a source of electric energy carried by the train, a second electro-mechanical device in normally open circuit and means carried by the train for closing said circuit, there being normally open circuit connections between said electro-mechanical means.

5. In a device for stopping trains, means for actuating emergency brakes, means for releasing a throttle lever, means for actuating said lever, a single pressure conduit a valve therein, an intermediate pressure chamber connected with said conduit, a plurality of pressure tubes leading from said chamber to the brake and throttle means, a releasing magnet, a lock adapted to be released by said magnet when energized, and spring actuated means, normally held by said lock, and adapted to actuate said valve.

6. In a device for stopping trains, means for actuating emergency brakes and means for shutting off steam, in combination with a single pressure conduit, a valve in said conduit a plurality of pressure tubes connected with said conduit and with said aforementioned means, spring actuated means for operating said valve, a lock normally holding said spring actuated means in inoperative position, a magnet for releasing said lock and a second magnet adapted to close a circuit to energize said lock controlling magnet.

7. In a device for stopping trains, pressure controlled means for actuating pressure controlled emergency brakes and pressure controlled means for shutting off steam in combination with a supply conduit for said pressure, a valve in said conduit, a reciprocatory

spring actuated rod connected with said valve, means for locking said rod in normally inoperative position, an electro magnet having an armature normally engaging said lock and means for energizing said magnet thereby opening said pressure valve to apply pressure for actuating the brake and actuating the steam supply controlling means.

8. In a device of the character described, separate means for simultaneously releasing a throttle lever, actuating said lever to control a steam supply, and admitting pressure to actuate emergency brakes, in combination with an electrically releasable mechanical means for opening a single valve to supply pressure for actuating said several means.

9. In a device of the character described, separate means for simultaneously releasing a throttle lever, actuating said lever to control a steam supply, and for admitting pressure to actuate emergency brakes, in combination with an electrically releasable mechanical means for opening a single valve to supply pressure from a single source of supply.

10. In a device of the character described, separate pressure actuated means for simultaneously releasing a throttle lever, for actuating said lever and for admitting pressure to actuate emergency brakes, all controlled by pressure from a single conduit, in combination with electro-mechanical means for actuating a single valve to supply pressure to said several means.

11. In a device of the character described, separate pressure actuated means for simultaneously releasing a throttle lever, for actuating said lever and for admitting pressure to actuate emergency brakes, all controlled by pressure from a single conduit, in combination with a normally deënergized magnet, an armature therefor, a lock engaging said armature, a pressure actuated reciprocatory rod normally held by said lock, a valve in said conduit connected with said rod and means for energizing said magnet to release said lock, thereby causing said rod to actuate the pressure controlling valve.

12. In an apparatus for stopping trains, simultaneously operable throttle-lever releasing and actuating means and brake pressure controlling means, in combination with electro-mechanical means for rendering said first mentioned means operative, and a second electro-mechanical means for closing a normally open circuit to said first mentioned electro-mechanical means.

13. In an apparatus for stopping trains, simultaneously operable throttle-lever releasing and actuating means, and brake pressure controlling means, in combination with a pressure supply conduit, a valve therein, a lever connected to said valve, a rod connected with said lever, means for reciprocating said rod, a lock for said rod, a magnet adapted to release said lock and means carried by the train for energizing said magnet.

14. In an apparatus for stopping trains, a movable throttle lever, a locking segment, a pawl carried by said lever for engagement with said segment, pressure operated means carried by said lever for releasing said pawl, pressure operated means for moving said lever, and means for simultaneously actuating said pawl and lever operating means, substantially as described.

15. In an apparatus of the character described, a throttle lever, a locking segment, a pawl carried by said lever, a pressure cylinder movable with said lever, a piston connected with said pawl, a relatively fixed pressure cylinder, a piston movable therein, means connected with said last piston for moving said lever and electro mechanical means for applying pressure to said cylinders.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ERNEST RENAUD.

Witnesses:
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J. B. DUPINS.