No. 881,706. PATENTED MAR. 10, 1908.

J. H. K. McCOLLUM.

AUTOMATIC STOP FOR RAILWAY VEHICLES.

APPLICATION FILED MAR. 30, 1907.

6 SHEETS—SHEET 1.

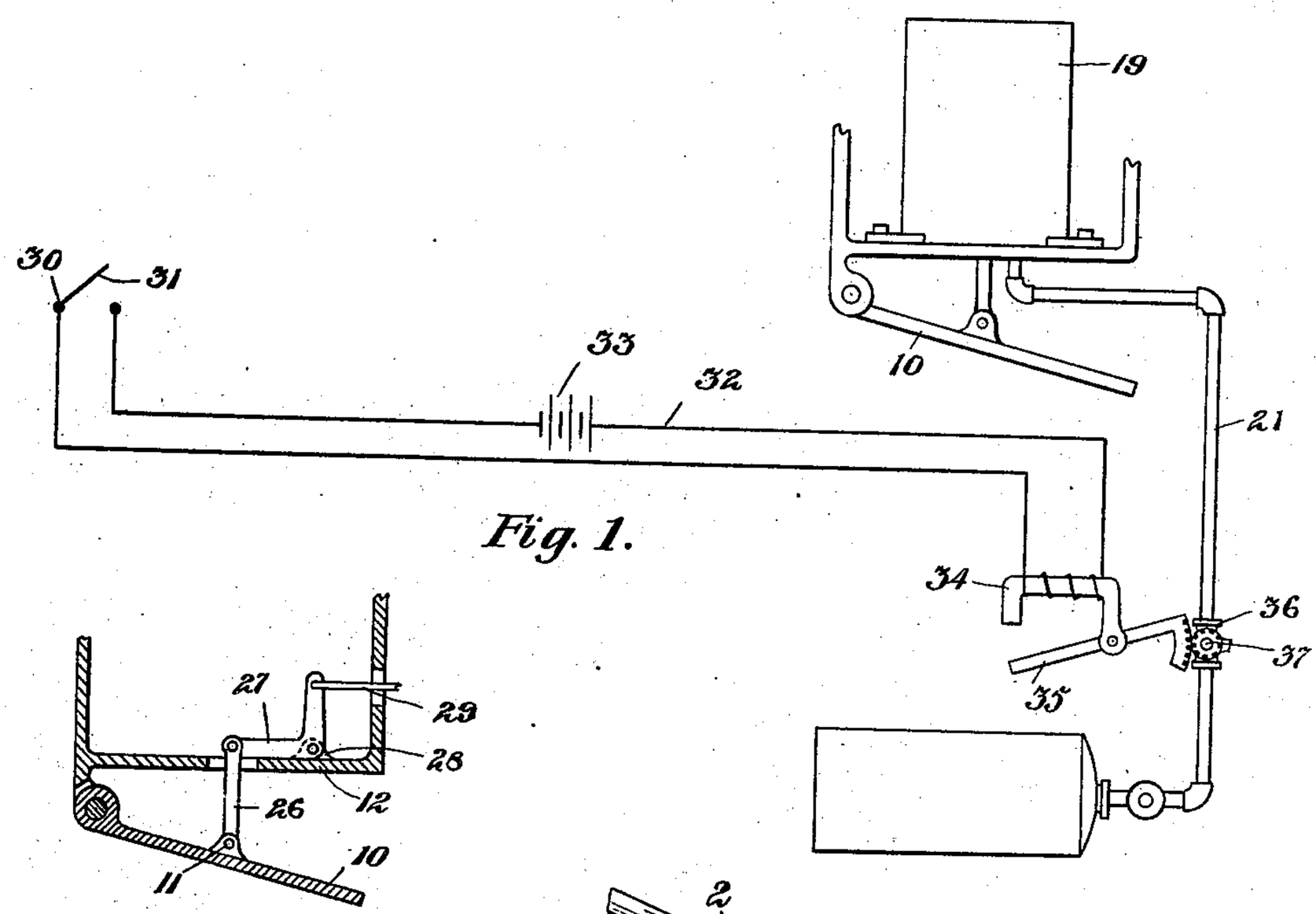

Fig. 1.

Fig. 6.

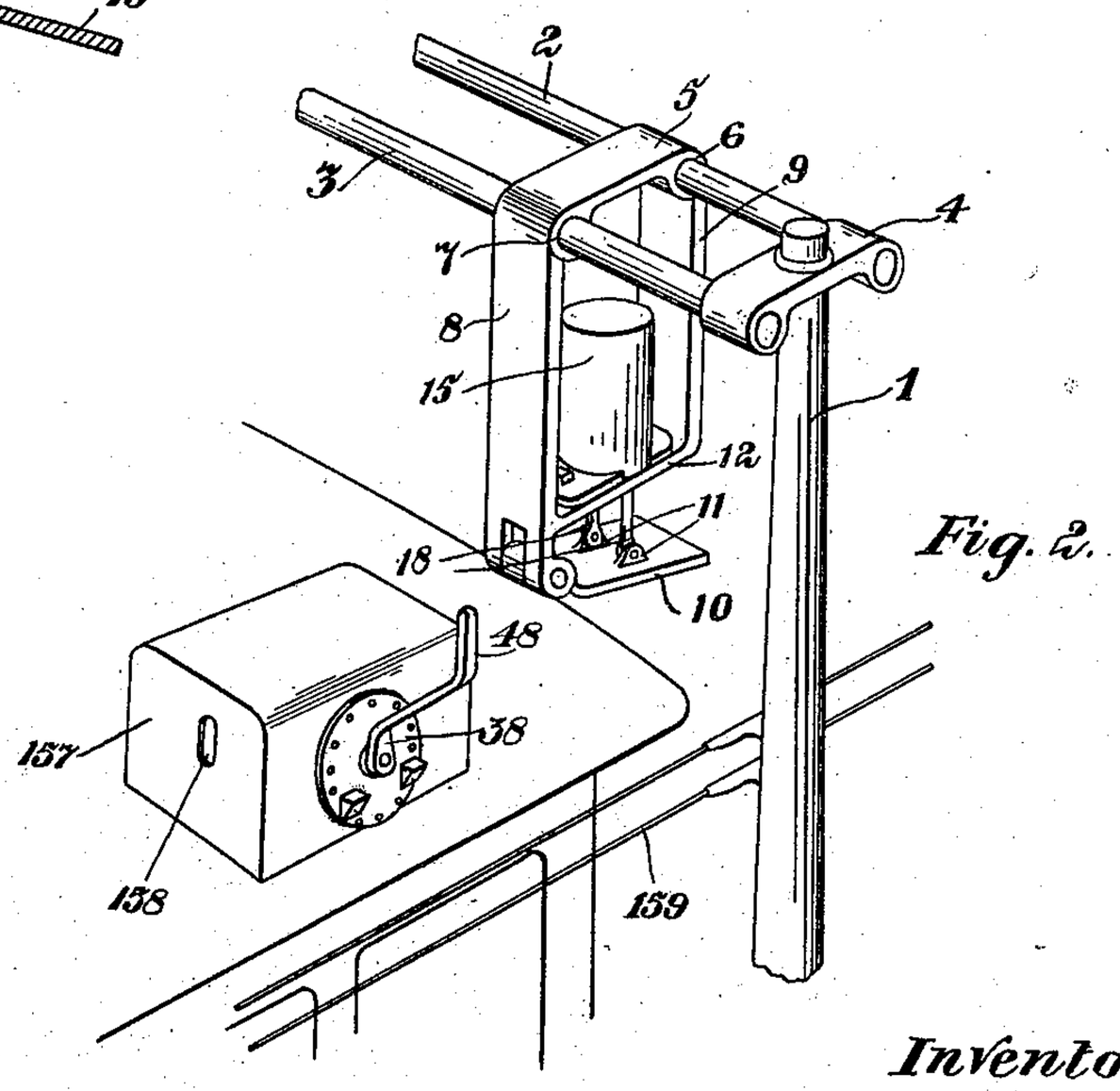

Fig. 2.

Witnesses.

A. Damiron

Wm. C. Muir

Inventor.

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by E. J. Featherstonhaugh

Attys.

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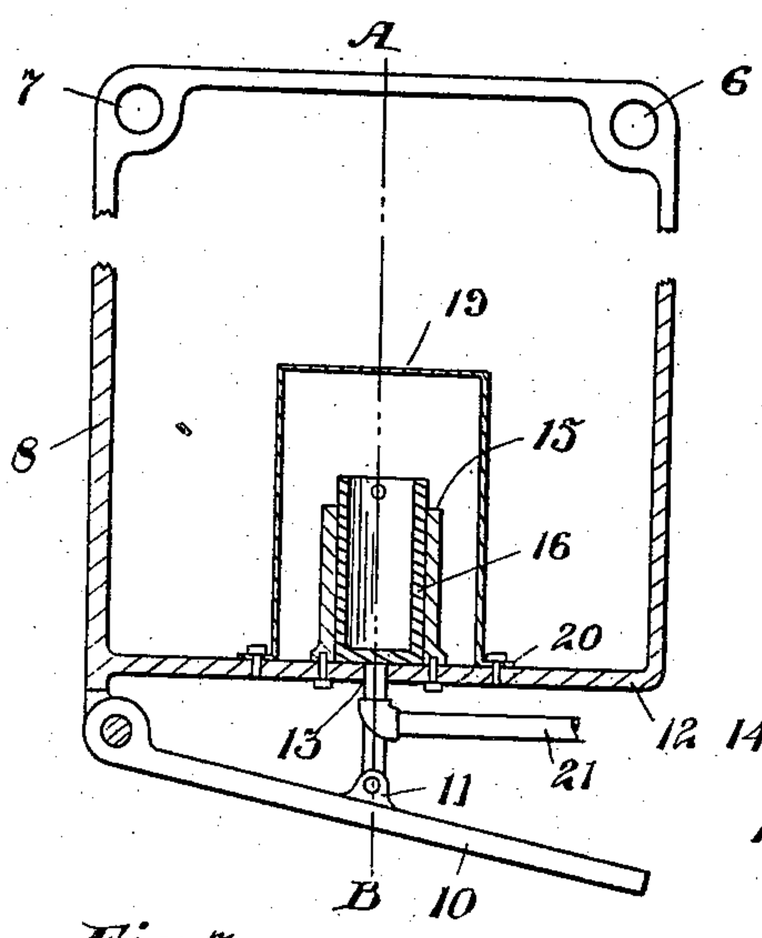

Fig. 3.

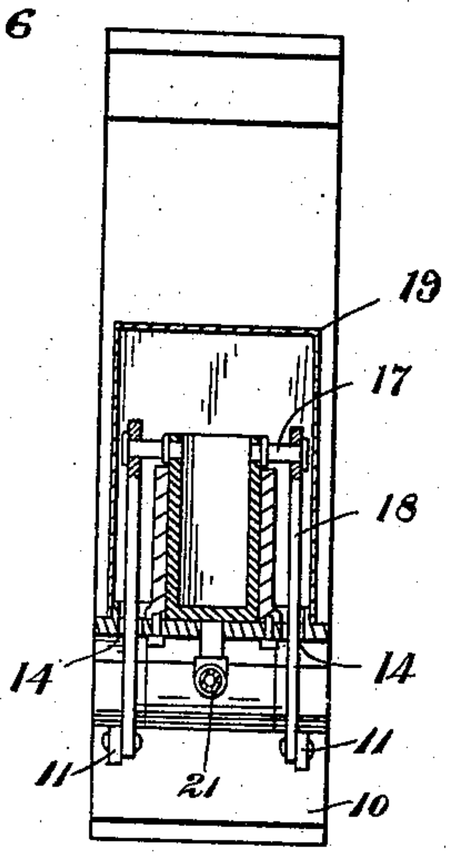

Fig. 4.

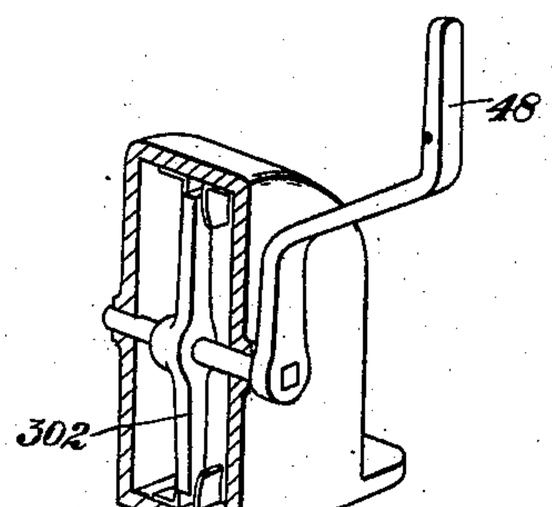

Fig. 22.

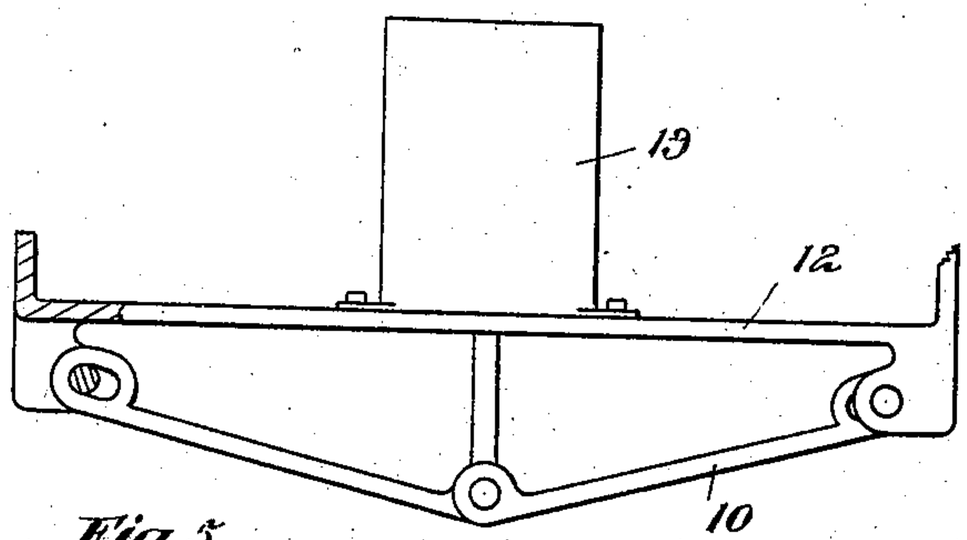

Fig. 5.

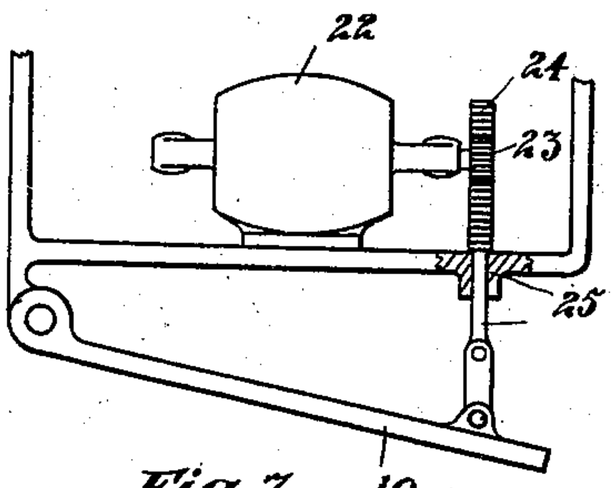

Fig. 7

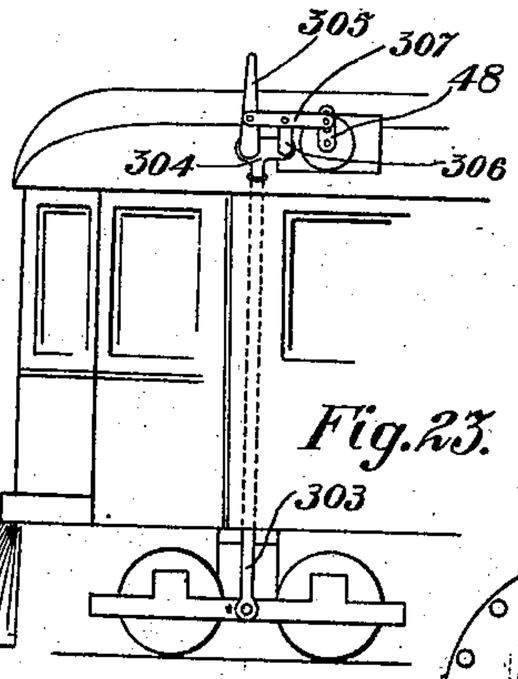

Fig. 23.

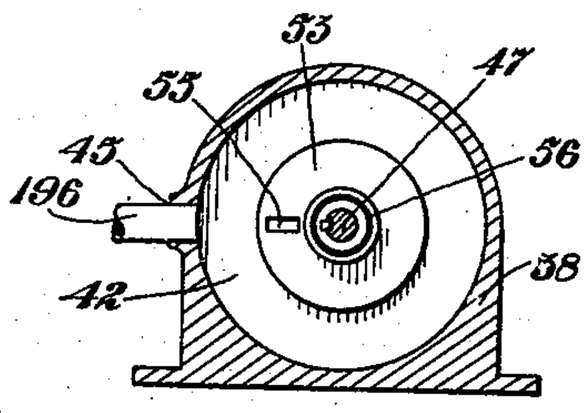

Fig. 12.

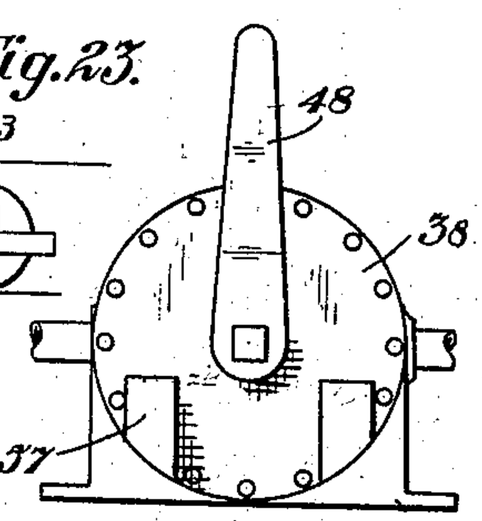

Fig. 10

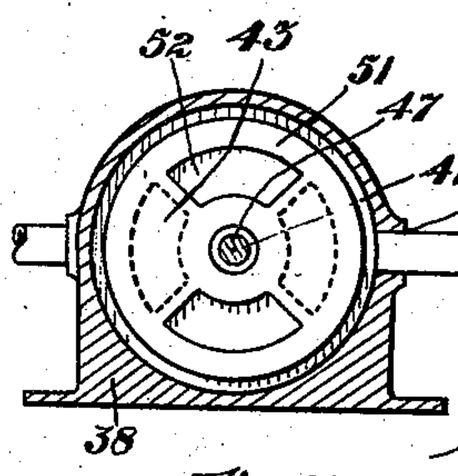

Fig. 11.

Witnesses.

A. Dennison

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6 SHEETS—SHEET 3.

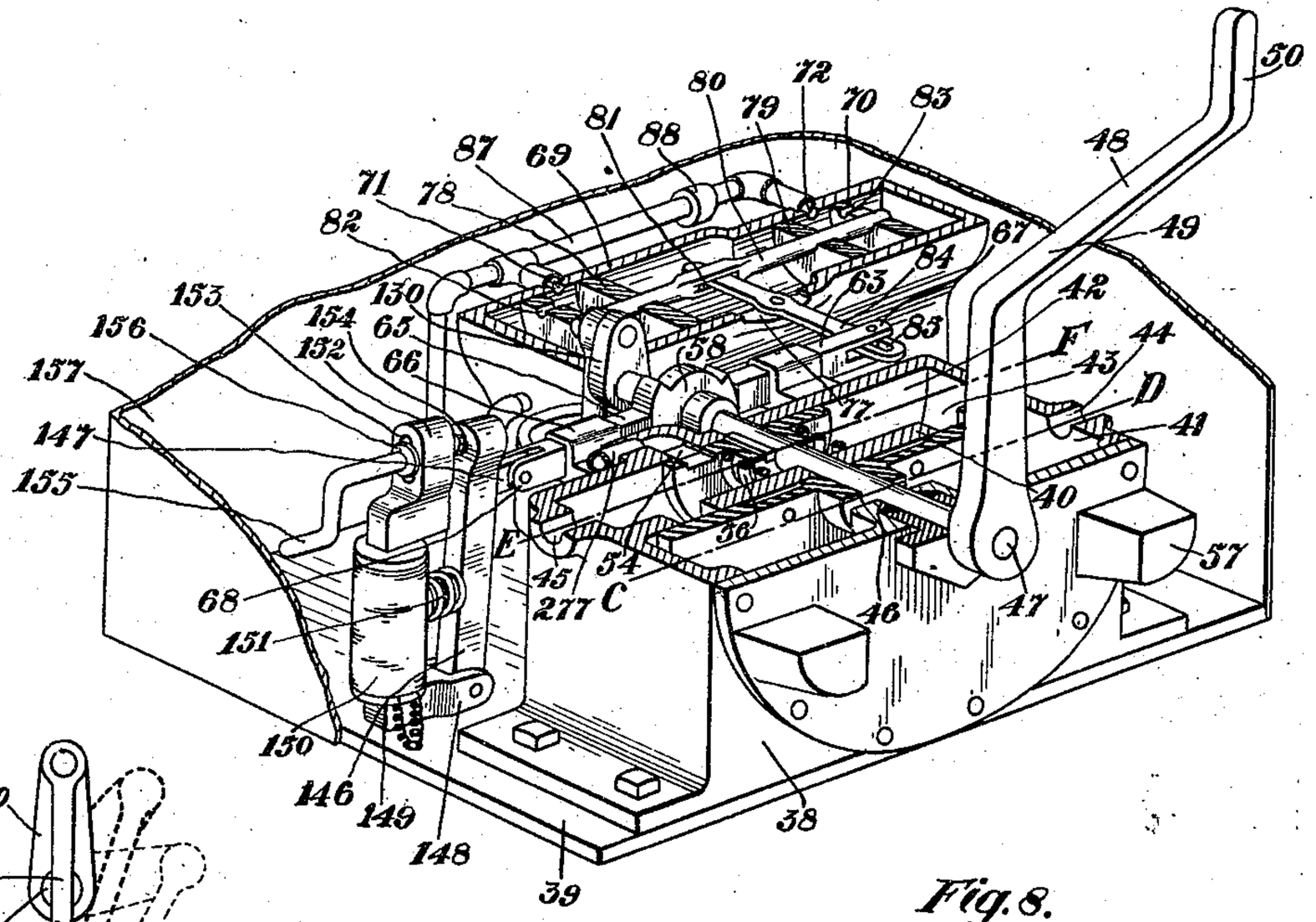

Fig. 8.

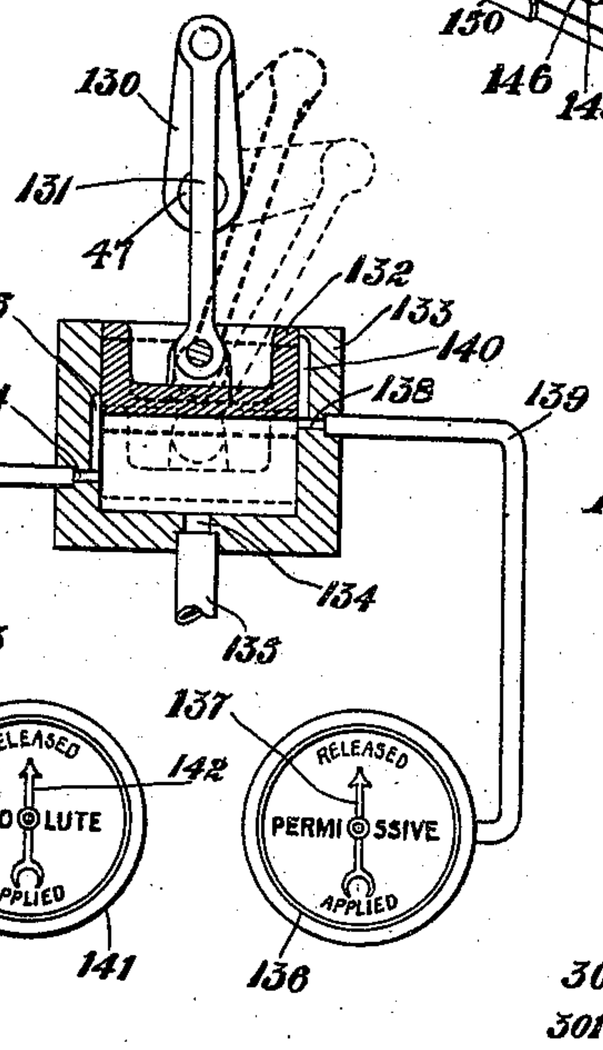

Fig. 18.

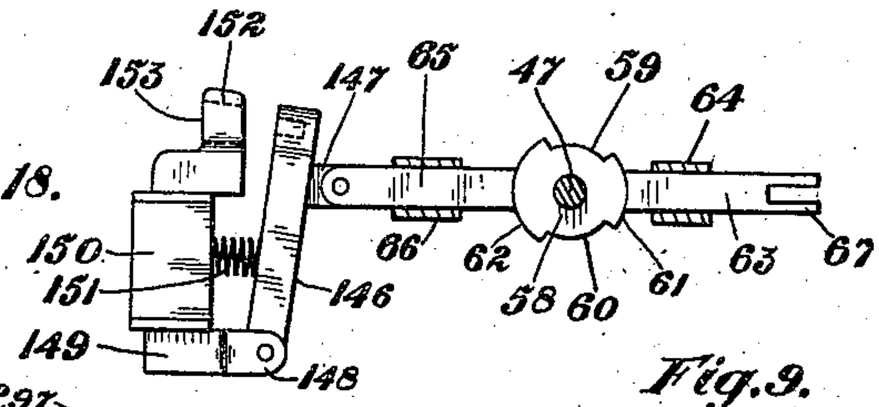

Fig. 9.

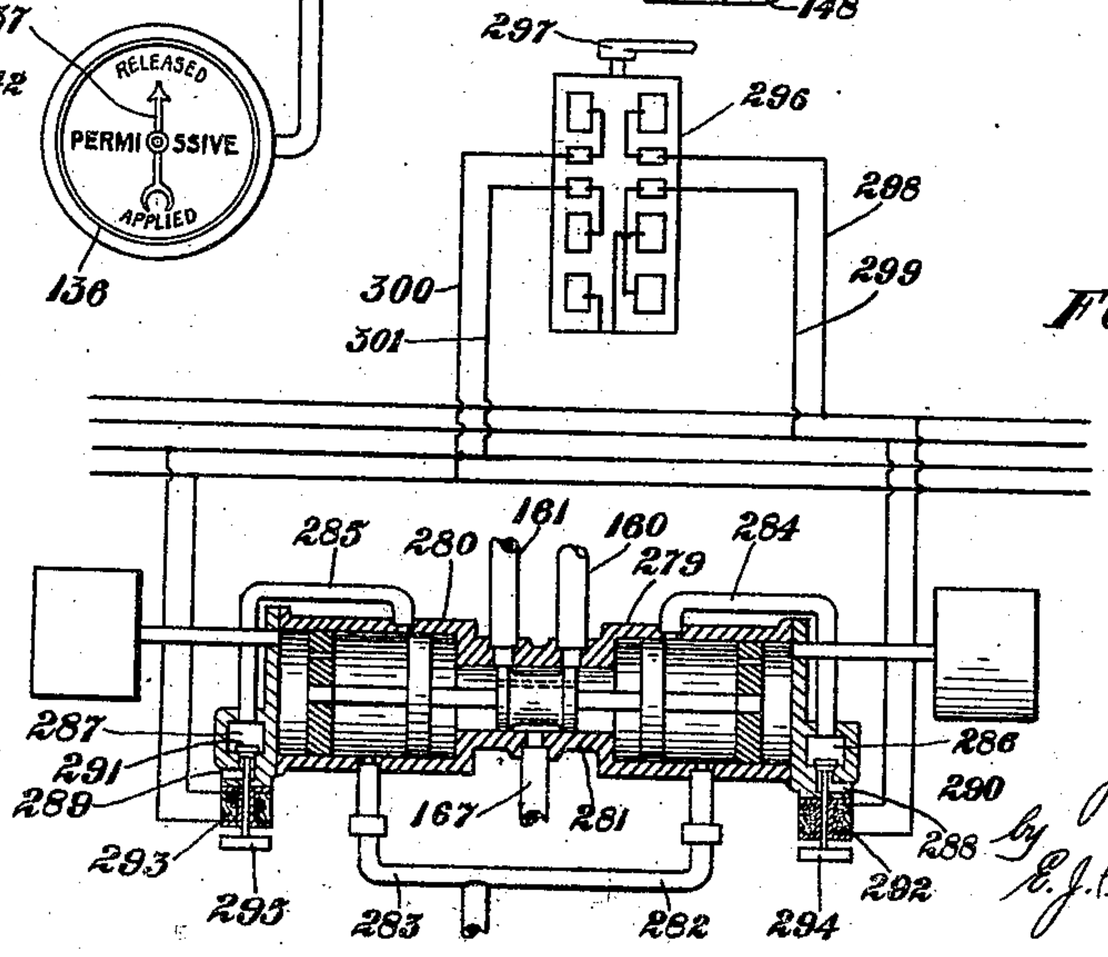

Fig. 19.

Witnesses

H. Dennison

W. C. Muir

Inventor.

J. H. K. McCollum

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No. 881,706. PATENTED MAR. 10, 1908.

J. H. K. McCOLLUM.

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6 SHEETS—SHEET 4.

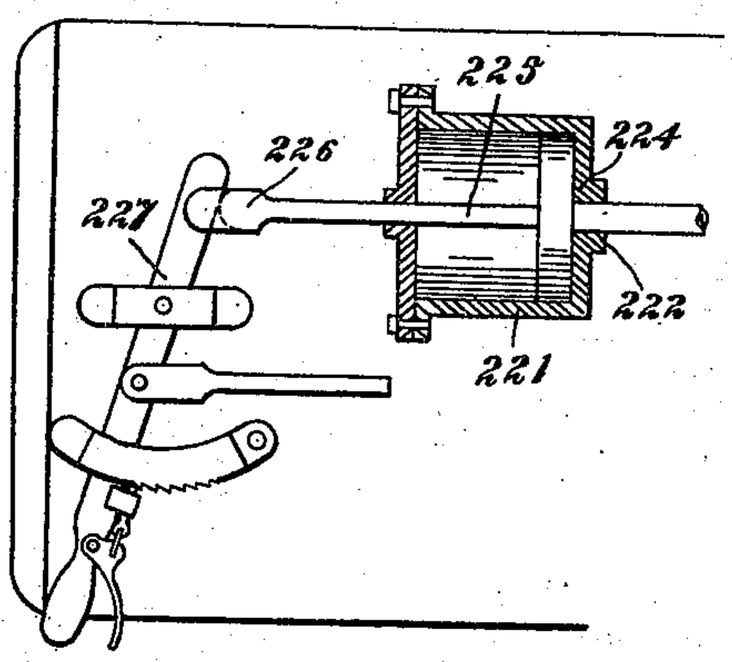

Fig. 16.

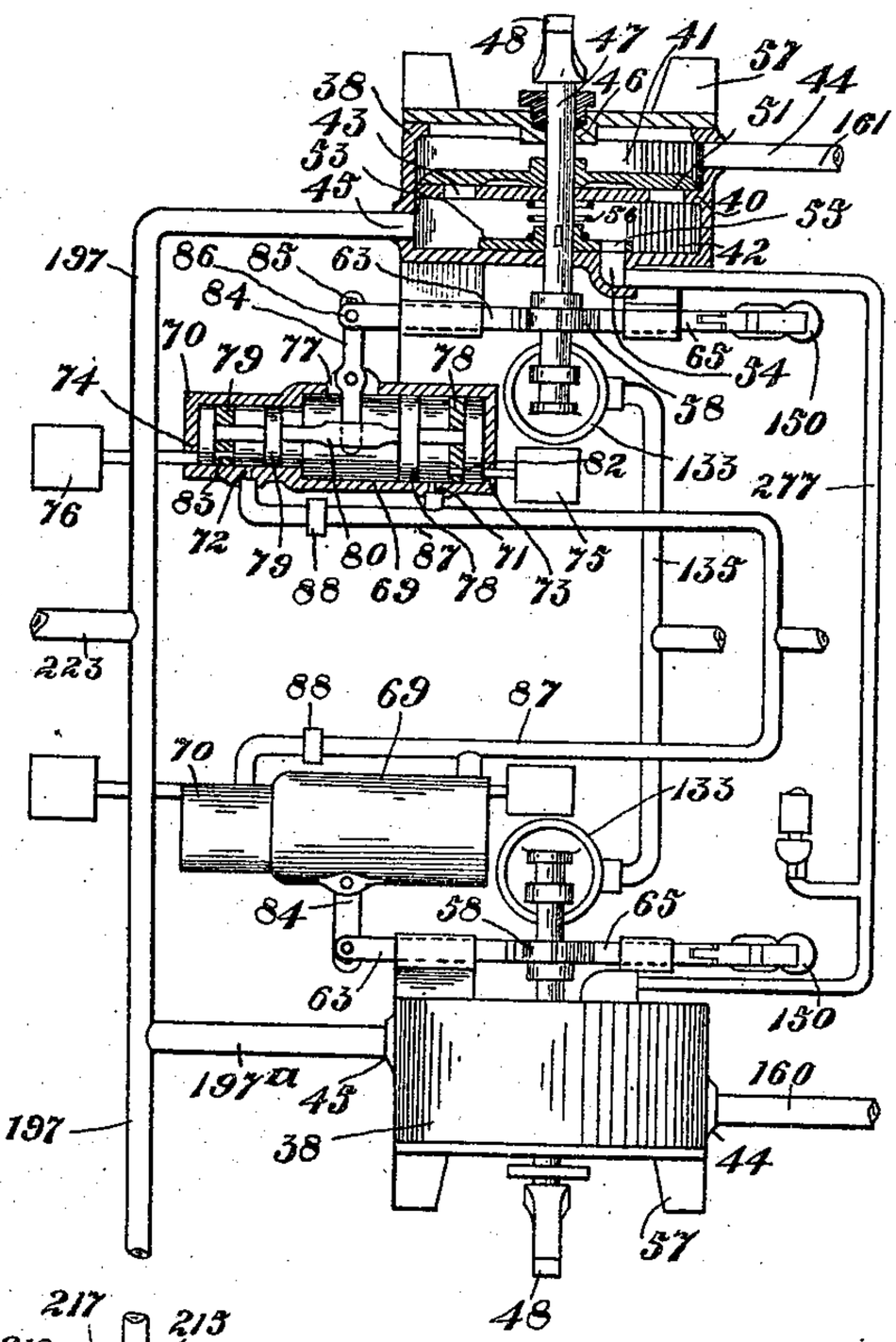

Fig. 15.

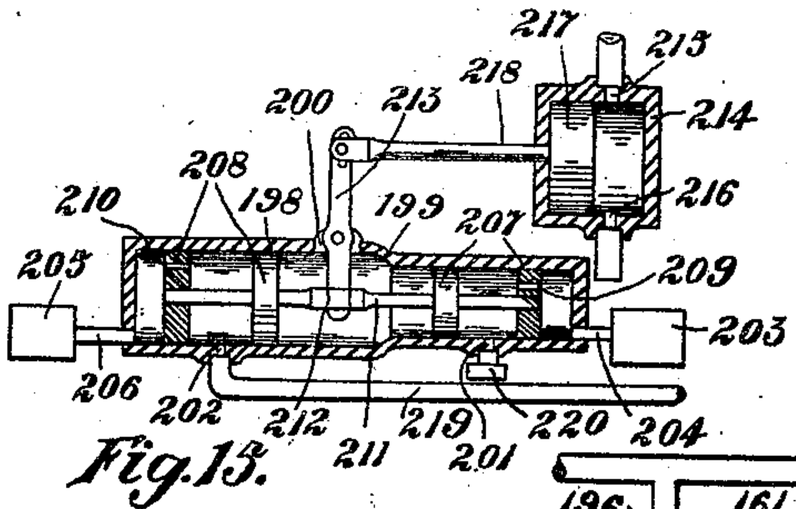

Fig. 13.

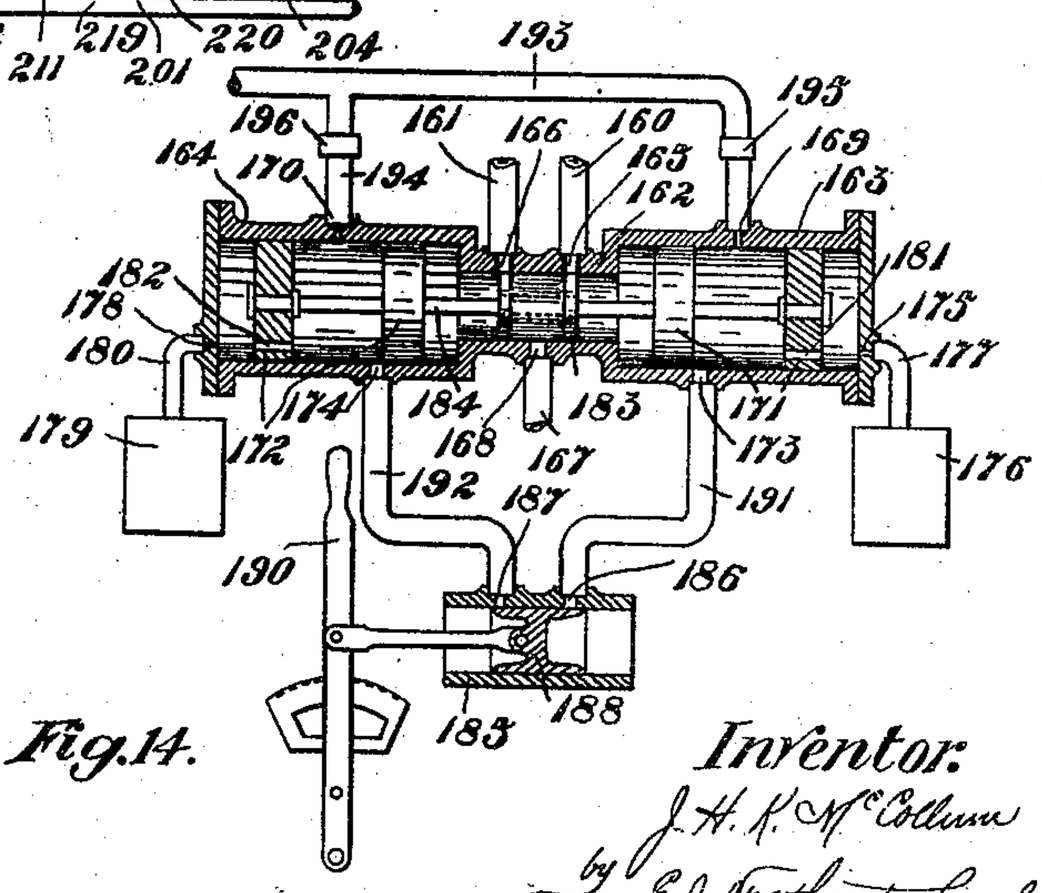

Fig. 14.

Witnesses.

H. Dennison.

Wm. C. Muir

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No. 881,706. PATENTED MAR. 10, 1908.

J. H. K. McCOLLUM.

AUTOMATIC STOP FOR RAILWAY VEHICLES.

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6 SHEETS—SHEET 5.

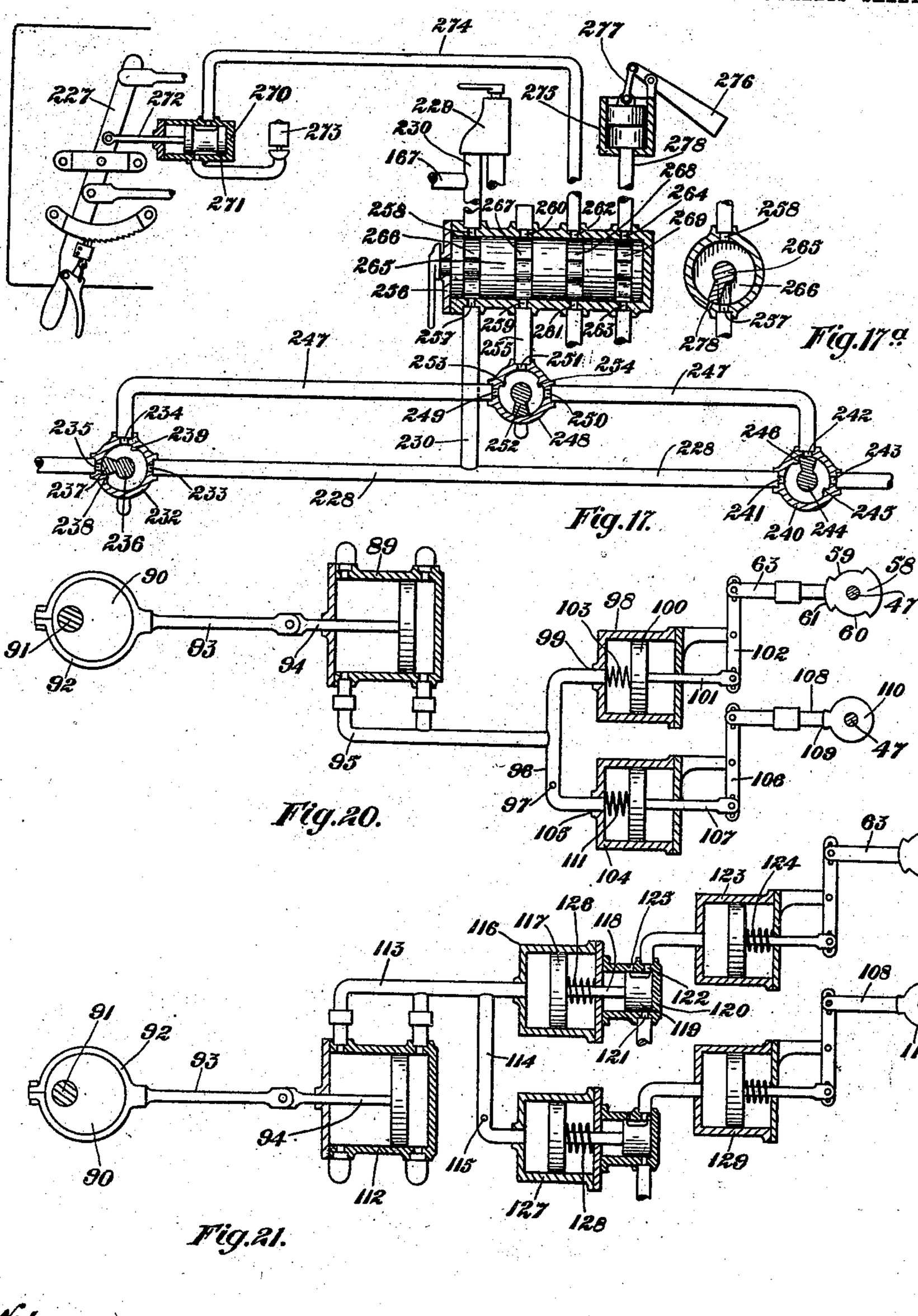

Fig.17a

Fig.17.

Fig.20.

Fig.21.

Witnesses.

H. Dennison

Wm. C. Muir

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6 SHEETS—SHEET 6.

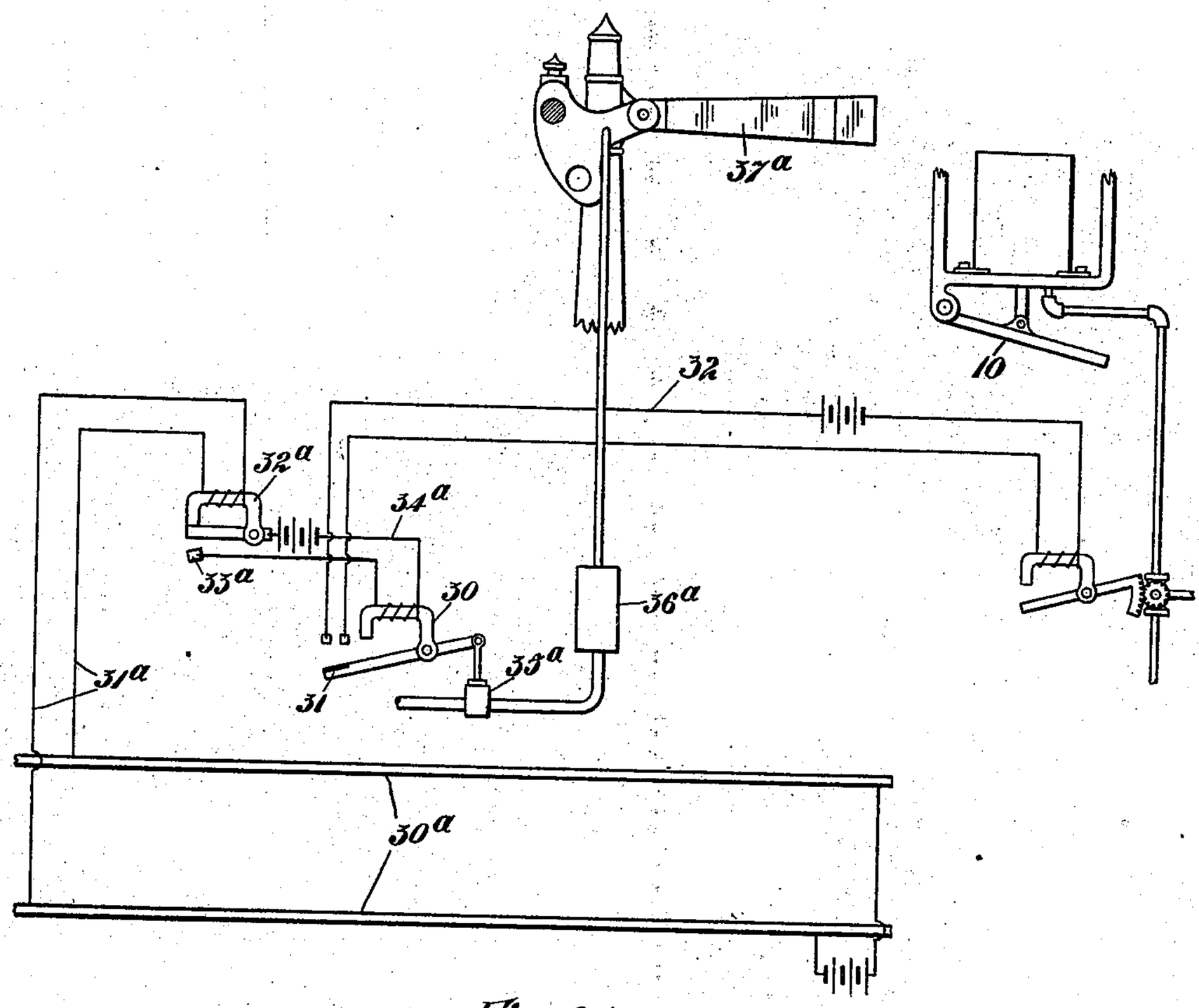

Fig. 24.

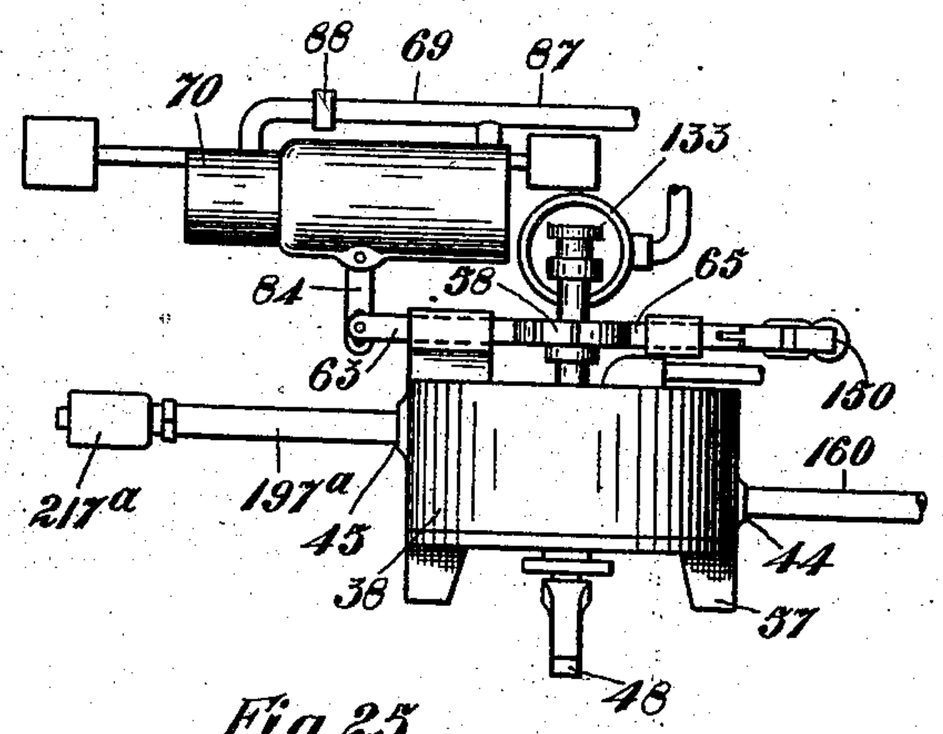

Fig. 25.

Witnesses

A. Dennison

Wm. C. Muir

Inventor:

J. H. K. McCollum

by E. J. Fetherstonhaugh

Atty.

UNITED STATES PATENT OFFICE.

JAMES HARRY KEIGHLY McCOLLUM, OF TORONTO, ONTARIO, CANADA.

AUTOMATIC STOP FOR RAILWAY-VEHICLES.

No. 881,706. Specification of Letters Patent. Patented March 10, 1908

Application filed March 30, 1907. Serial No. 365,544.

To all whom it may concern:

Be it known that I, JAMES HARRY KEIGHLY McCOLLUM, a subject of the King of Great Britain, resident of the city of Toronto, in the county of York, Province of Ontario, in the Dominion of Canada, have invented certain new and useful Improvements in Automatic Stops for Railway-Vehicles, of which the following is a specification.

The invention relates to improvements in automatic stops for railway vehicles as described in the present specification and shown in the accompanying drawings that form part of the same.

The invention consists essentially of the novel arrangement and construction of parts whereby a lever is operated by an obstructing member in the passage of the vehicle and the arresting mechanism applied during the disarrangement of said lever.

The objects of the invention are to eliminate the danger of accidents happening from the inattention of an engineer in charge of the vehicle, and to provide a simple and automatic means of stopping the vehicle in which the parts governing the operation of the arresting mechanism will be normally in a danger position.

In the drawings Figure 1 is a diagrammatic view showing an electric means of governing the controlling mechanism of the striker plate. Fig. 2 is a perspective detail of the striker plate and lever and valve mechanism showing a portion of the cab of a locomotive and the supporting pole and frame for the striker plate. Fig. 3 is an enlarged sectional detail showing a mechanical means of operating the striker plate. Fig. 4 is a cross section through the line A—B in Fig. 3. Fig. 5 is an enlarged detail showing a double striker plate. Fig. 6 is a detail of a striker plate showing a manual means of operation. Fig. 7 is a detail of a striker plate showing an electric means of operation. Fig. 8 is an enlarged perspective view showing the valve for controlling the brake mechanism and the mechanism controlling said valve on the vehicle in horizontal section. Fig. 9 is a side elevation of the rotary latch mechanism shown in Fig. 8. Fig. 10 is a reduced end elevation of the main valve illustrated in Fig. 8. Fig. 11 is a reduced cross sectional view of the main valve through the line C—D in Fig. 8. Fig. 12 is a reduced cross sectional view of the main valve through the line E—F in Fig. 8. Fig. 13 is a plan view showing the valve mechanism as illustrated in Fig. 8 and arranged for forward and back movement of the vehicle and the necessary pipe connections leading to the other operating parts. Fig. 14 is a longitudinal sectional view of the cylinder and pistons employed in directing the flow of the expansile fluid to one or the other of the valves illustrated in Fig. 13 and showing the pipe connection to the pipe connections in Fig. 13 broken away. Fig. 15 is a longitudinal sectional view of the cylinders and pistons employed in governing the exhaust through the main valve aforesaid and showing a pipe connection leading to the pipes illustrated in Fig. 13 broken away. Fig. 16 is a plan view of the throttle lever mechanism in the cab and the cylinder controlling the same, showing the pipe leading to the pipes illustrated in Fig. 13 broken away. Fig. 17 is a plan view of the pipe connections and turn cocks showing the means employed for cutting out the manual and automatic control of the arresting mechanism in any one vehicle. Fig. 17[a] is a cross sectional view through the main cock shown in Fig. 17. Fig. 18 is a view showing a section of the cylinder employed for automatically closing the valves, and the valve indicators and the pipe connections to said indicators. Fig. 19 is a longitudinal sectional view of the cylinders and pistons similar to those shown in Fig. 14 for governing the direction of the flow of the expansile fluid to one or other of the valves illustrated in Fig. 13 and showing diagrammatically the electrical connections from an electrical vehicle controller to said cylinders for controlling the operation of the pistons in said cylinders. Fig. 20 is a diagrammatic sectional view showing a modified form of mechanism for controlling the automatic brake controlling valve on the vehicle. Fig. 21 is a diagrammatic sectional view showing a further modified form of mechanism for controlling the automatic brake controlling valve on the vehicle. Fig. 22 is a sectional perspective view of the striking lever secured to the spindle of an electric switch in place of being secured to the spindle of an air valve as illustrated in Fig. 8. Fig. 23 is a side elevation of a portion of an electric car showing the method of supporting the striking lever. Fig. 24 is a diagrammatic view of the operating parts of an electro-gas operated semaphore and its

electrical connections and the electric connections for controlling the movement of the striker plate operatively connected with said semaphore. Fig. 25 is a plan view of the valve mechanism illustrated in Fig. 8 showing a pop valve connected to the outlet from the main valve and the pipes leading to the other operating parts broken away.

Like numerals of reference indicate corresponding parts in each figure.

It is known in various contrivances to interpose in a stretch of railway track a mechanical trip for the purpose of operating devices within the vehicle passing along said railway line, and further, it is known to shut off the motive power and apply the brakes automatically in passing such trip contrivances, but climatic conditions have, as a general rule, seriously interfered with the continuous successful operation of the exposed parts of the various devices, which have been tested from time to time, and also complications have crept into the construction of the parts within the vehicle to render the said parts amenable to the vagaries of the exposed parts and to enable the engineer in charge of the vehicle to manually control and set in order the automatic arresting mechanism, and it is with a view of overcoming the difficulties incident to climatic conditions and to devise ân apparatus which may be free from the interference of the engineer in charge and yet be of simple construction that the lever operating the valve or switch mechanism has been made to contact, *en route*, the plate normally in the position of danger and remain in the position to which it is turned by said plate, until rearranged after the application of the brakes and the shutting off of the motive power.

Referring to the drawings, 1 is a pole, from which extend the cross arms 2 and 3, the said cross arms being supported at the top of said pole by a suitable cross tree 4.

The pole 1 is arranged in an upright position by the side of a line of railway preferably within a reasonable distance of a semaphore signal, though it may be used for the semaphore signals in itself, however, it is presumed for convenience in this description, that this pole, and many others of a similar construction, stand beside the railroad track at a distance from the usual semaphore signals sufficient to permit the stoppage of the vehicle after the application of the brakes, before the said vehicle reaches the semaphore signal. In all likelihood, and particularly where there are two or more railway tracks, the cross arms 2 and 3 will extend over said tracks into a cross tree supported by a pole at the other side of the tracks and even in single track railways, such construction will probably be adopted for the sake of reliability in the operation of the apparatus and the lowering of the maintenance charges.

5 is a bridge spanning the cross arms 2 and 3, the said cross arms extending through the holes 6 and 7 in said bridge.

8 and 9 are legs depending downwardly from the bridge 5 and preferably forming part therewith and of unequal length, the longer leg 8 having hinged to its lower end the striker plate 10. The striker plate 10 is preferably a straight flat strip of metal having the lugs 11 projecting from its upper side intermediate of its length, said lugs having laterally arranged pivot holes therethrough.

12 is a base plate rigidly secured to or forming part with the lower end of the leg 9 and extending across to the leg 8 and fixedly secured thereto. 13 is a hole in said base plate 12, and 14 are slots therethrough directly over the lugs 11 in the horizontal position of the striker plate 10.

15 is a cylinder open at the upper end and mounted on the base plate 12 centrally over the hole 13. The base plate 12 forms the head of said cylinder 15 and the hole 13 the inlet for the expansile fluid into said cylinder.

16 is a piston operating in the cylinder 15 and at the upper end thereof having the lugs 17 extending laterally therefrom. 18 are rods pivotally secured to the lugs 17 at their upper ends and extending downwardly through the slots 14 in the base plate 12 to the striker plate 10, being pivotally secured to the lugs 11 from the upper side of said striker plate. The slots 14 are of proper dimensions to permit a certain swing of the rods 18 to accommodate the different positions of the striker plate 10. 19 is a hood over said cylinder and piston and completely inclosing the same and having the flange 20 fixedly bolted to the base plate 12.

21 is a pipe connected at one end to an expansile fluid supply and at the other end to the inlet 13, so that on turning on the expansile fluid from the supply through said pipe, the piston 16 will rise in the cylinder 15 and through the connection with the striker plate 10 by the rods 18 lift said striker plate to its upward position which is substantially horizontal or parallel with the base plate 12.

In Fig. 7 another manner of raising the striker plate 10 is shown, and in which 22 is a motor operating the gear wheel 23. 24 is a rack co-acting with the gear wheel 23 and directly connected to the striker plate 10, the said rack, or rod, forming part therewith, traveling upwardly and downwardly in a slot 25 in said base plate 12, and lifting said striker plate on the connection of said motor with the source of electric power. The striker plate is lowered by its own weight or additional weight carried thereby, if necessary on the stoppage of the operation of the motor, the armature spinning in the reverse direction.

In Fig. 6, the striker plate 10 is shown as lifted by a mechanism operated manually,

and in this form the striker plate 10 is connected by the rods 26 pivotally secured to the lugs 11 through the hole 13 in the base plate 12 to a bell crank lever 27. The bell crank lever 27 is pivotally secured at its angle in a lug 28 projecting upwardly from the base plate 12. A rod or chain 29 is pivotally connected to the extremity of the other section of the crank lever and extends over suitable pulleys to any well known form of lever situated in a station or switch house.

In any of the forms of operating the striker plate hereinbefore described, many modifications may be made to suit existing conditions and in fact, any convenient means may be adopted of raising and lowering it, but in order that the invention may be more fully comprehended three forms of construction have been set forth in detail in this specification. Further, it must be understood that the particular arrangement and form of the striker plate, hinged, as it is shown and described herein, to one of the legs of the frame formed by the said bridge and the said legs, is not necessary in order to make this invention operative, for the inclined plate may be attached in any suitable way to any suitable form of support above, beside or below the passing vehicle, the essential feature in this part of the invention being that there must be a relief of some kind to the lever on its striking said plate, but the form shown is what is considered the most suitable for the purpose, as the incline of the plate reduces any deleterious shock resulting from the impact of the striking lever.

30 is a relay instrument of any suitable form and shown in Fig. 1 as simply an electric switch which may be automatically or manually operated, though this instrument will in all probability be the electro-magnet forming the relay instrument in the usual semaphore mechanism having the operation of its parts governed by electrical connection with the rails bonded in blocks.

The application of the device to coöperate with an automatic semaphore the arm of which is normally at the danger position, is shown diagrammatically in Fig. 24. In this view a block 30^a of the rails is shown. The rails are bonded together at one end of the block and a suitable battery included in the bond. The opposite end of the block is also bonded by a wire 31^a which leads to an electro-magnet 32^a forming a closed track circuit, known as the primary circuit. 33^a is a switch terminal arranged below the armature of the magnet 32^a with which said armature makes contact on the cutting out of the battery in said closed circuit. 34^a is a circuit normally open, connected to the armature of the magnet 32^a and to the terminal 33^a. A suitable battery is included in the circuit 34^a as also is the relay instrument 30. The relay instrument 30 on the breaking of the primary circuit, is energized and operates the valve 35^a which controls the supply of gas to the cylinder 36^a which operates the semaphore arm 37^a and simultaneously closes the circuit 32 operating the electrical or mechanical means for lifting the striker plate.

The system of operating the semaphore is quite well known and is merely shown to illustrate the manner in which the striker plate may be operated simultaneously with the semaphore arm.

It may be here explained, that when the danger semaphore is up the circuit 32 will be open and when the danger arm is down and the road clear the circuit 32 will be closed, thus forming a closed circuit for operating the mechanism for lifting the striker plate 10. The striker plate in consequence of the closed circuit is lifted when the line is clear and when the line is not clear and the danger semaphore in view the circuit 32 is open and the striker plate 10 in its lower position.

33 is an electric battery in the circuit 32 though the said circuit may be energized from any suitable source of power.

34 is an electro-magnet included in the circuit 32 and having an armature 35.

36 is a three way valve in the expansile fluid pipe 21 controlling the supply of fluid to the cylinder 15, and having its stem 37 pivotally connected to the armature 35, the electrical pull on said armature 35 operating said valve and governing the supply of expansile fluid to said cylinder 15.

The supply of expansile fluid for operating the piston 16 in the cylinder 15 may be from the same source, as that used in the operation of the arms of the semaphore, and in all probability will be, though in many places a separate supply may be installed. In the event of the expansile supply coming from the semaphore installation, suitable pipes, of course, will be laid connecting the tank in said semaphore with the said cylinder 15, and in this connection it may also be mentioned, that the valve governing the supply of expansile fluid to said cylinder may be also operated through a pipe connection from the fluid, in place of by the electric circuit 32, and this would necessitate another valve at the expansile fluid tank operatively connected with the moving parts affecting the semaphore.

The relay instrument or switch 30 may also be, as previously mentioned, an ordinary knife switch installed in a station or switch house and manually operated to permit of the passage of a train, as also a separate tank of expansile fluid may be used in somewhat the same manner, that is to say, particularly for the manual control of the main valve 36 controlling the supply of fluid for the cylinder 15.

In Fig. 5 a double striker plate is shown, to accommodate a train coming from either direction and is particularly suitable for a single track line, the only difference being that the striker plates are raised from their meeting ends and one cylinder is sufficient for the purpose of lifting, otherwise the construction may be precisely the same as in the form shown and described.

In this specification the invention is particularly described with reference to the present known system of air brakes, in which the escape of the air from the train line has the effect of applying the brakes, though it must be understood that the valve operating the brakes may be arranged so as to close instead of open, if other means are used in applying the brakes than the escape of the air from the train line.

In order to more fully comprehend the nature of this invention I shall explain its operation, as confined to a steam railway train of a double track road, using the system of semaphores much in vogue, whereby the semaphores are automatically operated in the passage of the train over rails bonded in blocks, through a relay instrument customarily placed in a suitable casing in connection with the rod mechanism for lifting and lowering the arms.

38 is an air valve casing here shown mounted on a suitable base 39 secured to the top of the cab of a locomotive at one side thereof.

40 is a wall partitioning the interior of the casing 38 longitudinally into two compartments 41 and 42, the said wall having the ports 43 therethrough and the said casing having the inlet 44 into the compartment 41 and the outlet 45 from the compartment 42 and the bearings 46 in the heads thereof, the outer of said bearings being suitably bushed and packed and the inner held tight by the valves. 47 is a spindle journaled in the bearings 46, and 48 is a striker lever fixedly secured to the end of said spindle projecting beyond the outer head of said casing, the said striker lever having an outward offset 49 and terminating in the upright portion 50.

51 is a valve mounted on the spindle 47 and fixedly secured thereto and abutting the wall 40 in the chamber 41 and closing the ports 43, the said valve having the ports 52 registering with the ports 43 on the rotation of the spindle 47.

53 is a valve mounted on the spindle 47 and abutting the inner face of the outer wall of the chamber 42 and closing the exhaust port 54 through the outer wall of said chamber and having the port 55 registering with the port 54 in the normal position of the spindle 47 and consequently the upright position of the striker lever 48. The valve 53 is suitably keyed on the spindle 47 to insure its rotation therewith and is held to the inner face of the outer wall by the spiral spring 56 encircling said spindle between said valve and the partition wall 40.

57 are lugs projecting from the outer face of the outer head of the valve casing 38 at each side thereof and below the center so that the striker lever 48 cannot be reversed in its position, that is to say, it cannot be turned so as to project downwardly and thus leave the valves in their closed position. These lugs are an additional safety precaution though not essential in the construction.

58 is a rotary latch mounted on the spindle 47 to the outside of the inner head of the valve casing 38 and fixedly secured thereon and having the notches 59 and 60 cut in the rim portion thereof. The notches are separated at the one side of the latch by the short length of rim portion 61, and at the other side by the longer length of rim portion 62 extending for substantially half the circumference around said latch.

63 is a latch bolt sliding in the bracket 64 fixedly secured to and extending from the inner head of the casing 38, said latch normally abutting the short length of rim 51.

65 is a latch bolt sliding in the bracket 66 fixedly secured and extending from the inner head of the casing 38, said latch normally abutting the periphery of the longer length of rim 62. The latch bolt 63 has the forked outer end 67 and the latch bolt 65 has the forked end 68.

69 is a cylinder having the reduced end 70 and the inlets 71 and 72 leading through the side wall into the larger portion and reduced end of said cylinder respectively, and the orifices 73 and 74 leading through suitable connections into the reservoirs 75 and 76, and the opening 77 centrally arranged in the side wall thereof.

78 are pistons operating in the larger end of the cylinder 69, and 79 are pistons operating in the reduced end 70 of the cylinder 69. 80 is a piston rod fixedly secured to all of said pistons and having a longitudinally arranged central slot 81 therethrough.

82 is a small orifice through the outer one of the pistons 78, and 83 is a small orifice through the outer one of the pistons 79.

84 is a lever centrally pivoted to the side wall of the cylinder 69 in the opening 77 and having a longitudinal slot 85 at the outer end thereof, said lever at its inner end projecting through the slot 81 in the piston rod 80.

86 is a pin extending across the forked end 67 of the latch bolt 63 and secured thereto extending through the longitudinal slot 85 at the outer end of the lever 84, consequently any movement of said piston will affect the position of the said latch bolt 63 sliding in the bracket 66.

87 is a pipe connecting the inlets 71 and 72

to the train line of the air brake mechanism and having intermediately arranged between the said inlets 71 and 72 the check vlave 88.

It will be thus seen that through the continuous flow of air from the train line into the cylinder 69, a constant pressure is maintained on the pistons 78 and 79, that is to say, the air flowing through the inlets 71 and 72 into the space between the pistons 78 and into the space between the pistons 79, finds its way through the orifices 82 and 83 into the ends of the cylinder and into the reservoirs 75 and 76 respectively, the said reservoirs being used merely for the storing of the air in place of lengthening out the cylinder at each end.

It has already been explained that the pistons 78 are of larger diameter than the pistons 79 consequently the pressure of air on the outer of the pistons 78 will overbalance the pressure of the air on the outer of the pistons 79 and exert a continuous thrust towards the reduced end 70 of the cylinder 69, therefore the lever 84 pivoted in the opening 77 will be held in constant forward engagement with the end of the latch bolt 63 and retain the said latch bolt in engagement with the rotary latch 58 while the full pressure of the train line remains intact.

The striker plate 10 is normally, as explained, in its lower position, and this position is coincident with the danger position of the semaphore, as the circuit 32 connecting the lifting mechanism of said striker plate, is constantly open as long as the semaphore danger arm is up, or the danger lights showing. On the approach of a train toward a semaphore with the line clear ahead, the danger arm is automatically lowered by the action of the relay instrument of the semaphore mechanism, which also closes the circuit 32 thus opening the valve 36. This permits the ingress of gas or other expansile fluid from, say the semaphore tank, to the cylinder 15 and causes the piston 16 to rise, and through the connection of the said piston with the striker plate 10 lifts the latter to its upright position, which is clear of the striker lever 48 on the vehicle in the passage of the said lever thereunder. In the event of the semaphore remaining in the danger position, the circuit 32 will remain open and therefore the striker plate 10 will not be lifted to its upper position, and if the engineer of the train through inattention, should not regard the danger signal, before the said train reaches the striker plate 10, which may be placed at a suitable distance from the semaphore, the striker lever 48 will come into contact with the inclined striker plate and thus be turned from its upright position. The turning of the lever 48 from its upright position turns the rotary valves 51 and 53 and opens the ports in the wall 40 and closes the port 54, allowing the escape of air from the train line, which immediately begins the application of the air brakes. It will now be understood that when the striker lever 48 is turned and consequently the spindle 47 the rotary latch 58 will rotate and permit the latch bolt 63 to slide off the shorter length of rim 61 and slide into a notch as has already been explained. The larger pistons 78, keeping a constant forward thrust on the latch bolt, will cause the latch 63 to engage the bed of either of the notches 59 or 60 according to the direction in which the said striker lever is turned. The turning of the spindle opens the ports 43 by the rotation of the valve 51 with the said spindle and the latch 63 temporarily locks the valve in its open position. The opening of the ports 43 reduces the pressure in the train line for the purpose of applying the air brakes and coincidently reduces the pressure in the space between the pistons 78, which allows the slow egress of air from the space behind the outer of the pistons 78, through the orifice 82 into the space between said pistons 78, as the air behind said pistons is at a higher pressure than the air in the space between the said pistons 78 on the reduction of the pressure in the train line, but the air behind the outer of the pistons 79 will not be reduced in pressure on account of the intervening check valve 88 between the inlets 71 and 72. The higher pressure of air behind the pistons 79 causes the said pistons and piston rod 80 to move in the direction of the larger end of the cylinder, as soon as the pressure in the reservoir 75 has leaked through the orifice 82 and reduced sufficiently to give the balance of power to the reduced end. The reduction of pressure in the larger end of the cylinder is necessarily slow on account of the small size of the orifice 82 retarding the egress of the air from the end of the cylinder, therefore the movement of the pistons is also slow. As the pistons 79 are shoved up to the end of the cylinder 69 the latch bolt 63 is withdrawn from the notch 59 or 60 permitting the return of the rotary latch 58 to its normal position in order that the latch bolt may again engage the shorter length of rim portion 61.

Another and perhaps a more preferable, certainly a more positive form of holding the valve 51 to its open position, is shown in Fig. 20. In the said Fig. 20, 89 is a vacuum pump of any suitable type, the parts of which are not specifically set forth in this specification with the exception of the piston rod extending through the head in the casing of the said pump. The pump 89 is preferably installed under the body of the vehicle in any suitable place though in all likelihood it would be in proximity to a rotating axle. 90 is an eccentric mounted on a rotating axle 91 of the vehicle and having its encircling strap 92 pivotally connected by the

eccentric rod 93 to the projecting end of the piston rod 94 of said pump, thereby insuring the operation of the said pump during the rotation of the said axle and the ceasing of the operation thereof on the stoppage of the vehicle. 95 is a pipe connected to the inlets of said pump to the front and to the rear of the piston, and 96 is a pipe leading from the pipe 95 and having a small intake hole 97 near the end thereof. 98 is a cylinder having an exhaust opening 99 through one end thereof connected to the pipe 96 and having constant communication with the pipe 95. 100 is a piston operating in the cylinder 98, and 101 is a piston rod extending from the piston 100 upwardly to the head of the said cylinder. 102 is a lever centrally pivoted in any suitable form of bracket or supported in proximity to the end of said cylinder 98 and pivotally connected to the outer end of the piston rod 101 at one end and at its other end to the latch bolt 63. 103 is a spiral spring inserted in the cylinder 98 between the end of the piston and the inlet 99 and exerting a continuous spring pressure against the said piston to withdraw the latch bolt 63 from engagement with the rotary latch 58. 104 is a cylinder constructed precisely the same as the cylinder 98 having the inlet 105 connected to the pipe 96 and having constant communication with the pipe 95 and the vacuum pump 89. 106 is a lever similar to the lever 102, pivotally connected to the piston rod 107 operating in the cylinder 104 and to the latch bolt 108. The latch bolt 108 is of similar construction to the latch bolt 63 and engages the periphery of the extending short length of rim 109 of a rotary latch 110 secured to the spindle 47. 111 is a spiral spring inserted in the cylinder 104 between the end of the piston and the inlet 105 and exerting a constant spring pressure against the said piston and the piston rod and holding the latch bolt 108 to its outermost position, so that the rotary latch 110 will be free to rotate.

In this form of construction, while the vehicle is in motion the rotation of the axle, on which the eccentric 90 is mounted, will insure the continuous action of the piston of the vacuum pump 89, and as the inlets to said vacuum pump are connected through the pipes 95 and 96 to the cylinders 98 and 104, there will be a vacuum created throughout the lengths of said pipe and in the said cylinders between the exhaust openings of the said cylinders and the pistons. The vacuum created in the cylinders 98 and 104 is sufficient to overcome the spring pressure against the said pistons and thereby exert a constant pressure on the latch bolts 63 and 108, so that upon the rotation of the spindle 47 the latch bolts will be forced into the notches on the rotary latches and the valve 51 will be held in its open position. The length of rim portion 109 on the latch 110 is considerably shorter than the length of rim portion 61 of the latch 58 so that if the striker lever 48 is moved, but a short distance, the latch 108 will be pushed past the shoulder formed by the said extending rim portion and prevent the valve 51 from being returned to its normal or closed position, and if the striker lever 48 is turned further, so that the short length of rim portion 61 of the latch 58 is turned beyond the end of the latch bolt 63, the said latch bolt will drop into either one of the notches 59 or 60, as has been previously described. If the striker lever 48 has been turned, so that the latch bolt 108 has dropped behind the shoulder formed by the length of rim portion 109 of the latch 110, but not enough to allow the latch bolt 63 to drop into either of the notches 59 or 60, an application of the brakes will be made by the opening of the valve 51 and as the speed of the vehicle decreases the action of the vacuum pump 89 will necessarily be slower, therefore the vacuum created will be less than when the vehicle is traveling at a high rate of speed and continue to drop as the speed of the train decreases. The spring 111 in the cylinder 104 is of a predetermined strength, so that when the vacuum in the cylinder 104 drops below a certain point, the spring will overcome the difference between the vacuum and the atmospheric pressure to the other side of the piston and cause the said piston to move forwardly in the said cylinder, thereby tilting the lever 106 and withdrawing the latch bolt 108. The latch 110 will then be free to move back to its normal position and consequently the valve 51 may be closed. The spring 103 in the cylinder 98 is considerably weaker than the spring 111 and will not release the latch 63, until the vacuum pump has ceased to move and the pressure on both sides of the piston 100 equalized. But when the vehicle has come to a stop and the atmospheric pressure has leaked through the orifice 97 in the pipe 96 to equalize the pressure on both sides of the piston 100, the spring 103 will force the said piston forward withdrawing the latch bolt 63 and allowing the latch 58 to be returned to normal. It will therefore be seen that with a governor in the form of a vacuum pump operating as described, a train traveling at an excessive rate of speed at a certain point on a railway, say on approaching a dangerous curve, may have its arresting mechanism operated, so that the speed must be reduced to a certain predetermined rate before the engineer may release the arresting mechanism and increase his speed. This may be done by the introduction of a striker plate along the line of railway, the said striker plate being set in such a position, that it will turn the striker lever 48 a sufficient distance to allow the latch

bolt 108 to operate, but will not turn the striker lever far enough to allow the latch bolt 63 to operate.

The arrangement of a spring of a certain predetermined strength in the cylinder 98, to accomplish the result hereinbefore explained, makes it imperative for the train to come to a stop before the arresting mechanism can be released and the train again started.

Another modified form of holding the valve 51 to its open position is shown in Fig. 21. In the said Fig. 21 112 is an air pump of any suitable type operated from a rotating axle in a similar manner to the vacuum pump 89. 113 is a pipe connected to the outlets of said pump to the front and rear of the piston, and 114 is a pipe having communication with said pipe 113 and extending therefrom and having an exhaust opening 115 therein. 116 is a cylinder having an inlet through one end thereof connected to the pipe 114 and having constant communication with the pipe 113. 117 is a piston operating in the cylinder 116. 118 is a piston rod projecting outwardly from the said cylinder and carrying at its outer end a valve 119 sliding in the reduced outer end 120 of the cylinder 116, the said reduced end having the ports 121 and 122 closed by said valve in its outer position. The port 121 is connected to the main reservoir and the port 122 is connected to the cylinder 123. The construction of the cylinder 123 and the operating parts thereof is exactly similar to the cylinder 98, but in place of the spring 103 a spring 124 surrounding the piston rod, between the head of the cylinder and the piston, exerts a constant forward pressure on the latch bolt 63. 125 is an exhaust port in the reduced end 120 of the piston 116 and communicating with the interior of the cylinder 123 when the valve 119 is closing the port 121. 126 is a spring surrounding the piston rod 118 in the cylinder 116 and exerting a constant spring pressure between the outer end of said cylinder and the said piston and adapted to move the valve 119 and open the ports 121 and 122. The spring 126 is very light in construction and the pressure within the piston has to be reduced to practically atmospheric pressure before the said spring will cause the valve 119 to open. 127 is a cylinder having the inlet end connected with the pipe 114 and having constant communication with the pipe 113. The cylinder 127 and its operating parts is precisely similar to the cylinder 116 with the exception that the spring 128 surrounding the piston rod is much stronger than the spring 126. 129 is a cylinder precisely similar to the cylinder 123 and arranged to operate the latch bolt 108. In this form of governor an air pump continues pumping air through the pipes 113 and 114 and any excess of pressure is allowed to exhaust through the hole 115. The air flowing into the cylinders 116 and 127 exerts a constant forward pressure on the valve mechanism thereof, retaining said valves in a closed position, and on the slowing down of the train and consequently the action of the air pump 112 to a certain predetermined speed, the spring 128 will overbalance the pressure of air against the piston in the cylinder 127 and the valve will therefore be opened allowing the pressure of air from the main reservoir to enter the cylinder 129 and consequently release the latch 108. When the train has come to a stop and all pressure leaked out of the cylinder 116, the spring 126 will overbalance the pressure between the piston and the inlet end of the cylinder and cause the valve 119 to open and allow the ingress of air from the main reservoir to the cylinder 123 thereby withdrawing the latch 63. It will thus be seen that the working portions of the cylinders 116 and 123 may be accurately adjusted, so that the pressure of the spring 126 will hold the latch 63 into engagement with the rotary latch 58, until the vehicle has come to a stop and immediately thereafter, the latch is automatically released allowing the return of the valve 51 to its normal position. The cylinders 127 and 129 and their working parts may be accurately adjusted so that an engine traveling at a high rate of speed, on approaching a dangerous curve or tressle or other dangerous place on the line of railway, may be absolutely prevented from continuing at the said high speed by having a suitable striker plate arranged as previously described. The arrangement of the said striker plate will be such that the spindle 47 will be turned only so far as to allow the latch bolt 108 to engage the notch in the rotary latch 110, therefore, it will be seen that when the speed of the train has been reduced to the required rate, the latch bolt 108 will automatically release and allow the valve 51 to be returned to its normal position before the train is brought to a stop.

The means of holding the valve 51 to its open position and the automatic means of releasing the holding mechanism has been fully described, and it is now necessary to point out the manner in which the said valve is returned to its normal or closed position and the progress of the vehicle resumed.

Subsequent to the release of the latch bolts, the valve spindle may be turned to normal, by the engineer turning the lever 48 to its vertical position, or suitable mechanical connections may be made extending down into the cab to be operated by the engineer or the valve may be closed automatically on the release of the latches, and the preferable form of automatic return mechanism is herein described.

At the extreme inner end of the spindle

47 the crank 130 is fixedly secured and pivotally connected by the rod 131 to the plunger 132 operating in an upright cylinder 133.

134 is an air inlet centrally arranged through the bottom of the cylinder 131 and connected to the train line by the pipe 135, thus there is a constant upward pressure on the plunger 132, retaining the crank 131 normally in a vertical position and consequently the striker lever 48, and the rotary latches 58 and 110 in their normal position.

136 is an indicator in the form of a pressure gage having the indicating hand 137 and the words "Released" and "Applied" diametrically arranged, and the word "Permissive" thereacross, and adapted, on the continuous pressure of air thereinto from the cylinder 133 through the orifice 138 and the pipe 139, to retain the point of said hand at the word "Released" and on the exhaust of the air from the said indicator, through the pipe 139 and the orifice 138 and the vertical port 140 made in the inner wall of the cylinder, to allow the said hand to turn and point to the word "Applied." The port 140 is arranged in the inner wall of the cylinder 123 towards the upper end thereof, while the orifice 138 is arranged about midway of the height of said cylinder, registering with the lower end of the said port, consequently, as the plunger 132 is lowered, through the turning of the striker lever 48, the top of said plunger drops below the upper end of the port 140 and the lower end below the mouth of the orifice 138 opening into the cylinder therebeneath, therefore, the passing of the plunger over the mouth of the orifice 138 cuts off the flow of air from the cylinder 133 into the gage 136 and permits the exhaust from the gage through the port 140 and out over the upper end of the plunger 132. Similarly the indicator 141 is arranged in connection with the cylinder 133 and on this indicator, which is also in the form of a pressure gage, the words "Released" and "Applied" are also written and diametrically arranged, and the word "Absolute" thereacross. The hand 142 is arranged to point to the words "Released" and "Applied" respectively on the inflow to and the outflow from the said indicator. The indicator 141 is connected to the cylinder 133 by the pipe 143, which leads to the orifice 144 in proximity to the lower end of the cylinder 133, the orifice 144 registering with the lower end of the port 145 vertically arranged in the inner wall of the cylinder 133.

The "Absolute" indicator and the arrangement of its connection with the cylinder 133 is intended to indicate the lowermost position of the striker lever 48 after being turned, therefore the plunger 132 is moved, by the greatest turn of the striker lever 48, to a lower position in the cylinder 133 and this opens the port 145 and closes the mouth of the orifice 144 into the cylinder 133 and allows the air to exhaust from the indicator through the port 145 in precisely the same manner as described in connection with the operation of the indicator 136 and sends the hand 142 around, so as to point to the word "Applied."

In the turning of the striker lever 48 to make an application of the brakes there are three positions, the first and second only having been described. The operation of the plunger 132 in the cylinder 133 will return the lever 48 to its normal position from either of the three positions but gages have been shown only for the second and third position.

In the application of the brakes at the second position of the striker lever 48, the latch bolt 63 is simply moved off the shorter lengths of rim 61 on to the bed of one or other of the notches 59 or 60 and coincidently the plunger 132 is forced downwardly in the cylinder 133, against the constant air pressure therebeneath. The brakes then being applied the escape of air from the indicator 136 sends the hand of said indicator to point to the word "Applied."

Immediately following the application of the brakes by the reduction of pressure in the train line, the constant pressure of air, beneath the plunger 132 will have the effect of forcing the said plunger upwardly. The plunger cannot move upwardly, of course, until the said latch bolt 63 has been withdrawn, through the actions of the withdrawing mechanism hereinbefore described, and as has been before explained herein, the action of said withdrawing mechanism is gradual, a sufficient period of time being allowed to elapse to make a thorough application of the brakes, either to bring the train to a stop or slacken the speed as described, but when the said latch bolt is withdrawn from the notch, the plunger 132 is free to move upward, as the said latch bolt is the means of holding the lever in its turned position. The return of the plunger to its upward position is the step necessary to restore all parts to normal, as the rotation of the spindle closes the valve 51 and allows the pressure in the train line to be again brought up to its regular pressure, which accomplishes the result of releasing the brakes and again causing the thrust on the latch bolts to be in the direction of the rotary latches.

It has now been explained as to how the striker lever 48, when turned to its first and second positions, is brought back to its upright and normal position, but it is desirable in some instances to securely lock said striker lever 48 in its turned position and keep the valve 51 in its open position, so that it may be quite beyond the power of the engineer or motorman in charge of the vehicle to return the said lever to its upright and normal position, and in order to accomplish

this result the forked end 68 of the latch bolt 65 is pivotally connected to the arm 146, through the lug 147 projecting from said arm. The arm 146 is pivotally secured in the jaw 148 in the base 149, said base 149 being superposed on the base 39 in proximity to the valve casing 38 and rigidly secured thereto.

150 is an electro-magnet rigidly secured on the base 149 immediately to the rear of the arm 146.

151 is a helical spring introduced between the electro-magnet 150 and the arm 146 and exerting a constant forward pressure on said arm and consequently on the latch 65 against the longer length of rim 62 of the rotary latch 58.

152 is a lug rigidly secured to or forming part with the top portion of the frame of the magnet and having a slot 153 therethrough in alinement with the threaded orifice 154 in the top end of the arm 146. 155 is a key having a threaded end and a collar 156 intermediate of its length adapted to contact with the outer surface of the lug surrounding the slot 153, the threaded end turning in the orifice 154 for the purpose of drawing the said arm rearwardly to release the latch bolt 65 from engagement with the rotary latch 58. The key 155 is the manual means of drawing the latch bolt from engagement with the rotary latch while the electro-magnet 150 is the electric means, and in the use of the latter, of course, the key is entirely dispensed with and the armature 146 drawn to the electro-magnet against the spring pressure simply by the connecting of the said electro-magnet with a suitable electric source of power.

The turning of the striker lever 48 to its lowermost position rotates the latch 58 to such an extent as to turn the longer length of rim 62 past the end of the latch bolt 65 and thus allow the said latch bolt to enter into one or other of the notches 59 or 60, and as there is no means of withdrawing this latch bolt other than the manual or electric means explained, the lever must remain in its lowermost position with the valve 51 open and the brakes applied, until a key in the possession of an independent person is inserted to draw the arm 146 to its rearward position, or until the wires of an electric circuit, under the control of an independent person, are connected with the electro-magnet to accomplish the same purpose.

The withdrawal of the latch bolt 65 permits the operation of the plunger 132 in exactly the same manner as subsequent to the withdrawal of the latch bolt 63 and operates the indicator 141 to bring the hand 142 pointing to "Released."

A casing 157 covers the base 39 and incloses all the aforesaid parts with the exception of the striker lever and the projecting end of the spindle, the outer head only of the valve casing 38 projecting through one of its sides. The casing 157 has an opening 158 in one of its sides for the insertion of the key, said opening can be arranged in any suitable manner, that is, with any form of destructible covering so as to insure its inviolability.

The most likely operation in the withdrawing of the absolute latch bolt will be the electric means, and with such means the opening 158 will be unnecessary. The wires from the electro-magnets will lead into the cab of the locomotive, where through suitable contacts, the engineer or motorman may connect the same with the wires 159 in a circuit under the control of a switch operator or station attendant, the said electro-magnets being wound so as to operate with the current flowing in the particular circuit employed.

In order to provide a mechanism, which will be adaptable for the forward or back movement of the vehicle, the valve 38 and the latch and automatic return mechanism together with the striker lever is repeated at the other side of the cab and the inlets to said valve are connected to the train line by the pipes 160 and 161, through a valve chamber 162 having the cylinders 163 and 164 extending from each end thereof and communicating therewith, the said pipes 160 and 161 leading from the outlets 165 and 166 in the wall of said valve chamber, and the pipe 167 leading from the train line to the inlet 168 through the wall of said chamber.

169 and 170 are inlets to the cylinders 163 and 164 respectively leading into said cylinders into the space between the pair of pistons 171 operating in the cylinder 163 and the space between the pistons 172 operating in the cylinder 164. 173 and 174 are exhaust openings through the wall of the cylinder also leading from the aforesaid spaces between the pistons, and larger in diameter than the inlets 169 and 170.

175 is an orifice through the head of the cylinder 163, and 176 is a reservoir connected to said orifice 175 by the pipe 177.

178 is an orifice through the head of the cylinder 164 and 179 is a reservoir connected to the said orifice by the pipe 180.

181 is an orifice through the outer of the pistons 171.

182 is an orifice through the outer of the pistons 172.

The orifices 181 and 182 are also larger in diameter than the inlets 169 and 170.

183 is a valve traveling in the valve chamber 162 and in its central position, closing the outlet ports 165 and 166, and connected to the pistons 171 and to the pistons 172 by the rod 184, so that on the movement of said pistons from their centrally balanced position in either one direction or the other, one of the said outlet ports will be opened and

permit the passage of air from the train line into one or other of the valves 38, as the case may be.

185 is a valve chamber having the inlets 186 and 187 closed by the valve 188 in its central position in said chamber, the said valve being pivotally connected by the rod 189 to the reversing lever 190 in the case of a steam locomotive, and the said chamber having a free exhaust at each end thereof. The inlets 186 and 187 are connected to the exhaust openings 173 and 174 of the cylinders 163 and 164 by the pipes 191 and 192.

193 is a pipe leading from the train line to the inlet 169 and connected to the inlet 170 by the pipe 194.

195 is a check valve in the length of pipe 192 in proximity to the inlet 169, and 196 is a check valve in the length of pipe 194 in proximity to the inlet 170.

On the forward movement of the reverse lever 190 the valve 188 will be moved forwardly in the valve chamber 185, opening the inlet to said valve chamber 185 and consequently making a free exhaust from the cylinder 163. The air pressure in the cylinders 163 and 164, that is, behind the outer pistons at each end thereof, previous to the forward movement of the lever, has been even, the air entering said cylinders through the inlets between the pistons and finding its way through the orifices in the outer pistons to the ends of the cylinder and the reservoirs connected thereto. The effect of opening the exhaust from the cylinder 163 will reduce the air pressure between the pistons 171, thereby insuring the gradual return of air through the orifice 181 in the outer of said pistons from the end of the cylinder and the reservoir 176, and as the pressure in the end of said cylinder and reservoir is reduced, the pressure behind the outer of the pistons 172 overbalances the pressure behind the outer of the pistons 171 and moves all the pistons in the direction of the cylinder 163. This opens the outlet 165 and permits the passage of air from the train line around the valve 183, through said outlet into the pipe 160 and on to one of the valve casings 38, there being a continuous pressure in said pipe from the train line in readiness to pass through said valve for the application of the brakes for the full period during which said train is moving forward. The operation of the pistons 172 in the cylinder 164 is precisely the same with the exception that the pistons 171 and 172 move in the opposite direction and allow the passage of the air through the pipe 161 cutting it off from the said pipe 160. The check valves 195 and 196 prevent the return of the air from the cylinders 163 and 164 to the train line on the reduction of pressure therethrough.

197 is a pipe leading from the outlet 45 from one of the valve casings 38 and connected to the outlet of the other valve casing 38 by the pipe 197a.

198 is a cylinder having a reduced end 199 and an opening 200 in the side wall hereof also the inlets 201 and 202 into the reduced end and larger end respectively.

203 is a reservoir connected to an orifice leading to the head of the reduced end 199 of the cylinder by the pipe 204, and 205 is a reservoir connected to an orifice in the head of the larger end of the cylinder by the pipe 206.

207 are pistons arranged in the reduced end 199 of the cylinder to each side of the inlet opening 201, and 208 are pistons arranged in the larger end of the cylinder to each side of the inlet opening 202. 209 is an orifice through the outer of the pistons 207, and 210 is an orifice through the outer of the pistons 208. 211 is a piston rod joining all of said pistons and having a slot 212 centrally arranged between said pairs of pistons. 213 is a lever centrally pivoted in the opening 200 in the side wall of said cylinder and extending into the slot 212 in the said piston rod and having an elongated slot at its outer end.

214 is a valve chamber having the inlet opening 215 connected with the pipe 196 and the exhaust opening 216.

217 is a valve operating in the valve chamber 214 and connected by the stem 218 to the lever 213, being attached thereto by a pin extending across the forked end of said valve stem through the elongated slot at the end of said lever.

The opening of the valve 51 in either of the valve casings 38 will allow the passage of air from the train line therethrough, the said air exhausting through the valve chamber 214.

The cylinder 198 is connected to the train line by the pipe 219, a check valve 220 being introduced between the inlet 201 and the said pipe 219. The larger diameter of the pistons 208, when the train line pressure is normal, will retain the thrust of the pistons in the direction of the reduced end 199 of the cylinder, consequently holding the valve 217 to the end wall of the valve chamber 214, and on the sudden reduction of the air pressure in the train line the check valve 220 will prevent the escape of air at the higher pressure from behind the outer of the pistons in the reduced end, whereas the air behind the outer of the pistons in the larger end will gradually flow through the orifice 210 in the outer of said pistons and eventually become even with the pressure of the train line. The thrust then will be entirely in the direction of the larger end of the cylinder and the lever 213 consequently turned on its pivot. The lever thus being turned on its pivot will move the valve 217 in the valve chamber 214 and close the openings thereto and there-

from, in fact, completely block up the exhaust from the train line. The action of this valve is very gradual, the adjustment of the parts being such that the time elapsing between the beginning and end of the operation thereof allows for a sufficient reduction of the air pressure in the train line to permit a service application of the brakes.

The cylinder 198 and valve 217 is introduced in the continuation of the train line pipe beyond the valve 38, as it is not advisable to throw open the train line and make an emergency application, for such is very injurious to the rolling stock of the railroad: It would also necessitate considerable delay in pumping up the train line pressure to release the brakes and would entirely prohibit the use of the slowing down mechanism herein described.

It may be here stated that the valve 217 and its operating parts may be dispensed with and an ordinary form of pop valve 217ª substituted as shown in Fig. 25. The pop valve 217ª would be so regulated as to permit the required reduction of pressure in the train line to make a service application of the brakes and when the proper reduction is made, automatically close, retaining the remaining pressure in the pipes.

In railroad practice the pressure in the train line often varies considerably without operating the brakes and therefore if the train line pressure happened to be very low when the valves 38 were opened the pop valve would close before the proper reduction would be made to apply the brakes. The arrangement of cylinders and pistons previously described for operating the valve 217 however, allows any variation in the constant train line pressure without affecting the proper working of the said pistons and valve, as the pressure equalizes in both ends of the cylinder 198 and therefore are much preferable.

221 is a cylinder having the inlet 222 at one end thereof joined to the pipe 196 by the communicating pipe 223.

224 is a piston operating in the said cylinder 221 and having a piston rod 225 extending forwardly therefrom through the head of said cylinder and engaging with its forked end 226 the outer end of the pivoted throttle lever 227 so that when the air flows through the valve casing 38 and into the pipe 196, the air behind the piston 224 will cause it to move forward in the cylinder and shut off the steam to the locomotive.

In practice it is frequently necessary, particularly for the purpose of assisting the progress of one vehicle with another, to have the brake mechanism of one of the vehicles entirely cut off from operation, either manually by the engineer or motorman in charge, or automatically by this stop system, but at the same time operative from the other vehicle, and in order to accomplish this result and provide for all contingencies the arrangement of valves and connections illustrated in Fig. 17 is shown.

In Fig. 17, 228 is a train line pipe extending from end to end of the vehicle and connected to the engineer's valve 229 by the pipe 230. The engineer's valve, of course, being connected to the main reservoir in the usual way through the pipe 231. 232 is a valve casing having the ports 233, 234 and 235. 236 is a rotary valve within the valve casing 232 having the cut off portion 237 of just sufficient width to cut off one of the said ports. The ports 233 and 235 are preferably diametrically arranged and the port 234 is arranged midway between the aforesaid ports. 238 is a stop within the valve casing 232 between the ports 235 and 233, and 239 is a stop within the valve casing between the ports 234 and 233. The stops 238 and 239 limit the movement of the cut off portion 237 of the valve, so that it can only close the ports 234 and 235. 240 is a valve casing similar to the valve casing 232 having the ports 241, 242 and 243. 244 is a rotary valve within the casing 240 and precisely similar to the valve 236. 245 and 246 are stops arranged within the casing 240 limiting the movement of the valve 244, so that it can only cut off the ports 242 and 243. The train line pipe 228 is connected to the ports 233 and 241 of the valves 232 and 240 respectively. 247 is a branch pipe connecting the ports 234 and 242 of the valves 232 and 240, and 248 is a valve of similar construction to the valve 232 having the inlet ports 249 and 250 in communication with the said branch pipe 247 and an outlet port 251 arranged midway of the ports 249 and 250. 252 is a rotary valve contained within the casing 248 and 253 and 254 are stops arranged to limit the movement of the said valve so that the outlet 251 can not be closed thereby. 255 is a pipe leading from the outlet 251. 256 is a valve casing inserted in the length of pipe 230 between the engineer's valve and the train line pipe 228 and below the branch connection 167 leading therefrom to the inlet 168 in the valve chamber 162 in Fig. 14. The valve casing 256 is located in position on a vehicle where access to the same cannot be had, while the vehicle is in motion. 257 is an inlet to the valve casing 256 in communication with the pipe 230, and 258 is a corresponding outlet preferably arranged diametrically opposite the said inlet 257. 259 is an inlet to the valve casing 256 in communication with the pipe 255, and 260 is an outlet preferably arranged diametrically opposite to the said inlet 259. 261 is an inlet to the valve casing 256 suitably connected to the train line 228 or to the main reservoir, and 262 is the corresponding outlet to said inlet. 263 is an-

other inlet in the valve casing 256 suitably connected to the main reservoir, and 264 is the corresponding outlet. 265 is a valve fitting within the valve casing 256 and having the circumferential recesses 266, 267, 268 and 269 arranged opposing the inlets 257, 259, 261 and 263. The said circumferential recesses do not extend completely around the periphery of the valve, a solid portion, sufficiently wide to close the said inlets, being left in a portion of each of the said recesses, the solid portions, closing the inlets 251 and 263, being arranged in alinement with one another and the portions, closing the inlets 259 and 261, being arranged so that when the inlets 257 and 263 are closed, the inlets 259 and 261 will be open and on the turning of the valve 265 by means of a suitable handle the inlets 257 and 263 will be opened before the inlets 259 and 261 are completely closed. It will therefore be seen that the valve 265 cannot be turned or manipulated in any manner, so that the inlets 257 and 263 will not be open, when the inlets 259 and 261 are closed, or the said inlets closed, when the inlets 259 and 261 are closed. 270 is a valve casing located in proximity to the throttle lever 227 having a suitable inlet and an outlet in the side wall thereof. 271 is a piston valve operating in the valve casing 270, and 272 is a valve rod secured to said valve and extending outwardly through the head of said valve casing and pivotally secured to the throttle lever 227. The valve 271 is arranged to close the inlet in the valve casing 270, when the throttle is closed, but immediately on the opening of the throttle, the said valve will open the said inlet and establish communication with the outlet from said casing. 273 is a whistle connected to the outlet in the said valve casing. 274 is a pipe connecting the outlet 262 in the valve casing 256 with the inlet in the valve casing 270. 275 is a cylinder located in the vehicle in a position to the front of the operator and having a piston operating therein. 276 is a semaphore arm pivotally supported from the said cylinder and operatively connected with said piston through the connecting rod 277. 278 is a pipe connecting the cylinder 275 with the outlet 264 in the valve casing 256. It will be seen, that as the branch pipe 167 is connected to the pipe 230 leading from the engineer's valve, between the said engineer's valve and the valve 256, the said engineer's valve and the valve 38 are irremediably connected, therefore it will be impossible to operate the brakes of the vehicle if the valve 265 is turned so as to cut off the connection between the engineer's valve and the train line, either manually or through the automatic device.

In the operation of this portion of the device, when an engine is traveling in front of a train in the ordinary manner the valve 236 is turned to close the port 235 and the valve 244 turned to close the port 242, thus the forward end of the train line pipe 228 is closed and the rear end open to communicate with the remainder of the train. If the valve 265 is set, so that the engineer's valve and valves 38 are not in communication with the train line, the inlets 259 and 261 in the valve casing 256 will be open and the air in the train line will exhaust through the branch pipe 247, valve casing 248, pipe 255 and through the valve 265 to the atmosphere, thus applying the brakes. The air from the main reservoir or train line pipe will flow freely through the ports 261 and 262 in the valve casing 256 into and through the pipe 274. When the inlets 259 and 261 are open, the inlets 257 and 263 will be closed and the pressure of air in the cylinder 275 be released through the port 278 in the valve casing 256, which is uncovered by the valve in closing the port 263. The weight of the piston in the cylinder 275 will then pull downwardly on the connecting rod 277 and lift the semaphore arm 276 to danger. It will thus be seen that the said semaphore is a normal danger signal. Providing the engineer does not notice the danger signal and does not try his brakes before starting his train, immediately on pulling forward on the throttle lever 227, the valve 271 in the valve casing 268 will uncover the inlet port and allow the air from the main reservoir to pass through the said valve casing and exhaust port to the whistle 273, the rush of air through the whistle giving him an audible signal indicating that his brake valves are inoperative. As the brakes on the vehicle are set, it will be impossible for the vehicle to move, the engineer will therefore have to get out of the cab and turn the valve 265 to close the exhaust from his train line and in doing so he will of course, connect the brake operating valves.

The valves 236, 240 and 252 may be set in various ways to accommodate different conditions under which the vehicle may be traveling. If it is desired to run the vehicle alone, the valve 244 will be turned to close the port 243, thus closing the train line in the said vehicle and if the valve 265 is not set properly the danger signal 276 will operate and the brakes set as previously described.

Providing it is desired to assist a train by coupling an engine to the rear end, the valve 236 will be turned to open the port 235, after the usual connections have been made between the vehicles, thus closing the port 234, the valve 244 will be turned to close the port 243. The port 242 is then open to the train line and in order to prevent the escape of air therefrom on the turning of the valve 265 to render the manual and automatic operation of the brakes in the said rear engine inoperative, the valve 252, which is in the cab of

the vehicle within easy reach of the engineer will be turned to close the port 250. During the time in which the engine is assisting a train by pushing it from the rear, the port 261 is constantly open and therefore the whistle 273 will be constantly blowing showing the engineer that the engineer's valve and valves 38 are inoperative, but as his engine is coupled to the forward train the brakes are operated by the forward engine. Providing the engineer, on uncoupling from the train attached to the front end, fails to turn the valve 265, so as to open the ports 257 and 263 and close the ports 259 and 261, before closing the valve 236 and uncoupling the hose connection, the air in the train line of the said engine will escape as previously described.

If an engine with a train attached to the rear end is assisting another train by pushing it from behind, the valve 236 will be turned to open the port 235 and close the port 234, and the valve 244 will be turned to open the port 243, and close the port 242 and thus complete the communication between the train line of the front train and the rear train. The branch 247 is then completely cut off from the train line and the valve 265 turned, so that the ports 257 and 263 are closed. The valve 252 may rest in any position, as the branch 247 is shut off. The signals 273 and 276 will operate as previously described.

In the event of the valve 265 not being returned to normal before the valves 236 and 244 are returned to their proper relative positions, either an application of the brakes will be made or a signal will be given to the engineer, that his brakes are inoperative, so that there can be no possibility of him starting his engine without a knowledge of the condition of the aforesaid mechanism.

If an engine, which has been pushing one train and pulling another, is uncoupled from the front train and the valve 252 left covering the port 249 and the valve 236 turned to close the port 235 before uncoupling, and the valve 244 left covering the port 242, no application of the brakes will be made in the event of the valve 265 being left with the ports 259 and 261 open. In such an event it is possible to start the engine although the engineer's and automatic brake valves are cut out and inoperative, but the engineer finding his brake valve inoperative is able to make an application of the brakes and stop his train by turning the valve 252 and allowing the train line pressure to escape through the ports 249, 251, 259 and 260. When the train has been stopped the valve 265 may be set to its proper position. In order to prevent the use of this valve 252, except in an emergency when a train has been started with the engineer's valve inoperative, the handle may be suitably incased with a destructible covering, so that the covering must be broken to operate the valve. It must be understood however, that this valve is only used, when an engine is pushing a train from behind and has no train connected to its rear end and may in the ordinary equipment be entirely dispensed with.

277 is a pipe connecting the exhaust ports 54 in the end wall of the casing 38 and having a whistle introduced intermediate of the length thereof, for permitting the exhaust from the valve casings 38 and the pipe 196 and consequently the cylinder 221. The flow of air from the said cylinder and pipes into the pipe 196 will sound the whistle on its escape therethrough and thus give the engineer or man in charge, an audible signal that everything is normal. The return of the striker levers to the vertical position will, of course, return the valve 53 to the position to open the exhaust port 54.

In Fig. 19 a pair of cylinders 279 and 280 and a communicating valve chamber 281 therebetween, are shown, which are of precisely similar construction to the cylinders 163 and 164 and the valve chamber 162, having similar pairs of pistons operating therein and a like central valve with the connections to the valve casings 38 and to the train line.

The pipes 282 and 283 correspond to the pipes from the train line into the cylinders 163 and 164, while the pipes 284 and 285 correspond to the pipes leading to the valve chamber 185 from the exhaust openings. The pipes 284 and 285 lead to the valve chambers 286 and 287 having the exhaust openings 288 and 289.

290 and 291 are valves here shown as forming part with the cores of the magnets 292 and 293, the said cores having attached to their lower end suitable weights 294 and 295 forming the armatures of the magnets.

296 is the reverse roll of the controller operated by the handle 297 and connected to the electro-magnets 292 and 293 by the wires 298 and 299 and 300 and 301.

It is unnecessary herein to describe the operation of the electric controller, as it is well known, it being sufficient here to say, that on turning the handle 297, either the wires 298 and 299 or the wires 300 and 301 are energized, so as to energize either the magnet 292 or 293, as the case may be. The energizing of the magnet 292 will open the valve 290 and permit the escape of air from between the pistons in that end of the cylinder, the rest of the operation being precisely similar to that described in the operation of the pistons in the cylinders 163 and 164. The opening of the valve 293 is accomplished in precisely the same way, namely, by the energizing of the wires 300 and 301 and the drawing up of the armature

of the magnet 293 and consequently the opening of the valve.

This construction is, of course, particularly applicable to electrically driven vehicles, where the said electrically driven vehicles are equipped with an air brake mechanism.

It has been stated hereinbefore that the valves 38 and the latch mechanism and the means for returning the striker lever to its vertical position are preferably placed in the casing on the top of the cab or roof of the vehicle, but the position of the remaining parts has not been clearly defined, for the reason that in different vehicles they would be placed in different positions, of course in a steam locomotive the cylinder shutting off the steam would likely be in proximity to the throttle lever and would be connected to the exhaust from the valve in any suitable manner, and many of the other parts would also be within the vehicle, but the cocks cutting off the operation of the air brakes on any one of the vehicles would likely be somewhere on the outside of the vehicle in ordinarily inaccessible places, while the train is in motion.

The lever 48 may be made in any suitable shape and project from any convenient part of the vehicle, though the construction, described herein, is probably the most convenient, as the striker plate 10 need not be directly over the vehicle.

In Fig. 22 the lever 48 is shown as connected to the spindle of a rotary electric switch intended to operate an electric controlling apparatus of either electric brakes or motor controllers or both as the case may be. The details of the construction of this invention, as applied to electric railways, is not set forth in detail in this specification with the exception of the valve connection for directing the flow of air into the different valve casings according to the forward or back movement of the vehicle, but it will be readily understood from common practice in electrical work that the closin or opening of the switch 302 by the lever 48 may be used in making or breaking any number of electrical connections, in order to operate the different arresting mechanisms.

In place of having the striker plate mechanism operated automatically by the semaphore, the circuit 32 may be completed by the closing of an ordinary electric switch at a station or switch house, particularly in a railway where the electric block system of semaphore signaling is not installed. Two or more of the automatic stops can be erected between any two stations and trains from either direction, brought to a stop between stations. As the striker plate is normally at danger, the train will be stopped, unless the said striker plate be raised and this may be accomplished by the manual closing of a switch from a signal station. Further, where the connection to the said stop mechanism is not electric, the striker plate may be raised by the ordinary lever connection, such as has been commonly used for years to raise the semaphores, but this will only be necessary in some railroads.

In single track railroads, the striker plates are arranged, as explained in the foregoing description, so that their incline meets the lever from either direction, and the plates are lifted together from the meeting ends. If two sets of valve mechanism are not installed on the engine, the striker lever may have a suitable extension to the opposite side of the cab to engage the said striker plate, when running in the opposite direction.

The advantage of this system of stopping a train is that it may be operated with or without existing systems of signaling, as the mechanism is such that a signal can be attached thereto, and thus entirely eliminate the present systems of signaling, but the most satisfactory installation of this invention is with an automatic semaphore signaling system, where the parts and the means of operating may be used conjointly. Further, the safety in removing the human element, usually necessary in the arresting of a train, must be emphasized, and putting it beyond human power to start said train without some difficulty and in some cases, as previously explained, making it absolutely impossible for the operator to start the train, until allowed to do so by a second party.

The piston and cylinder holding the throttle lever, cannot of course, be tampered with, unless the engineer takes them to pieces, and such action would meet with certain condemnation by the proper officials. Any other tampering with the apparatus can be readily detected. In fact, it can all be entirely under the supervision of a terminal inspector, who can readily report any interference with the parts of the mechanism.

The application of this system to an electric railway need not be described at length herein, as in the description in detail of the parts the changes necessary have been mentioned. It would require very iittle difference in the construction, where electric railways are controlled by air brakes, as is so frequently now the case, for it would then only be a matter of shutting off the electric current in place of shutting off the steam, and the adaptation of the mechanisms just described to such a purpose would not require more than ordinary mechanical skill.

In the event of electric brakes being used in place of air brakes, the substitution of electrical devices for the mechanical devices would be a simple matter for any electrician of ordinary ability, as it has already been explained, that a general switch would be closed or opened when required by the action of the striker lever and plate, according to the electrical arrangement within the vehicle.

Some emphasis has been placed on the connection of the circuit 32 with a relay instrument in the semaphore mechanism, in view of the fact that such instrument is without doubt the most convenient at hand to complete the said circuit but it may be advisable and better construction in some instances, to close the said circuit by means of other moving parts of the said semaphore mechanism. The best method can only be determined at the time of installation and according to existing conditions.

In the application of this device to ordinary electric cars where the load carried varies considerably it is necessary to support the striker lever independent of the car body. One form of device for supporting the striker lever is shown in Fig. 23. The valve 38 is secured to the body of the car but the lever 48 has the offset end removed and a vertical slot formed therein. 303 is a rod pivotally secured at its lower end to the frame of the truck of the car and extending upwardly through the body of the said car and supported in suitable guides. The upper end 304 of the rod 303 is formed in a T-shape having a journal orifice at each end thereof. 305 is the striker lever pivotally supported in the forward journal bearing in the T-shaped head 303 and 306 is a short arm pivotally supported in the rear journal bearing in the said head. 307 is a connecting rod pivotally secured at one end to the striker lever 305 intermediate of its length and pivotally secured intermediate of its length to the upper end of the arm 306. The extending end of the rod 307 is secured to the lever 48 by a suitable bolt or pin secured in the said rod and extending through the vertical slot in said lever. It will be therefore seen that as the car body is raised or lowered the valve will move with it but the lever 305 will remain in a fixed position in relation to the rails and the lever 48 will move freely up and down without affecting the position of the lever 305 as the pin on the connecting rod slides free in the vertical slot. When the striker lever 305 comes in contact with a striker plate and turned in its bearing the connecting rod 307 causes the arm 306 to swing with the said lever and the pin at the other end engaging the lever 48 causes it to turn and open the valve in the same manner as when the lever 48 in the former construction strikes the striker plate.

What I claim as my invention is:

1. An automatic stop for railway vehicles, comprising, an obstructing member suitably supported in proximity to a line of railway, a moving member projecting from said vehicle and adapted to contact with said obstructing member, and a controlling device operated by said moving member and holding the arresting mechanism and said moving member in their stop position during the disarrangement of said moving member through contact with said obstructing member, substantially as described.

2. An automatic stop for railway vehicles, comprising a controlling device connected with the arresting mechanism, a lever connected with said controlling device and projecting above said locomotive and adapted to remain in its disarranged position during the period of the arresting of the vehicle, and a striker member suitably supported in proximity to the line of railway adapted to contact with said lever on the passage of the vehicle, substantially as described.

3. An automatic stop for railway vehicles, comprising a controlling device connected with the arresting mechanism, a lever connected with said controlling device and projecting from the vehicle and adapted to remain in its disarranged position during the period of the arresting of the vehicle, and a hinged striker plate supported in proximity to the line of railway and adapted in its lower position to operate said lever in the passage of the vehicle, substantially as described.

4. An automatic stop for railway vehicles, comprising a controlling device connected with the arresting mechanism, a lever connected with said controlling device and projecting from the vehicle and adapted to remain in its disarranged position during the period of the arresting of the vehicle, a striker plate hinged to a suitable support in proximity to the line of railway, and means for lifting said striker plate out of the line of contact of said lever on the passage of the vehicle, substantially as described.

5. An automatic stop for railway vehicles, comprising a controlling device connected to the arresting mechanism, a lever projecting upwardly from said vehicle and connected with said arresting mechanism, a striker plate hinged to a suitable support along the side and over the line of railway and normally resting in an inclined position, and means for lifting said striker plate out of the line of contact with said lever, substantially as described.

6. An automatic stop for railway vehicles, comprising a controlling device connected with the arresting mechanism, a lever projecting upwardly from said vehicle and connected with said arresting mechanism, a pole secured in an upright position beside a line of railway, cross arms from said pole, a frame supported from said cross arms, a striker plate hinged to said frame, a base plate fixedly secured to said frame above said striker plate, and means supported on said base plate for lifting said striker plate out of the line of contact of said lever in the passage of the vehicle, substantially as described.

7. An automatic stop for railway vehicles, comprising a controlling device connected

with the arresting mechanism, a lever projecting upwardly from said vehicle and connected with said controlling mechanism, a pole fixedly secured and standing beside the line of railway supporting a cross tree at the top thereof, a frame having suitable depending legs therefrom and holes at the upper corners thereof, cross arms extending through said holes and secured in said cross tree, a striker plate hinged to the lower end of one of said legs, a base plate secured to the lower end of the other leg and fixedly secured to the said leg above said striker plate, and means on said base plate for lifting said striker plate out of the line of contact of said lever in the passage of the vehicle, substantially as described.

8. An automatic stop for railway vehicles, comprising a controlling device connected with the arresting mechanism, a lever projecting from said vehicle and connected with said arresting mechanism, a striker plate hinged to a suitable support in proximity to the line of railway, and means governed by expansile fluid for lifting said striker plate out of the line of contact of said lever, substantially as described.

9. An automatic stop for railway vehicles, comprising a controlling device connected with the arresting mechanism, a lever projecting from the vehicle connected with said arresting mechanism, a hinged striker plate suitably supported in proximity to the line of railway, and electrical means for lifting said striker plate out of the line of contact of said lever in the passage of the vehicle, substantially as described.

10. An automatic stop for railway vehicles, comprising a controlling device connected with the arresting mechanism, a lever projecting from said vehicle connected with said controlling device, an inclined striker plate hinged to a suitable support in proximity to the line of railway, means governed by expansile fluid for lifting said striker plate from its inclined position, and electrical means for controlling the supply of expansile fluid substantially as described.

11. In an automatic stop for railway vehicles, the combination with the arresting mechanism of the vehicle, of a controlling device connected with said arresting mechanism, a lever projecting from said vehicle and connected with said controlling device, an inclined hinged striker plate supported over the line of passage of said lever, a cylinder suitably supported over said striker plate and a piston in said cylinder, a connecting rod to said striker plate, an expansile fluid supply connected with said cylinder, a valve interposed in the connections between said fluid and said cylinder, an independent means for operating said valve for the lifting of the said plate from the line of contact with said lever, substantially as described.

12. In an automatic stop for railway vehicles, the combination with the arresting mechanism of the vehicle, of a controlling device, a lever projecting from the vehicle and connected with said controlling device, a frame supported over the line of passage of said lever, an inclined striker plate hinged to said frame, a base plate rigidly supported on said frame above said striker plate having holes therethrough, a cylinder mounted on said base plate and a piston traveling therein, connecting rods to said hinged striker plate, an expansile fluid supply connected to said cylinder, a valve in the connections between said fluid and said cylinder, an electro-magnet operatively connected to said valve, an electric circuit suitably energized including said magnet, and means for opening and closing said circuit, substantially as described.

13. In an automatic stop for railway vehicles, the combination with the arresting mechanism of the vehicle, of a controlling device mounted on the roof of said vehicle and connected with said arresting mechanism, a lever connected to said controlling device and projecting outwardly from the vehicle, a hinged striker plate suitably supported in the line of contact of said lever, and means for lifting said striker plate out of the line of contact, substantially as described.

14. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of an air valve connected to said arresting mechanism, a lever secured to the stem of said air valve projecting outwardly from said vehicle, a hinged striker plate supported in the line of contact of said lever, and means for lifting said striker plate out of the line of contact, substantially as described.

15. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of an air valve mounted on the roof of said vehicle and connected with the arresting mechanism thereinside, a lever secured to the valve stem and offset beyond the side of said roof and projecting upwardly, a hinged striker plate in the line of contact of said lever, and means for lifting said striker plate out of the line of contact, substantially as described.

16. In an automatic stop for railway vehicles, the combination with the air brake train line and air reservoir, of a rotary valve interposed in said train line, a lever fixedly secured to the stem of said valve and extending upwardly therefrom beyond said vehicle, an inclined striker plate suitably supported in the line of contact of said lever, and means for lifting said striker plate out of said line of contact, substantially as described.

17. In an automatic stop for railway vehicles, the combination with the train line and air reservoir, of a rotary valve mounted on said vehicle and interposed in said train

line, a lever fixedly secured to the stem of said valve and extending upwardly therefrom, a pop valve regulated to a predetermined exhaust pressure connected to the pipe leading from the outlet of said valve, a hinged striker plate suitably supported in the line of contact of said lever, and means for lifting said striker plate out of said line of contact, substantially as described.

18. In an automatic stop for railway vehicles, the combination with the train line of the air brake mechanism, air reservoir and throttle lever, of a rotary valve mounted on said vehicle and interposed in said train line, a lever rigidly secured to the stem of said valve and projecting therefrom, a striker plate suitably supported in the line of contact of said lever, means for lifting said striker plate out of the line of contact of said lever, a cylinder within said vehicle and a piston traveling therein, communicating pipes from the outlet of said valve to said cylinder, and a rod operatively connecting said throttle lever with said piston, substantially as described.

19. In a device of the class described, in combination, a railway semaphore, a relay instrument operatively connected to said semaphore and electrically connected with the rails of the rail way, an obstructing member suitably supported in proximity to said line of rail way and normally in a danger position, means for temporarily removing said obstructing member from the danger position, means for operating said removing means, a normally open electric circuit suitably energized and completed by the speration of said relay instrument and controlling said means for operating said removing means, a vehicle having a suitable arresting mechanism, and a lever connected with said arresting mechanism and contacting with said obstructing member in its normal position, substantially as described.

20. In a device of the class described, in combination a rail way electrically bonded in blocks, a rail way semaphore operated by the passage of a vehicle over said bonded blocks, a relay instrument connected with said semaphore for actuating the operating parts, an electric circuit completed by the moving member of said relay instrument and suitably energized, an expansile fluid supply, an inclined striker plate hinged to a suitable support over said rail way, means for lifting said striker plate temporarily to an upward position governed by said expansile fluid, communicating pipes from said expansile fluid supply to said lifting means, a valve in said communicating pipes, and an electromagnet in said circuit connected to the stem of said valve, substantially as described.

21. In a device of the class described, in combination, a locomotive, a train line pipe connected to the air brakes, a throttle lever in said locomotive, a rotary air valve on the roof of the locomotive to one side thereof interposed in the length of said train pipe, a lever secured to the stem of the said valve and offset therefrom beyond said roof and projecting upwardly, and a striker member supported in proximity to the railway line and adapted in its lower position to turn said lever and open said valve on the passage of said vehicle, substantially as described.

22. In a device of the class described, in combination, a vehicle having a suitable arresting mechanism, a valve casing having a pair of stops projecting from the lower half of one of its heads and a valve stem journaled in suitable bearings in said head, a rotary valve within said casing and mounted on said stem, a lever secured to the end of said valve stem projecting through the head of said casing and adapted to meet one or other of said stops at the limit of its turning movement, and a striker member suitably supported in the line of contact of said lever, substantially as described.

23. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, and means for locking said controlling means to its open and operating position and continuing the application of the arresting mechanism for a period determined by the position of the actuating means in relation to said controlling means, substantially as described.

24. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, and a latch mechanism connected with and locking said controlling means to a position varying according to the action of said actuating means on said controlling means, substantially as described.

25. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a latch and latch bolt locking said controlling means in its open operating position, and pneumatic means for governing the position of said latch bolt, substantially as described.

26. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a latch and latch bolt locking said controlling means in its open operating position, a cylinder, a

piston operating therein, a rod extending from said cylinder operatively connected to said piston and latch bolt, and an expansile fluid supply connected with said cylinder, substantially as described.

27. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a latch and latch bolt locking said controlling mechanism to its open and operating position, a cylinder having a reduced end, an opening in the side thereof and inlets to said reduced end and the large end respectively, pistons operating in said reduced and large ends respectively, a rod connecting said pistons, a pivoted lever connecting said rod and said latch bolt through the side of the cylinder, and an expansile fluid supply connected with said inlets, substantially as described.

28. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a latch and latch bolt locking said controlling mechanism to its open and operating position, a cylinder having a reduced end, an opening through one side thereof and inlets to said reduced and large ends respectively, a pair of pistons operating in said reduced end, the outer of said pistons having an orifice therethrough, a pair of pistons operating in the large end, the outer of said pistons having an orifice therethrough, a rod connecting said pistons and operating said latch bolt, an expansile fluid supply, a pipe connecting said expansile fluid supply with said inlets, and a check valve arranged in said feed supply pipe between said inlets, substantially as described.

29. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a latch and latch bolt locking said controlling means to its open and operating position, a cylinder having a reduced end and an opening in the side thereof, inlets to said reduced and large ends respectively and orifices through the heads, a pair of pistons operating in said reduced end, the outer of said pistons having an orifice therethrough, a pair of pistons operating in the larger end, the outer of said pistons having an orifice therethrough, a rod connecting all of said pistons having a longitudinal slot centrally arranged therein, a lever pivoted centrally in said opening in said cylinder and extending into said longitudinal slot in the piston rod at one end and pivotally connected at the other end to said latch bolt, reservoirs connected to the orifices in the head at each end of said cylinder and communicating therewith through said orifices, an expansile fluid supply, a pipe connecting said expansile fluid supply with said inlets to the cylinder, and a check valve arranged in said feed pipe between said inlets, substantially as described.

30. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a rotary latch connected with said controlling means, a latch bolt slidably arranged in relation to said rotary latch, and automatic means for governing the position of said latch bolt in relation to the action of said actuating means on said controlling means, substantially as described.

31. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a rotary latch connected with said controlling means, a latch bolt slidably arranged in relation to said rotary latch, and pneumatic means for governing the position of said latch bolt in relation to the position of said rotary latch following the action of said controlling means, substantially as described.

32. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a rotary latch having circumferential notches therein, a latch bolt slidably arranged in relation to said rotary latch, and pneumatic means governing the position of said latch bolt in relation to said rotary latch following the action of said actuating means on said controlling means, substantially as described.

33. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of a rotary air valve controlling said arresting mechanism and carried by said vehicle, means apart from said vehicle for operating said valve, a rotary latch mounted on the spindle of said valve, latch bolts slidably arranged in relation to said rotary latch, and automatic means for holding said bolts to said latch and releasing said bolts from said latch governed respectively by the closed and open position of said air valve, substantially as described.

34. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of a rotary air valve connected with and controlling said arresting mechan-

ism, a projecting lever fixedly secured to the one end of the valve spindle, a rotary latch secured to the other end of said spindle having circumferential notches in its rim portion, a latch bolt slidably arranged in relation to said rotary latch and normally held to the periphery of said rotary latch, and pneumatic means for holding said latch bolt to said latch and for releasing said latch bolt from said latch governed by the closed and open position of said rotary valve respectively, substantially as described.

35. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said arresting mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a latch and latch bolts locking said controlling means in its open operating position, pneumatic means for withdrawing one of said latch bolts, and electric means for withdrawing the other of said latch bolts, for the return of said controlling means to its normal position, substantially as described.

36. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a rotary latch connected with said controlling means, a latch bolt slidably arranged and engaging said rotary latch on one side thereof, a latch bolt slidably arranged engaging said rotary latch on the other side thereof, means for withdrawing the first latch bolt from engagement with said latch on a moderate action by said actuating means on said controlling means, and means for withdrawing the second latch bolt on the maximum action of said actuating means on said controlling means, substantially as described.

37. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a rotary latch having a plurality of circumferential notches, and a plurality of latch bolts slidably arranged in relation to said rotary latch and normally engaging said latch and adapted to be withdrawn from engagement with said latch according to the varying position of parts of said controlling means influenced by said actuating means respectively, substantially as described.

38. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a rotary latch having a plurality of circumferential notches therein forming short and long lengths of rim portion between said notches respectively, a latch bolt normally engaging the shorter length and slidably arranged, a latch bolt normally engaging the longer length of rim portion and slidably arranged, means for withdrawing the first latch bolt and means for withdrawing the second latch bolt, substantially as described.

39. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a rotary latch having circumferential notches forming different lengths of rim portion between said notches, a latch bolt normally engaging the short length of rim and slidably arranged in relation to said latch, a latch bolt engaging the long length of rim portion and slidably arranged in relation to said latch, pneumatic means for withdrawing the first of said latch bolts, and electric means for withdrawing the second of said latch bolts, substantially as described.

40. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a rotary latch having circumferential notches forming different lengths of rim portion between said notches, a latch bolt normally engaging the short length of rim and slidably arranged in relation to said latch, a latch bolt engaging the long length of rim portion and slidably arranged in relation to said latch, pneumatic means for withdrawing the first of said latch bolts, and manual means for withdrawing the second of said latch bolts, substantially as described.

41. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a latch and latch bolt, an electro-magnet supported on a suitable base, an armature pivotally secured to said base and to said latch bolt and adapted to be drawn towards said magnet on the energizing of the windings thereof, and a spring introduced between said magnet and said armature and adapted to normally hold said latch bolt in engagement with said latch, substantially as described.

42. In an automatic stop for railway vehicles, the combination with the air brake mechanism and a train line of pipe, of an air valve introduced intermediately in said train line and having a plurality of chambers contained in the casing thereof and a rotary valve stem projecting therethrough, a lever pro-

jecting outwardly from one end of said valve stem, a latch mechanism engaging the other end of said valve stem, means for engaging said lever in the passage of said vehicle and turning said valve stem, and means for releasing said latch mechanism subsequent to its engagement with said valve stem after the rotation thereof, substantially as described.

43. In an automatic stop for railway vehicles, the combination with the air brake mechanism and a train line of pipe, of an air valve introduced in said train line of pipe and having a rotating spindle, a lever projecting outwardly from one end of said spindle, means apart from said vehicle for actuating said lever, a crank secured to the other end of said spindle, a cylinder connected to a suitable expansile fluid supply, a plunger operating in said cylinder, and a rod pivotally connecting said plunger to said crank, substantially as described.

44. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, said controlling means having a rotating spindle, a lever projecting therefrom, means apart from said vehicle for turning said lever and consequently said spindle, a crank at the inner end of said spindle, a cylinder connected with a suitable supply of expansile fluid, a plunger operating in said cylinder, and a rod connecting said plunger and said crank, substantially as described.

45. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, said controlling means having a rotating spindle, a lever projecting from said spindle, means apart from said vehicle for turning said lever and consequently said spindle, a crank at the inner end of said spindle, a cylinder connected with a suitable supply of expansile fluid through the bottom end thereof and having an orifice through the side wall thereof and an exhaust port longitudinally arranged in the side wall and registering with said orifice, a plunger operating in said cylinder and closing said exhaust in its upper position, a rod connecting said plunger to said crank, an indicator in gage form, and a pipe connecting said orifice in said cylinder to said indicator, substantially as described.

46. In an automatic stop for railway vehicles, the combination with the arresting mechanism, of means for controlling said mechanism connected thereto and carried by said vehicle, said controlling mechanism having a rotating spindle, a lever connected to said spindle, means apart from said vehicle for turning said spindle, a crank mounted at the inner end of said spindle, a cylinder connected with a suitable source of expansile fluid through the bottom thereof and having orifices through the side walls at different levels and longitudinally arranged ports in the said side walls registering with said orifices, a plunger operating in said cylinder and closing said exhaust ports respectively at different levels in its travel in said cylinder, a rod connecting said plunger to said crank, a plurality of indicators in the form of gages having indicating hands pointing out the position of the plunger or the position of the aforesaid lever, and pipes connecting said orifices in the side walls of said cylinder with said indicators, substantially as described.

47. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line of pipe, of an air valve casing containing an inlet chamber and an outlet chamber and having suitable bearings in the heads thereof and communicating ports therebetween, a valve stem journaled in said bearings, a valve mounted on said stem in the inlet chamber and controlling the passage of expansile fluid through said communicating ports, a valve mounted on said stem and governing an exhaust from the outlet chamber, a lever extending from said valve stem, means apart from said vehicle for turning said lever and consequently said valves, a pipe leading from said train line pipe into said inlet chamber, a pipe leading from said outlet chamber, and means attached to the latter pipe for controlling the exhaust therefrom, substantially as described.

48. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line of pipe, of an air valve casing partitioned into two chambers having an inlet opening into one of said chambers and an outlet opening from the other of said chambers and an exhaust opening from said outlet chamber and communicating ports through said partition, a valve stem journaled in the heads of said casing, a projecting lever from said valve stem, a rotary valve mounted on said valve stem and controlling the passage of air through said communicating ports, a rotary valve mounted on said valve stem and controlling the passage of air through said exhaust port, means apart from said vehicle for turning said lever and consequently said valves, a pipe leading from the train line to the aforesaid inlet opening, a pipe leading from the aforesaid outlet opening, and a valve at the end of said pipe leading from the outlet opening shutting off the exhaust therefrom after a predetermined decrease in the pressure in the train line pipe has been reached, substantially as described.

49. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line of pipe, of an air

valve introduced in said train line of pipe, a lever projecting from the stem of said air valve, means apart from said vehicle for turning said lever, a cylinder at the exhaust end of the train line pipe leading from said valve, a piston traveling in said cylinder, a cylinder having a reduced end and a rod projecting therefrom, a pair of pistons in the larger end of the latter cylinder and a pair of pistons in the reduced end of said latter cylinder and orifices through the outer of each of said pairs of pistons, a piston rod joining all of said pistons in said latter cylinder, a pivoted lever connecting said piston rod with the aforesaid piston rod, a pipe connecting the larger and reduced ends of the said latter cylinder with a supply of expansile fluid, and a check valve in the individual connection to said reduced end of the cylinder, substantially as described.

50. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line of pipe, of an air valve casing containing inlet and outlet chambers and openings to and from said chambers and therebetween, a valve stem journaled in said casing, rotary valves mounted on said stem and governing the communication between said chambers and the exhaust from said outlet chamber, a lever projecting from said valve stem, means for turning said lever apart from said vehicle, a pipe connecting the said inlet chamber with the train line pipe and a pipe leading from said outlet chamber, means for controlling the exhaust from said pipe leading from said chamber, a throttle lever, a cylinder, a piston traveling in said cylinder, a rod from said piston engaging said throttle lever, a pipe connecting the pipe leading from said outlet chamber to said cylinder, a pipe leading from the exhaust port from said outlet chamber, and an audible signal attached to said exhaust pipe and adapted to sound on the release of pressure against said throttle lever, substantially as described.

51. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line of pipe, of a pair of air valve casings, each having inlet and outlet chambers, openings to and from said chambers and communicating ports therebetween, valve stems journaled in said casings, a lever projecting outwardly from the end of each stem, rotary valves mounted on said stems and governing the passage of air through the said communicating ports and through the exhaust openings, a pipe connecting said exhaust openings, an audible signal exhaust introduced therein, pipes leading from the train line of pipe to said valve casings, pipes leading from said valve casings, means for controlling the exhaust from the latter pipes, and means directing the feed from the train line of pipe to one or other of the air valve casings, substantially as described.

52. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line of pipe, of a pair of air valve casings having inlet and outlet openings, valves governing the passage of air through said valve casings, means apart from said vehicles for operating said valves, exhaust pipes leading from said valve casings and terminating in a controlled exhaust, a pair of cylinders, a valve chamber joining said cylinders, a pair of pistons operating in each of said cylinders, the outer one of each pair having an orifice therethrough, a slide valve in said valve chamber, piston rods connecting said pistons with said valve at each end thereof, said valve chamber having an inlet opening and two outlet openings, pipes connecting said outlet openings with the aforesaid valve casings respectively, pipes leading from a suitable air supply to said pair of cylinders respectively, check valves introduced in said pipes, exhaust pipes from said cylinders, a valve chamber connected to said exhaust pipes, and a valve operating in said valve chamber for governing the exhaust from one or other of these cylinders and connected to a suitable controlling part of the mechanism for directing the backward or forward movement of the vehicles, substantially as described.

53. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line of pipe, of a pair of air valves controlling said arresting mechanism, means apart from said vehicle for operating said air valves, a pair of cylinders having inlet and exhaust openings, a valve chamber having an inlet opening and outlet openings, a slide valve controlling the passage of air from said inlet opening in the valve chamber to one or other of the said outlet openings, pipes leading from said outlet openings to the aforesaid air valves, a pipe leading from the train line to said inlet opening in the valve chamber, pipes leading to said inlet openings to the cylinders from a suitable expansile fluid supply, check valves introduced in the pipes leading to said inlet opening, a valve connected to the controlling lever of the mechanism directing the forward or backward movement of the vehicle, exhaust pipes leading to said valve from the exhaust openings in said cylinders, and exhaust pipes leading from the aforesaid pair of air valves, substantially as described.

54. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line of pipe, of a pair of air valve casings having inlet and outlet openings, valves governing the passage of air through said valve casings, means apart from said vehicle for operating said valves, exhaust pipes leading from said valve casings

and terminating in a controlled exhaust, a pair of cylinders, a valve chamber joining said cylinders, a pair of pistons operating in each of said cylinders, the outer one of each pair having an orifice therethrough, a slide valve in said valve chamber, piston rods connecting said pistons with said valve at each end thereof, said valve chamber having an inlet opening and two outlet openings, pipes connecting said outlet openings with the aforesaid valve casings respectively, pipes leading from a suitable air supply to said pair of cylinders respectively, check valves introduced in said pipes, exhaust pipes from said cylinders, a valve chamber connected with each of said exhaust pipes, electrically operated valves operating in said valve chambers for governing the exhaust from one or other of said cylinders and operated from the controlling mechanism for directing the backward or forward movement of the vehicle, substantially as described.

55. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line of pipe, of a pair of air valves controlling said arresting mechanism, means apart from said vehicle for operating said air valves, a pair of cylinders having inlet and exhaust openings, a valve chamber having an inlet opening and outlet openings, a slide valve controlling the passage of air from said inlet opening in the valve chamber to one or other of the said outlet openings, pipes leading from said outlet openings to the aforesaid air valves, a pipe leading from the train line to said inlet opening in the valve chamber, pipes leading to said inlet openings to the cylinders from a suitable expansile fluid supply, check valves introduced in the pipes leading to said inlet openings, valve chambers at each end of said cylinder having inlets and outlets, exhaust pipes leading to the inlets of said valve chambers from the exhaust openings in said cylinders, valves in said valve chambers closing the exhaust outlets therefrom having the stem thereof extending outwardly from said casing and an armature at the outer end thereof, electromagnets surrounding said valve stems and electrically connected to the controlling mechanism directing the forward or backward movement of the vehicle, and exhaust pipes leading from the aforesaid pair of air valves, substantially as described.

56. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, means for retaining said controlling means in its operative position, and means for governing the operation of said retaining means through the movement of the vehicle, substantially as described.

57. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism means for retaining said controlling means in its operative position, and pneumatic means for governing the operation of said retaining means through the movement of the vehicle, substantially as described.

58. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, means for retaining said controlling means in its operative position, and pneumatic means for governing the operation of said retaining means operatively connected with the said running gear, substantially as described.

59. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, a vacuum pump, means for operating said vacuum pump through the movement of the vehicle, and means for controlling said automatic means operatively connected with said vacuum pump, substantially as described.

60. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, a vacuum pump having a piston operating therein and a piston rod extending therefrom, an eccentric mounted on an axle of said running gear, an eccentric strap encircling said eccentric having a rod extending therefrom and pivotally connected to said piston rod, and means for controlling said automatic means operatively connected with said vacuum pump, substantially as described.

61. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, a vacuum pump, means for operating said vacuum pump through the movement of the vehicle, a cylinder having a piston operating therein and a piston rod extending through the head thereof, a pipe connecting said cylinder and said vacuum pump, and means connected to said piston rod for controlling said automatic means, substantially as described.

62. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, a vacuum pump operatively connected to said running gear, a cylinder having a piston operating therein and a piston rod extending through the head thereof, a pivotal lever centrally supported

and connected to said piston rod at one end thereof, means operatively connected to the other end of said lever for controlling said automatic means, and a pipe connecting the inlets to said vacuum pump and leading to said cylinder, substantially as described.

63. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, means for controlling said arresting mechanism connected thereto and carried by said vehicle, means apart from said vehicle for actuating said controlling means, a latch and latch bolt, a cylinder having a piston operating therein and a piston rod extending therefrom, a pivotal lever centrally supported and connected to said latch bolt at one end thereof and said piston rod at the other end thereof, a vacuum pump operatively connected with said running gear, a pipe leading from the inlets to said vacuum pump and connected to said cylinder, and spring means for holding said latch bolt out of engagement with said latch on the cessation of movement of said vehicle, substantially as described.

64. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, means for controlling said arresting mechanism connected thereto and carried by said vehicle and having a rotating stem, a rotary latch fixedly secured to said rotating stem having a short and long length of rim portion between the notches thereof, a latch bolt slidably arranged in relation to said latch, a cylinder having a piston operating therein and a piston rod extending therefrom and an inlet at the other end thereof, a pivotal lever centrally supported and connected at one end to the said latch bolt and at the other end to said piston rod, a vacuum pump operatively connected to said running gear, a pipe from the inlets to said vacuum pump communicating with the inlet to said cylinder, and a spring adapted to move said piston and withdraw said latch bolt from engagement with said latch on the cessation of movement of said vehicle, substantially as described.

65. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, means for controlling said arresting mechanism connected thereto and carried by said vehicle and having a rotating stem, a rotary latch fixedly secured to said rotating stem having a short length of rim portion extending from the main portion, a latch bolt slidably arranged in relation to said latch, a cylinder having a piston operating therein and a piston rod extending therefrom and an inlet at the other end thereof, a pivotal lever centrally supported and connected at one end to the said latch bolt and at the other end to said piston rod, a vacuum pump operatively connected to said running gear, a pipe from the inlets to said vacuum pump communicating with the inlet to said cylinder, and a spring adapted to move said piston and withdraw said latch bolt from engagement with said latch on the reduction of the speed of the vehicle to a predetermined rate, substantially as described.

66. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, means for controlling said arresting mechanism connected thereto and carried by said vehicle and having a rotating stem, a rotary latch fixedly secured to said rotating stem having a short and long length of rim portion between the notches thereof, a rotary latch fixedly secured to said rotating stem having a length of rim portion shorter than the short length of rim portion of the aforesaid latch, latch bolts slidably arranged in relation to said latches, a pair of cylinders having pistons operating therein and piston rods extending therefrom and inlets at the opposite ends thereof, pivotal levers centrally supported and connected at one end to the said latch bolts and at the other end to said piston rods, a pipe connecting the inlets to said cylinders, a vacuum pump operatively connected to said running gear, a pipe from the inlets to said vacuum pump communicating with the pipe leading to said cylinders, a spring inserted in the latter cylinder exerting a constant spring pressure against the piston thereof and adapted to cause the withdrawal of the corresponding latch bolt on the reduction of speed of the vehicle to a predetermined rate, and a spring inserted in the former of said cylinders and adapted to release the corresponding latch bolt on the cessation of movement of the said vehicle, substantially as described.

67. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, an air pump, means for operating said air pump through the movement of the vehicle, and means for controlling said automatic means operatively connected with said air pump, substantially as described.

68. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, an air pump operatively connected with said running gear, a cylinder having a piston operating therein and a piston rod extending therefrom and an inlet at the opposite end, a valve chamber at one end of said cylinder having inlet and exhaust openings, a valve operating in said valve chamber connected to said piston rod,

pipes connecting the outlets from said air pump and leading to the inlet to said cylinder, an expansile fluid supply, and a pipe connecting said expansile fluid supply with the inlet to said valve chamber, and means governed by the movement of said valve in said valve chamber for governing the operation of said automatic means; substantially as described.

69. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, an air pump operatively connected with said running gear, a cylinder having a piston operating therein and a piston rod extending therefrom and an inlet at the opposite end, a valve chamber at one end of said cylinder having inlet and exhaust openings, a valve operating in said valve chamber connected to said piston rod, pipes connecting the outlets from said air pump and leading to the inlet to said cylinder, an expansile fluid supply, and a pipe connecting said expansile fluid supply with the inlet to said valve chamber, a spring encircling said piston rod and adapted to move said piston and said valve on the cessation of movement of said vehicle and open said inlet and outlets in said valve chamber, and means governed by the movement of said valve in said valve chamber for governing the operation of said automatic means, substantially as described.

70. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, an air pump operatively connected with said running gear, a cylinder having a piston operating therein and a piston rod extending therefrom and an inlet at the opposite end, a valve chamber at one end of said cylinder having inlet and exhaust openings, a valve operating in said valve chamber connected to said piston rod, pipes connecting the outlets from said air pump and leading to the inlet to said cylinder, an expansile fluid supply, a pipe connecting said expansile fluid supply with the inlet to said valve chamber, a spring encircling said piston rod and adapted to move said piston and said valve on the cessation of movement of said vehicle and open said inlet and outlets in said valve chamber, a cylinder having an inlet thereto at one end thereof connected with the outlet from said valve chamber and a piston operating therein and a piston rod extending therefrom at the opposite end, a pivotal lever centrally supported and connected at one end to said piston rod, a latch bolt engaging said latch and pivotally connected to the other end of said lever, and a spring encircling said piston rod and exerting a constant pressure on said latch bolt in the direction of said latch, substantially as described.

71. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, an air pump operatively connected with said running gear, a cylinder having a piston operating therein and a piston rod extending therefrom, a valve chamber at the end of said cylinder having inlet and exhaust openings, a valve operating in said valve chamber connected to said piston rod, a pipe connecting the outlets from said air pump and leading to the inlet to said cylinder, a spring encircling the piston rod of said cylinder and adapted to move said piston and said valve on the reduction of the speed of the vehicle to a predetermined rate, and means governed by the movement of said valve in said valve chamber for governing the operation of said automatic means, substantially as described.

72. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism, an air pump operatively connected with said running gear, a cylinder having a piston operating therein and a piston rod extending therefrom, a valve chamber at the end of said cylinder having inlet and exhaust openings, a valve operating in said valve chamber connected to said piston rod, a pipe connecting the outlets from said air pump and leading to the inlet to said cylinder, a spring encircling the piston rod of said cylinder and adapted to move said piston and said valve on the reduction of the speed of the vehicle to a predetermined rate, an expansile fluid supply, a pipe connecting said expansile fluid supply with the inlet to said valve chamber, a spring encircling said piston rod and adapted to move said piston and said valve on the cessation of movement of said vehicle and open said inlet and outlets in said valve chamber, a cylinder having an inlet thereto at one end thereof connected with the outlet from said valve chamber and a piston operation therein and a piston rod extending therefrom at the opposite end, a pivotal lever centrally supported and connected at one end to said piston rod, a latch bolt engaging said latch and pivotally connected to the other end of said lever, and a spring encircling said piston rod and exerting a constant pressure on said latch bolt in the direction of said latch, substantially as described.

73. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line pipe, of means for controlling said mechanism carried by said vehicle, means apart from said vehicle for operating said controlling means, and

means for cutting out said controlling means, substantially as described.

74. In an automatic stop for railway vehicles, the combination with the arresting mechanism, and a train line pipe, of automatic means for controlling said arresting mechanism having communication with said train line and carried by said vehicle, a valve interposed between said automatic means and said train line and inaccessible while the vehicle is in motion for rendering the automatic means inoperative, substantially as described.

75. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line pipe extending from end to end of said vehicle, automatic means for controlling said arresting mechanism, manual means for controlling said arresting mechanism, a pipe connecting said automatic means and said manual means with said train pipe, a valve interposed in the length of said pipe between said train pipe and said controlling means and inaccessible during the movement of the vehicle, substantially as described.

76. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line pipe extending from end to end of said vehicle, automatic means for controlling said arresting mechanism, manual means for controlling said arresting mechanism, a pipe connecting said automatic means and said manual means with said train pipe, a valve casing interposed in the length of said pipe between the said train line and said controlling means having a plurality of inlets and a plurality of corresponding outlets, a valve within said casing adapted to close certain of said inlets when other of said inlets are open and to open said closed inlets on the closing of the open inlets, a branch pipe from said train line pipe connected to one of the inlets of the aforesaid valve casing which is opened on the closing of the inlet establishing communication between the controlling means and the train pipe, valves in said train line pipe communicating with said branch pipe, and a valve in said branch pipe, substantially as described.

77. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line pipe extending from end to end of said vehicle, automatic means for controlling said arresting mechanism, manual means for controlling said arresting mechanism, a pipe connecting said automatic means and said manual means with said train pipe, a valve casing interposed in the length of said pipe between the said train line and said controlling means having a plurality of inlets and a plurality of corresponding outlets, a valve within said casing adapted to close certain of said inlets when other of said inlets are open and to open said closed inlets on the closing of the open inlets, a three way valve interposed in the length of train pipe at one end of said vehicle and having an outlet therefrom, a three way valve interposed in the length of train pipe at the other end of said vehicle having an outlet therefrom, a branch pipe connecting the outlets from said three way valves, a three way valve interposed in the length of said branch pipe having inlets in communication therewith and an outlet therefrom, a pipe connecting the outlet from said valve casing with the aforesaid valve casing interposed in the length of pipe from the train line to the controlling means and forming a communication between the outlet from the three way valve in the said branch pipe to one of the inlets in the aforesaid valve casing which is open when the inlet communicating with said controlling means is closed, substantially as described.

78. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line pipe extending from end to end of said vehicle, automatic means for controlling said arresting mechanism, manual means for controlling said arresting mechanism, a pipe connecting said automatic means and said manual means with said train pipe, a valve casing interposed in the length of said pipe between the said train line and said controlling means having a plurality of inlets and a plurality of corresponding outlets, a valve within said casing adapted to close certain of said inlets when other of said inlets are open and to open said closed inlets on the closing of the open inlets, a valve casing interposed in the length of said train pipe at one end thereof having a port leading to said pipe and a port leading to the continuation of said pipe and a port arranged intermediate of the aforesaid ports, a valve casing interposed in the length of said train pipe at the other end thereof having a port leading to said pipe and a port leading to the continuation of said pipe and a port arranged intermediate of the aforesaid ports, valves in said valve casings adapted to close the outer ports and the intermediately arranged ports, a branch pipe joining the intermediate ports of said valve casings, a valve casing interposed in the length of said branch pipe having an outlet port therefrom, a valve in said valve casing adapted to close either of the inlet ports to said casing, a pipe connecting the outlet from said valve casing with the aforesaid valve casing interposed in the length of pipe from the train line to the controlling means and forming a communication between the outlet from the three way valve in the said branch pipe to one of the inlets in the afore-

said valve casing which is open when the inlet communicating with said controlling means is closed, substantially as described.

79. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line pipe extending from end to end of said vehicle, automatic means for controlling said arresting mechanism, manual means for controlling said arresting mechanism, a pipe connecting said automatic means and said manual means with said train pipe, a valve casing interposed in the length of said pipe between the said train line and said controlling means having a plurality of inlets and a plurality of corresponding outlets, a valve within said casing adapted to close certain of said inlets when other of said inlets are open and to open said closed inlets on the closing of the open inlets, a branch pipe from said train line pipe connected to one of the inlets in the said valve casing which is open when the inlet communicating with the controlling means is closed, means for cutting out said branch pipe, and means for indicating the position of said valve, substantially as described.

80. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line pipe extending from end to end of said vehicle, automatic means for controlling said arresting mechanism, manual means for controlling said arresting mechanism, a pipe connecting said automatic means and said manual means with said train pipe, a valve casing interposed in the length of said pipe between the said train line and said controlling means having a plurality of inlets and a plurality of corresponding outlets, a valve within said casing adapted to close certain of said inlets when other of said inlets are open and to open said closed inlets on the closing of the open inlets, a branch pipe from said train line pipe connected to one of the inlets in the said valve casing which is open when the inlet communicating with the controlling means is closed, means for cutting out said branch pipe, an expansile fluid supply, a pipe from said expansile fluid supply communicating with an inlet to said valve casing which is open when the inlet to said controlling means is open, a visual signal, and a pipe leading from the outlet corresponding to the inlet from said expansile fluid supply to said visual signal, substantially as described.

81. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line pipe extending from end to end of said vehicle, automatic means for controlling said arresting mechanism, manual means for controlling said arresting mechanism, a pipe connecting said automatic means and said manual means with said train pipe, a valve casing interposed in the length of said pipe between the said train line and said controlling means having a plurality of inlets and a plurality of corresponding outlets, a valve within said casing adapted to close certain of said inlets when other of said inlets are open and to open said closed inlets on the closing of the open inlets, a branch pipe from said train line pipe connected to one of the inlets in the said valve casing which is open when the inlet communicating with the controlling means is closed, means for cutting out said branch pipe, an expansile fluid supply, a pipe from said expansile fluid supply communicating with an inlet to said valve casing which is open when the inlet to said controlling means is open, a cylinder having an inlet at one end thereof, a plunger operating in said cylinder, a semaphore arm pivotally supported from said cylinder, a connecting rod pivotally secured to said plunger and said semaphore arm, a pipe leading from the outlet corresponding to the inlet from said expansile fluid supply to said visual signal, substantially as described.

82. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line pipe extending from end to end of said vehicle, automatic means for controlling said arresting mechanism, manual means for controlling said arresting mechanism, a pipe connecting said automatic means and said manual means with said train pipe, a valve casing interposed in the length of said pipe between the said train line and said controlling means having a plurality of inlets and a plurality of corresponding outlets, a valve within said casing adapted to close certain of said inlets when other of said inlets are open and to open said closed inlets on the closing of the open inlets, a branch pipe from said train line pipe connected to one of the inlets in the said valve casing which is open when the inlet communicating with the controlling means is closed, means for cutting out said branch pipe, an expansile fluid supply, a pipe from said expansile fluid supply communicating with an inlet to said valve casing which is open when the inlet to said controlling means is closed, an audible signal, a pipe leading from the outlet corresponding to the inlet from said expansile fluid supply to said audible signal, and a valve interposed in the length of said pipe, substantially as described.

83. In an automatic stop for railway vehicles, the combination with the arresting mechanism and a train line pipe extending from end to end of said vehicle, automatic means for controlling said arresting mechanism, manual means for controlling said arresting mechanism, a pipe connecting said automatic means and said manual means

with said train pipe, a valve casing interposed in the length of said pipe between the said train line and said controlling means having a plurality of inlets and a plurality of corresponding outlets, a valve within said casing adapted to close certain of said inlets when other of said inlets are open and to open said closed inlets on the closing of the open inlets, a branch pipe from said train line pipe connected to one of the inlets in the said valve casing which is open when the inlet communicating with the controlling means is closed, means for cutting out said branch pipe, an expansile fluid supply, a pipe from said expansile fluid supply communicating with an inlet to said valve casing which is open when the inlet to said controlling means is closed, a valve casing having an inlet and an outlet, a valve in said valve casing operatively connected to the throttle lever for controlling the movement of the vehicle and opening communication between said inlet and said outlet on the opening of the throttle, a whistle connected to said outlet, and a pipe leading from the outlet corresponding to the inlet from said expansile fluid supply to the inlet of said valve casing, substantially as described.

84. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism on said vehicle, automatic means for controlling said arresting mechanism, manual means for controlling said arresting mechanism, means for operating said automatic controlling means apart from said vehicle, means operatively connected to said running gear for controlling the automatic means for controlling said arresting mechanism, means for cutting out said manual and automatic means for controlling the arresting mechanism, and means for indicating the condition of said cutting out means, substantially as described.

85. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism supported from the vehicle body, means for operating said controlling means supported from said running gear, and means for actuating said operating means apart from said vehicle, substantially as described.

86. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism supported from the vehicle body, and having an operating lever extending therefrom, a rod supported from said running gear and extending above said vehicle body, a striker lever pivotally supported from said rod, means for operating said operating lever from said striker lever, and means apart from said vehicle for actuating said striker lever, substantially as described.

87. In a device of the class described, in combination, a vehicle having a suitable running gear, an arresting mechanism in said vehicle, automatic means for controlling said arresting mechanism supported from the vehicle body, and having an operating lever extending therefrom, and a vertical slot in said lever, a rod pivotally supported from said running gear and extending above said vehicle body having a T-shaped upper end and journal bearings in the ends of said T-shaped end, a lever supported in the forward journal in the T-shaped end, a lever supported in the rear journal in the T-shaped end, a connecting rod pivotally secured at one end to the first mentioned lever midway of the length thereof and to the other lever midway of its length at the end thereof and having a pin from the extending end extending through the slot in the said operating lever, and means apart from said vehicle for operating said lever, substantially as described.

88. In a device of the class described, in combination, a cylinder having a reduced end and suitable inlets and outlets, a pair of pistons in the larger end and a pair of pistons in the smaller end, the outer one of each of said pair having an orifice therethrough, a piston rod joining said pistons, feed pipes leading to the inlets of said cylinder and communicating therewith, a check valve introduced in the pipe leading to the reduced end of said cylinder, and means having parts governed by said pistons in said cylinder for controlling the arresting mechanism of said vehicle, substantially as described.

89. In a device of the class described, in combination, a vehicle having a suitable running gear, a vacuum pump operatively connected with said running gear, cylinders having exhaust openings therefrom and pistons operating therein, pipes leading from said cylinders to said vacuum pump, and means having parts governed by said pistons in said cylinders for controlling the arresting mechanism of said vehicle, substantially as described.

90. In a device of the class described, in combination, a vehicle having a suitable running gear, an air pump operatively connected with said running gear, cylinders having inlets thereto and pistons operating therein, pipes leading from said air pump to said cylinders, and means having parts governed by said pistons in said cylinders for controlling the arresting mechanism of said vehicle, substantially as described.

91. In a device of the class described, in combination, a vehicle having a suitable running gear, an air pump operatively connected with said running gear, cylinders having in-

lets thereto and pistons operating therein, pipes leading from said air pump to said cylinders, valve casings adjacent to said cylinders having an inlet and an outlet and valves therein, operatively connected with said pistons, pipes leading from an expansile fluid supply to said inlets, cylinders having inlets and pistons operating therein, pipes from said valve casings to said cylinders, and means having parts governed by said pistons in said cylinders for controlling the arresting mechanism of said vehicle, substantially as described.

Signed at the city of Toronto, in the county of York, Province of Ontario, in the Dominion of Canada, this 25th day of March, 1907.

JAMES HARRY KEIGHLY McCOLLUM.

Witnesses:
H. DENNISON,
WM. C. MUIR.