J. R. GOLDEN.

AUTOMATIC GATE FOR RAILWAY CROSSINGS.

APPLICATION FILED AUG. 26, 1911.

1,053,591.

Patented Feb. 18, 1913.

4 SHEETS—SHEET 1.

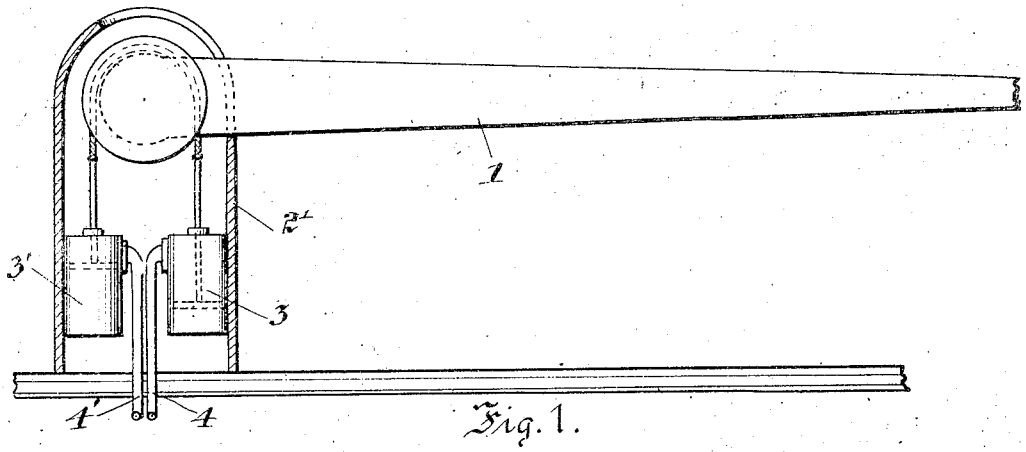

Fig. 1.

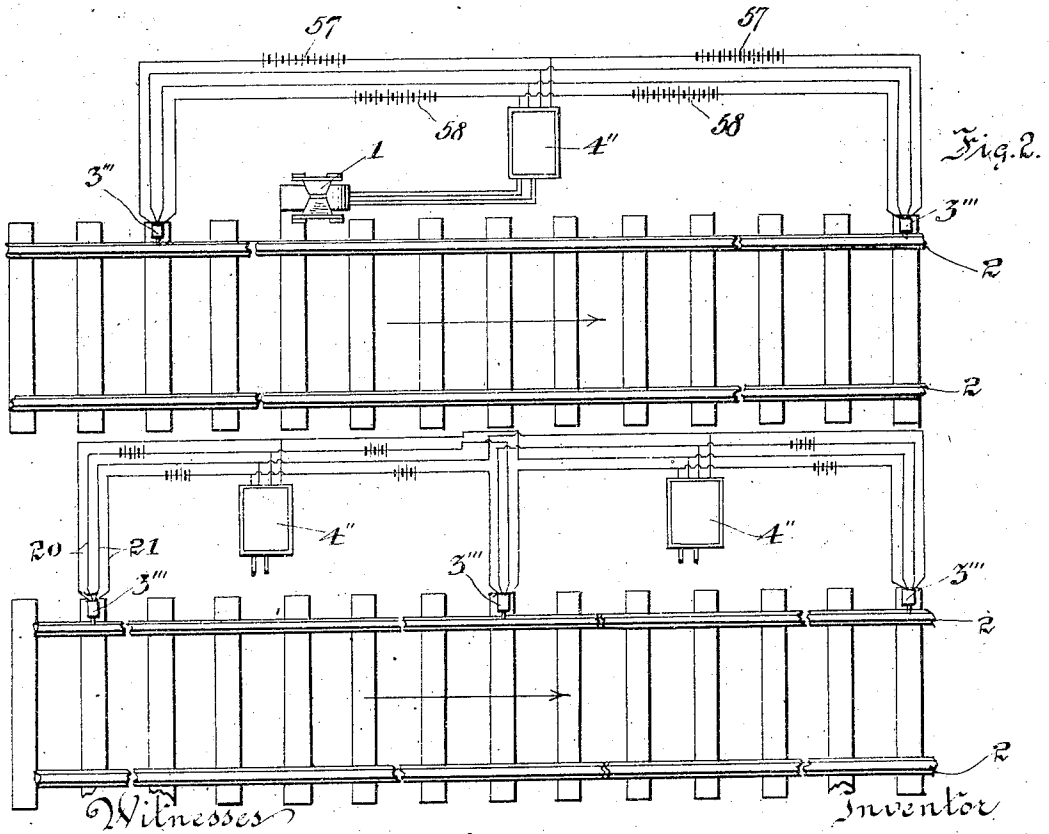

Fig. 2.

Fig. 3.

Witnesses

W. E. Smith

B. G. Richards

Inventor

John R. Golden

by Joshua H. Potts

his Attorney.

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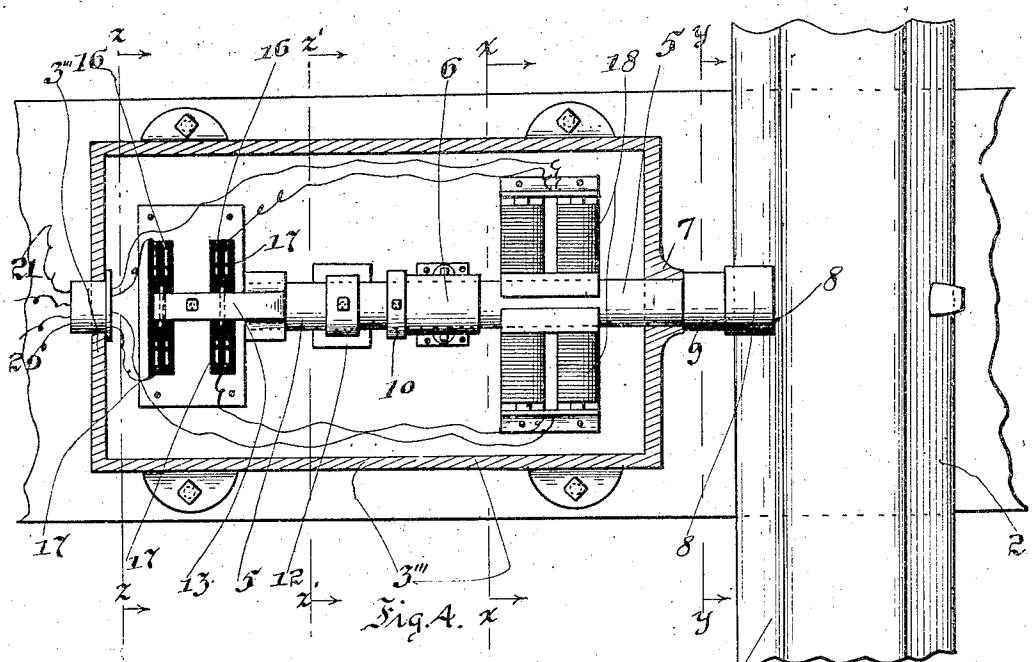

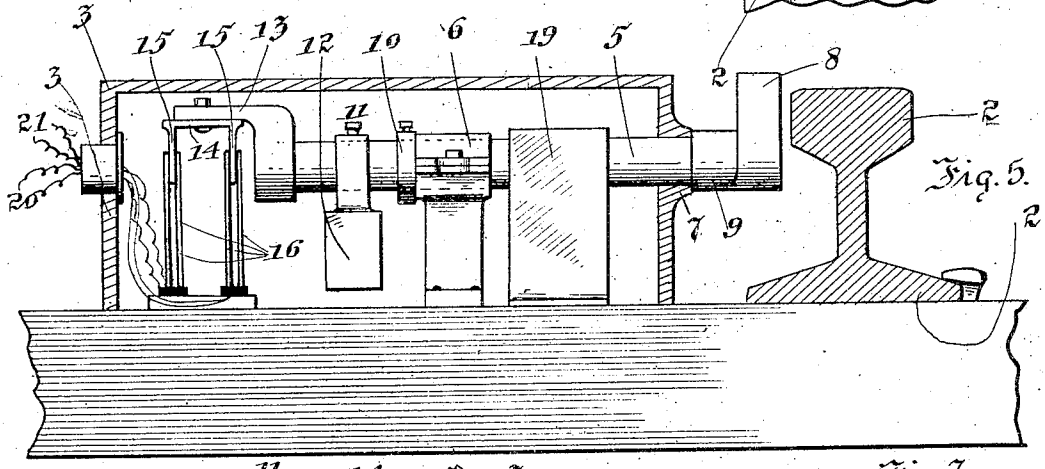

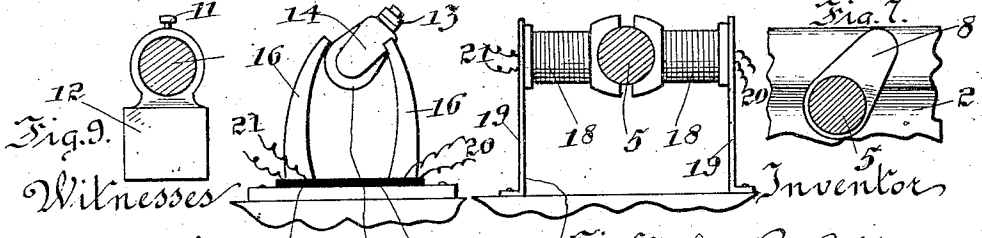

Witnesses

W. T. Smith

B. G. Richards

Inventor

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by Joshua R. H. Potts

his Attorney

J. R. GOLDEN.

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4 SHEETS—SHEET 3.

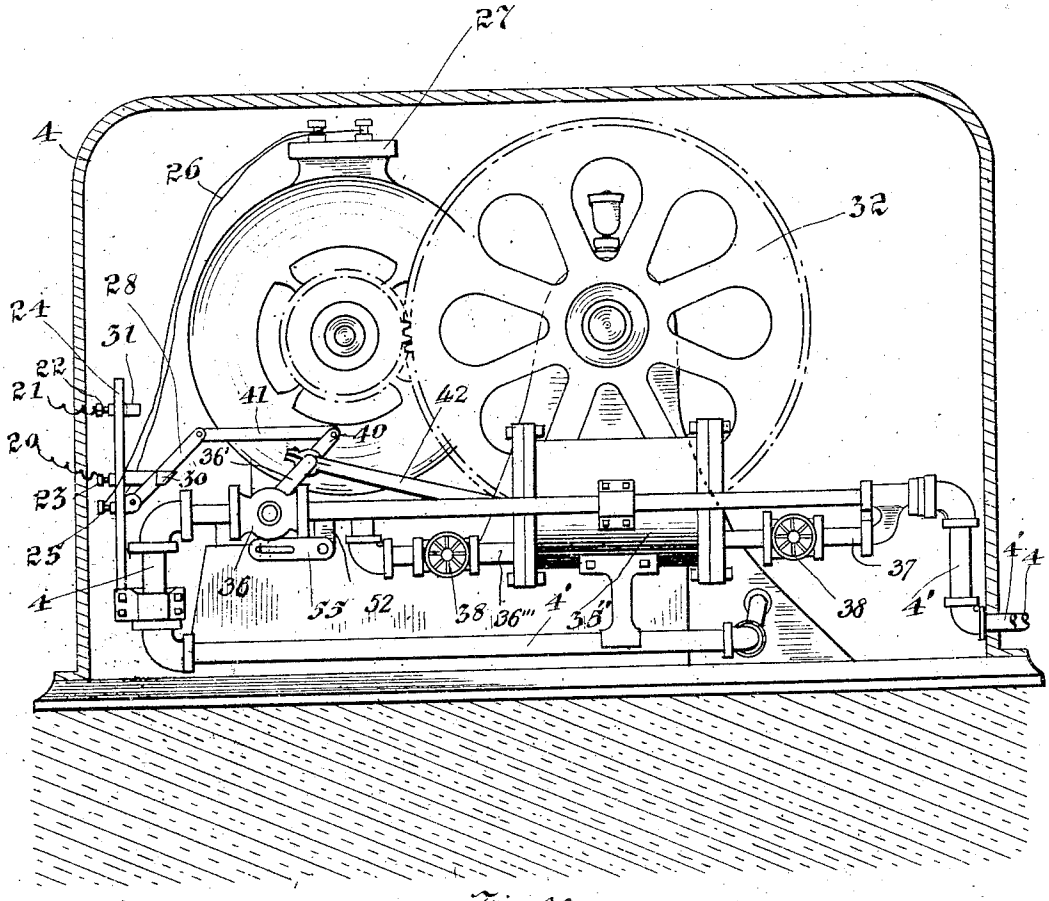

Fig. 10.

Witnesses:

W. C. Smith

B. G. Richards

Inventor:

John R. Golden,

by Joshua R. H. Todd

his Attorney.

J. R. GOLDEN.

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4 SHEETS—SHEET 4.

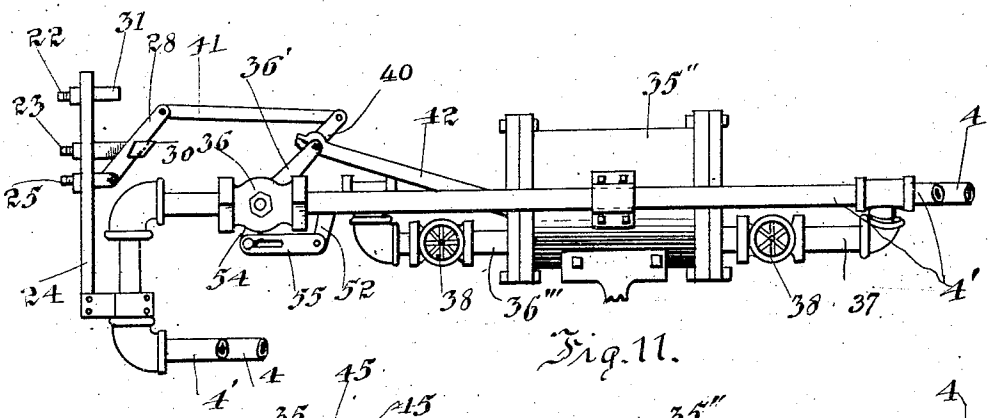

Fig. 11.

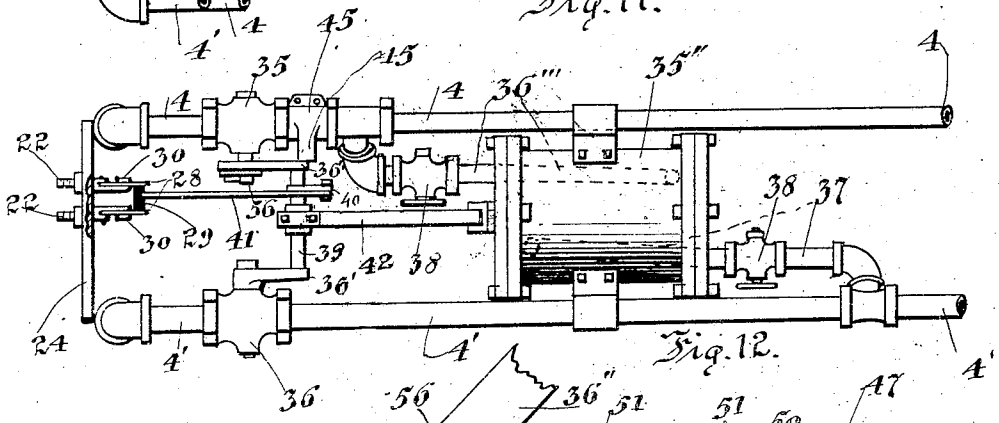

Fig. 12.

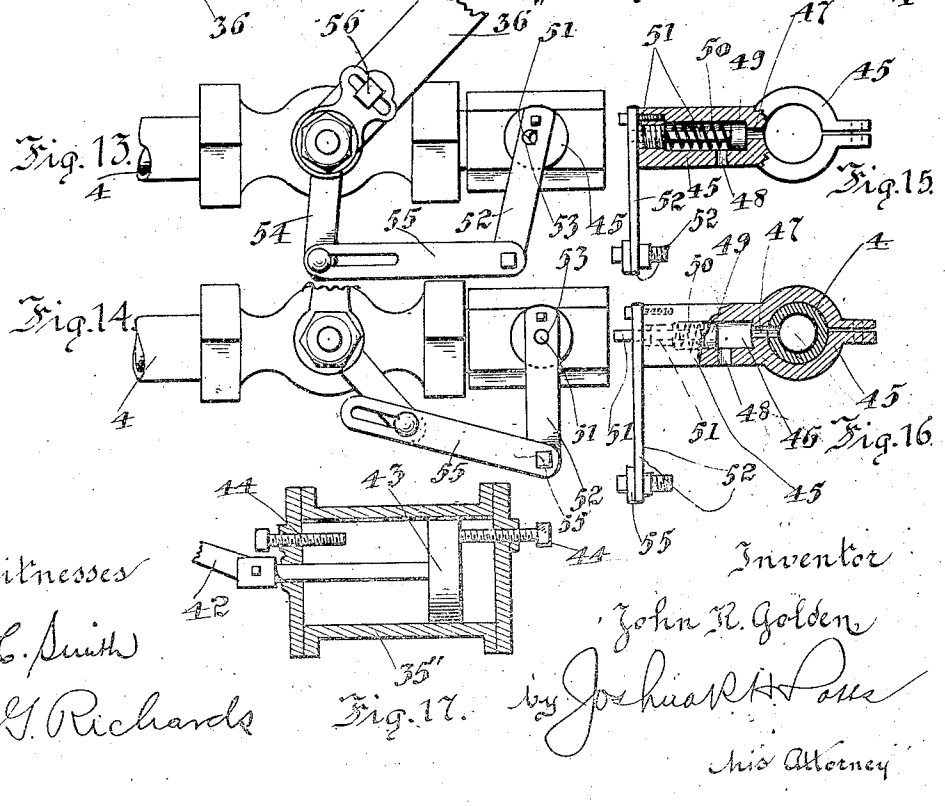

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

Witnesses

W. C. Smith

B. G. Richards

Inventor

John R. Golden

by Joshua R. H. Potts

his Attorney

UNITED STATES PATENT OFFICE.

JOHN R. GOLDEN, OF HAMMOND, INDIANA.

AUTOMATIC GATE FOR RAILWAY-CROSSINGS.

1,053,591. Specification of Letters Patent. Patented Feb. 18, 1913.

Application filed August 26, 1911. Serial No. 646,092.

To all whom it may concern:

Be it known that I, JOHN R. GOLDEN, a citizen of the United States, residing at the city of Hammond, county of Lake, and State of Indiana, have invented certain new and useful Improvements in Automatic Gates for Railway-Crossings, of which the following is a specification.

My invention relates to improvements in automatic gates for railway crossings, and has for its object the provision of an automatically controlled gate which is so designed and constructed as to be operated pneumatically when a train passes over a controlling switch in the neighborhood of the crossing.

My invention consists in the combinations and arrangements of parts hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings forming a part of this specification and in which,

Figure 1 is a side elevation of a railway gate employed in my invention, Fig. 2 is a top plan view of the preferred arrangement of operating parts of my invention, Fig. 3 is a modified arrangement of said operating parts, Fig. 4 is a horizontal section showing an electrical switch box, a railway rail being shown in top plan view, Fig. 5 is a vertical section of said switch box and rail, Fig. 6 is a transverse section taken on the line x—x of Fig. 4, Fig. 7 is a transverse section taken on a line y—y of Fig. 4, Fig. 8 is a transverse section taken on a line z—z of Fig. 4, Fig. 9 is a section taken on a line z'—z' of Fig. 4, Fig. 10 is a side elevation of the gate controlling mechanism and showing the electrical connections thereof with the controlling switch, Fig. 11 is a side elevation of the main parts of said gate controlling mechanism, Fig. 12 is a top plan view of said last named parts, Fig. 13 is an enlarged detailed side elevation showing a valve employed in the mechanism in closed position, Fig. 14 is a view similar to Fig. 13 but showing said valve in open position, Figs. 15 and 16 are transverse sectional views of parts shown in Figs. 13 and 14 respectively, and Fig. 17 is an enlarged longitudinal vertical section of a cylinder employed in said mechanism.

The preferred form of construction as illustrated in the accompanying drawings comprises an ordinary gate 1 which is mounted on a frame 2′ and pneumatically operated in the usual manner, there being compressed air cylinders 3 and 3′ and pipes 4 and 4′ leading thereto. The construction is such that when compressed air is supplied to the pipe 4′ that the piston in the cylinder 3′ will be depressed, thus raising the gate 1 by means of the ordinary flexible transmission leading thereto. When compressed air is supplied to the pipe 4 the piston within the cylinder 3 will be depressed, thus causing the gate 1 to be lowered into the normal position as shown in Fig. 1. By reference to Fig. 2 the arrangement of the gate ~~1~~, a railway track 2, electrical switch box 3‴, electro-pneumatic gate controlling mechanism 4″, and the electric connections of the latter with said switch boxes, will be understood. The arrangement as shown in Fig. 2 is preferred, but if so desired an arrangement as shown in Fig. 3 may be adopted which reduces the number of operating parts.

Each switch box 3‴ is provided with a longitudinally disposed switch shaft 5 which is journaled in bearings 6 and 7 provided in said box as illustrated in Figs. 4 and 5. One end of the shaft 5 is provided with an operating lever 8 which is disposed adjacent a rail 2 and adapted to be oscillated by contact with the tread of a railway wheel, the direction of oscillation of the operating lever 8 depending upon the direction of movement of a train running upon the track 2. A hub 9 is provided at the center of oscillation of the lever 8 and either rigidly secured to or formed integral with the shaft 5 so as to rotate with the latter. A collar 10 is secured to the shaft 5 in such a manner as to prevent the same from longitudinal movement. Suspended from the shaft 5 and rigidly secured thereto by means of a set screw 11 is a weight 12 which normally assumes the vertical position as shown in Fig. 9. The inner end of the shaft 5 is provided with an arm 13 which is disposed parallel with the extended axis of said shaft but spaced apart therefrom as clearly illustrated in Fig. 5. To the inner side of the arm 13 is secured a member 14 carrying blades 15 which are adapted to coöperate with pairs of curved members 16 for forming knife switches, said members extending upwardly from an insulating base plate 17 as illustrated in Fig. 8. From this construction it is clear that when the arm 8 is oscillated in one direction that the arm 13 will contact with one pair of members 16,

and when oscillated in the other direction will contact with the other pair, the electrical circuits in connection with said members being thus closed by the oscillation of the arm 8. The function of the weight 12 is to maintain the blades 15 normally out of engagement with the members 16, the normal position of said weight corresponding with the vertical or inoperative position of the arm 8. When the parts are in this position neither of the circuits terminating in the members 16 are closed. Assuming that the arm 8 is oscillated as shown in Fig. 7 due to the wheels of a passing train, then one of the electrical circuits will be closed in a manner as aforesaid. It then becomes necessary to lock the shaft 5 in position a sufficient time for the operation of the gate controlling mechanism in the box 4''. In order to accomplish this a pair of electro-magnets 18 are disposed diametrically opposite relative to the shaft 5 which is the armature of said magnets. Upon the closing of either circuit one of the electro-magnets 18 will be energized and drawn toward its armature or shaft 5, thus causing a frictional locking means as illustrated in Fig. 6. The shaft 5 will remain immovable until the circuit is broken which is effected in the box 4'' as will be hereinafter described. After the circuit is broken the frictional engagement of the magnet 18 with the shaft 5 will be released, whereupon said shaft will return to the normal position by the action of the weight 12. The magnets 18 are supported by means of flexible standards 19 which permit of a slight movement to and from the shaft 5 for making and breaking the locking engagement.

The electrical circuits 20 and 21 connect a switch 3''' with a gate controlling mechanism contained in a box 4'', the wiring diagram being illustrated in Fig. 2. Referring to Fig. 10, the manner in which the circuits 20 and 21 enter the box 4'' is clearly shown, terminals 22 and 23 being provided on a switch board 24 for said circuits respectively. A terminal 25 is also provided on the switch-board 24 from which wires 26 extend to an electric motor 27. Pivotally connected to the inner end of the terminal 25 is an oscillatory switch lever 28 which is adapted to close either the circuit 20 or 21, the former being closed as illustrated in Fig. 10. By reference to Fig. 12 an insulator 29 is shown which separates the two arms of the switch lever 28, thus preventing the passage of an electric current therebetween. When the circuit 20 is closed as illustrated in Fig. 10 the arms of the lever 28 rest in sockets 30 which are provided at the inner extremities of the terminals 20, these sockets providing positive electrical connections. From this construction it is seen that when the switch lever 28 is oscillated to a vertical position that the same will open the circuit 20 and close the circuit 21 by engagement with the inner end 31 of the terminal 22. The electric motor 27 will be furnished current and run in the same direction when the lever 28 rests in the socket 30 or contacts with the terminal 31, supposing the corresponding circuit to be closed.

From the foregoing description it is apparent that when the arm 8 is oscillated in one direction by means of the wheels of a moving train that either the circuit 20 or 21 will be closed and cause the electric motor 27 to operate. An air compressor 32 is geared to the electric motor 27 so as to run simultaneously therewith, this construction being illustrated in Fig. 10. During the operation of the air compressor 32 compressed air is produced in the pipes 4 and 4' leading therefrom to mechanism which will be presently described. Incorporated in the pipe 4 is a valve 35 and in the pipe 4' a similar valve 36, the general arrangement of these valves being shown in Fig. 12. The pipes 4 and 4' are connected to a cylinder 35'' by means of pipes 36''' and 37 respectively, there being valves 38 provided in these pipes for regulating the passage of air there-through. By reference to Fig. 1 it will be observed that the pipe 4 leads to the cylinder 3, consequently when air is supplied to said pipe the gate 1 will be lowered, air within the cylinder 3 acting on the piston thereof as aforesaid. In like manner when the pipe 4' is charged with compressed air the gate will be raised.

The valve controlling mechanism comprises a valve lever 36' and a valve lever 36'', which are connected by means of a rigid crank pin 39. Extending upwardly from the crank pin 39 is an arm 40 which is adapted to transmit motion to the switch lever 28 by means of a connecting rod 41. The crank pin 39 is adapted to oscillate the valve arms 36' and 36'' for effecting the opening and closing of the valves 35 and 36. The crank pin 39 is actuated by means of a connecting rod 42 which extends from said crank pin to a piston 43 operating in the cylinder 35''. This piston is limited in its reciprocation by means of screws 44 which are tapped into the heads of the cylinder 35'', this construction being illustrated in Fig. 17. Clamped to the pipe 4 is a small cylinder 45 the general disposition of which is illustrated in Fig. 12. The bore 46 of this cylinder is arranged in communication with the pipe 4 by means of a short axial passage 47 as shown in Fig. 16, there being a radially extending port 48 leading from said bore which forms an exhaust passage for air contained within the pipe 4. Operating in the bore 46 is a piston 49 which is maintained in the normal closed position

as shown in Fig. 15 by means of a compression helical spring 50 surrounding the stem 51 of the piston 49. Pivoted to an open end of the cylinder 45 is a downwardly extending arm 52, there being an opening 53 provided in said arm which is adapted to register with the free end of the stem 51 when said arm is in vertical position as illustrated in Fig. 14. When the arm 52 is inclined to the vertical as shown in Fig. 13, the stem 51 is not permitted to pass through the opening 53, the interference to such movement being clearly shown. Extending from the lower end of the arm 52 to a depending arm 54 is an adjustable connecting rod 55, said arm 54 being arranged in rigid connection with the valve arm 36'' and adapted to oscillate therewith in an opposite direction. While the arm 54 is rigidly secured to the valve arm or lever 36'' an adjustable connection 56 is provided in order to attain the proper coöperation of the parts.

The operation for opening and closing the gates is as follows: Assuming that the arm 8 has been moved to an inclined position as shown in Fig. 7 by the passage of a train thereover, then the circuit 20 will be closed as will be clear by reference to Figs. 4 and 7. Simultaneously with this operation the motor 27 will begin to run, the current passing through the terminals 23 and socket 30 as illustrated in Fig. 10. Compressed air will now be produced in the pipes 4 and 4' by the action of the air compressor 32. With the position of the operating parts as shown in the several views the valve 35 is open and permits the free flow of compressed air there-through and thence through the pipe 4 for lowering the gate 1, it being understood that this is the first operation of the gate after the arm 8 has been oscillated. A part of the compressed air flowing through the pipe 4 is diverted to the pipe 36''' and thence to the cylinder 35'', the amount of air thus diverted being controlled by the regulating valve 38. The air thus admitted into the cylinder 35'' forces the piston 43 therein from the position shown in Fig. 17, one of the screws 44 limiting the movement of said piston as aforesaid. This action of the piston 43 moves the crank pin 39 and the valve levers 36' and 36'' in such a manner as to close the valve 35 and to open the valve 36. Consequently the compressed air will cease flowing through the pipe 4 and to the cylinder 3, it being assumed that sufficient air has been introduced into the cylinder 3 for the lowering of the gate 1. Simultaneously with the closing of the valve 35 the switch lever 28 is moved out of engagement with the socket 30 and into engagement with the terminal 31. The circuit is thus broken which causes the electro-magnets 18 to be demagnetized whereupon the shaft 5 will be oscillated to its normal or neutral position by means of the weight 12. The gate 1 will remain in the lowermost position as shown in Fig. 1 until the train passes over a second arm 8 which is adapted to close the circuit 21.

As above described, the switch lever 28 has been moved into contact with the terminal 31, consequently when the circuit 21 is closed the motor will begin to operate as before. The compressed air from the compressor 32 will now flow through the pipe 4', valve 36 and thence to the cylinder 3', whereupon the gate 1 is raised by the action of the piston in said cylinder. After the last described operation is completed the compressed air within the pipes 4' and cylinder 3' will have time to leak out sufficiently to reduce the pressure therein to atmospheric pressure. But the time elapsed between the lowering and raising of the gate 1 is very short, consequently it is necessary to provide means for the escape of the compressed air in the pipes 4 after the gate 1 is lowered, it being clear that if a pressure remains in the cylinder 3 that the introduction of compressed air into the cylinder 3' for raising the gate would be counterbalanced. To this end the cylinder 45 is provided. When the switch lever 28 has been moved into contact with the terminal 31 the arm 52 is moved simultaneously into the vertical position as shown in Fig. 14, thus causing the registration of the opening 53 with the piston stem 51. The compressed air within the pipe 4 will now act upon the piston 49 and cause the same to assume the position as shown in Fig. 16, the stem 51 of said piston passing through the opening 53 without interference. This action of the piston 49 uncovers the exhaust port 48 whereupon the compressed air is exhausted. The pressure within the pipe 4 being now reduced to atmospheric pressure there will be no resistance to the action of the piston in the cylinder 3' for raising the gate 1 when this operation occurs.

I have found that the high pressure supplied by the air compressing apparatus easily drives the piston in the cylinder 3 downward against the pressure generated temporarily in the upper end of the other cylinder by the upward movement of the piston therein. The moving parts in cylinder 3' are purposely fitted somewhat loosely, and the slight leakage thus provided for, quickly reduces the pressure in that cylinder below that required to perform any work in raising the gate.

It will be noted that the wires 26 permanently connect the terminals or binding posts 25 to the motor 27. The levers 28 being constantly hinged to the inner ends of the terminals or binding posts 25, consequently, when positioned as in Fig. 10, com-

plete the circuit through 20, while an upward movement of the levers 28 will break this circuit and complete the circuit through 21 by contacting with the sockets 31.

A gate closing and opening mechanism as set forth is simple of construction and reliable in operation.

The arrangement shown in Fig. 3 is adapted for use in cities where the gates are close together, and it is desired to close a gate ahead at the same time a gate behind is open. To this end a switch 3''' is arranged between the two gates and connected with circuits 20 and 21 for each gate controlling mechanism. By this arrangement, when the central switch 3''' is operated to open one gate, it will also close the other.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, the same is capable of variation and modification without departing from the spirit of the invention. I therefore do not wish to be confined to the exact details of construction as set forth, but desire to avail myself of such variations and modifications as fall within the scope of the appended claims.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an automatic gate for railway crossings, the combination with a railway track, of an electric switch arranged adjacent said track and comprising a horizontally disposed oscillatory shaft, an arm formed integral with said shaft at one end thereof and adapted to contact with the tread of a car wheel to produce oscillation thereof, means on said shaft for maintaining the same in a medial neutral position, a pair of electro-magnets arranged adjacent said shaft and adapted to hold the same in an oscillated position, a pair of electric circuits adapted to be opened or closed by the oscillation of said shaft, said electro-magnets being in said circuit, a gate operating mechanism comprising an electric motor, means for switching said motor into either one of said circuits, an air compressor geared to said motor and adapted to supply compressed air, an oscillatory gate member, a pair of pneumatic cylinders adapted to operate said gate member in either direction according to the circuit in which said motor is placed, compressed air pipes leading from said air compressor to said pneumatic cylinders, and valves arranged in said pipes for controlling the distribution of compressed air therein, substantially as described.

2. In an automatic gate for railway crossings, the combination of a railway track, an oscillatory gate member, a pair of pneumatically operated cylinders adapted to operate said member in either direction, an electric switch comprising an oscillatory shaft arranged adjacent said railway track, there being an arm on one end of said shaft capable of being oscillated in either direction according to the direction of movement of a train on said track, said arm being oscillated by the wheels of said train, bearings for said shaft incorporated in said switch, a weight secured to said shaft and adapted to maintain the same in a neutral or intermediate position, a pair of electro-magnets adapted to hold said shaft in an oscillated position when energized by a current passing there-through, a pair of electric circuits leading from said switch, said electro-magnets being in said circuits, said shaft being adapted to open or close either circuit when oscillated, the circuit which is closed or opened being determined by the direction of movement of the train on said track, a gate controlling mechanism comprising an electric motor arranged so as to be placed in either of said circuits, an air compressor driven by said electric motor and adapted to supply compressed air for the operation of said pneumatic cylinders, and means for diverting a portion of the compressed air introduced to one of said pneumatic cylinders for opening a switch in the circuit in which said motor is temporarily placed, substantially as described.

3. In an automatic gate for railway crossings, the combination with a railway track, of an electric switch arranged adjacent said track and comprising an oscillatory shaft adapted to be operated by the wheels of a train passing over said track, the direction of oscillation of said shaft depending upon the direction of movement of said train, a pair of electric circuits adapted to be closed by the oscillation of said shaft, each circuit being open when said shaft is in an intermediate or neutral position, a weight mounted on said shaft for normally maintaining the same in said neutral position, a pair of electro-magnets arranged in operative connection with said shaft and adapted to automatically hold the same in any oscillated position thereof, a gate controlling mechanism comprising an electric motor, means for placing said motor in either one of said circuits, an air compressor geared to said motor and adapted to generate compressed air, an oscillatory gate member, a pair of pneumatic cylinders for oscillating said member, means for furnishing compressed air to said cylinders alternately from said compressed air supply, and means for automatically opening the circuit in which said motor is placed after the delivery of sufficient air to one of said pneumatic cylinders for operating said gate member in one direction, substantially as described.

4. In an automatic gate for railway crossings, the combination with a railway track,

of an electric switch arranged adjacent said track and adapted to be operated by the wheels of trains passing thereover, a pair of circuits leading from said switch and adapted to be opened or closed by the operation thereof, a gate controlling mechanism comprising an electric motor, means for placing said motor in either one of said circuits, an air compressor geared to said motor and adapted to supply compressed air, an oscillatory gate member, a pair of pneumatic cylinders one of which is adapted to oscillate said member in one direction and the other cylinder to operate the same in the other direction, a pair of pipes leading from said air compressor to said pair of cylinders, and pneumatic means for switching said motor into the other circuit when sufficient air has been delivered to one of said pneumatic cylinders for operating said gate in one direction, substantially as described.

5. In an automatic gate for railway crossings, the combination with a railway track of an electric switch arranged adjacent said track and adapted to be operated by the wheels of trains passing thereover, a pair of electric circuits leading from said switch and adapted to be opened or closed thereby, one circuit being closed when a train is passing in one direction and the other circuit being closed when a train is passing in the other direction, a gate controlling mechanism comprising an electric motor, means for placing said motor in either one of said circuits, means for supplying electrical energy to said circuits, an air compressor geared to said motor and adapted to operate synchronously therewith, an oscillatory gate member, a pneumatic cylinder adapted to lower said gate, a second pneumatic cylinder adapted to raise said gate, compressed air pipes leading from said air compressor to said cylinders for supplying operative fluid thereto, a switch cylinder, means for diverting a portion of the compressed air being delivered to one of said pneumatic cylinders to said switch cylinder, and means coöperating with said switch cylinder for breaking the circuit in which said motor is placed, substantially as described.

6. In an automatic gate for railway crossings, an oscillatory gate member, a pneumatic cylinder adapted to oscillate said member in one direction, a second pneumatic cylinder for oscillating said gate member in the other direction, an air compressor, pipes leading from said air compressor to said pneumatic cylinders, valves for shutting off the air in one of said pipes when compressed air is flowing through the other, a switch cylinder arranged in piped connection with said compressed air pipes and adapted to receive a portion of the compressed air flowing there-through, a piston operating in said switch cylinder and adapted to control the shut-off valves in said compressed air pipes, an electric motor, a switch in combination with a railway track and adapted to be operated by trains passing thereover, a pair of circuits leading from said switch, means for placing said motor in either one of said circuits, and means coöperating with said valves for breaking a circuit in which said motor is placed, substantially as described.

7. In an automatic gate for railway crossings, an oscillatory gate member, a pneumatic cylinder adapted to oscillate said member in one direction, a second pneumatic cylinder for oscillating said gate member in the other direction, an air compressor, pipes leading from said air compressor to said pneumatic cylinders, valves for shutting off the air in one of said pipes when compressed air is flowing through the other, a switch cylinder arranged in piped connection with said compressed air pipes and adapted to receive a portion of the compressed air flowing there-through, a piston operating in said switch cylinder and adapted to control the shut-off valves in said compressed air pipes, an electric motor, a switch in combination with a railway track and adapted to be operated by trains passing thereover, a pair of circuits leading from said switch, means for placing said motor in either one of said circuits, means coöperating with said valves for breaking a circuit in which said motor is placed, and automatic means for exhausting compressed air after use in one of said pneumatic cylinders, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN R. GOLDEN.

Witnesses:

HELEN F. LILLIS,

ARTHUR A. OLSON.