May 15, 1962 J. HOLT 3,034,240

HIGHWAY CROSSING GATE CONTROL SYSTEM FOR RAILROADS

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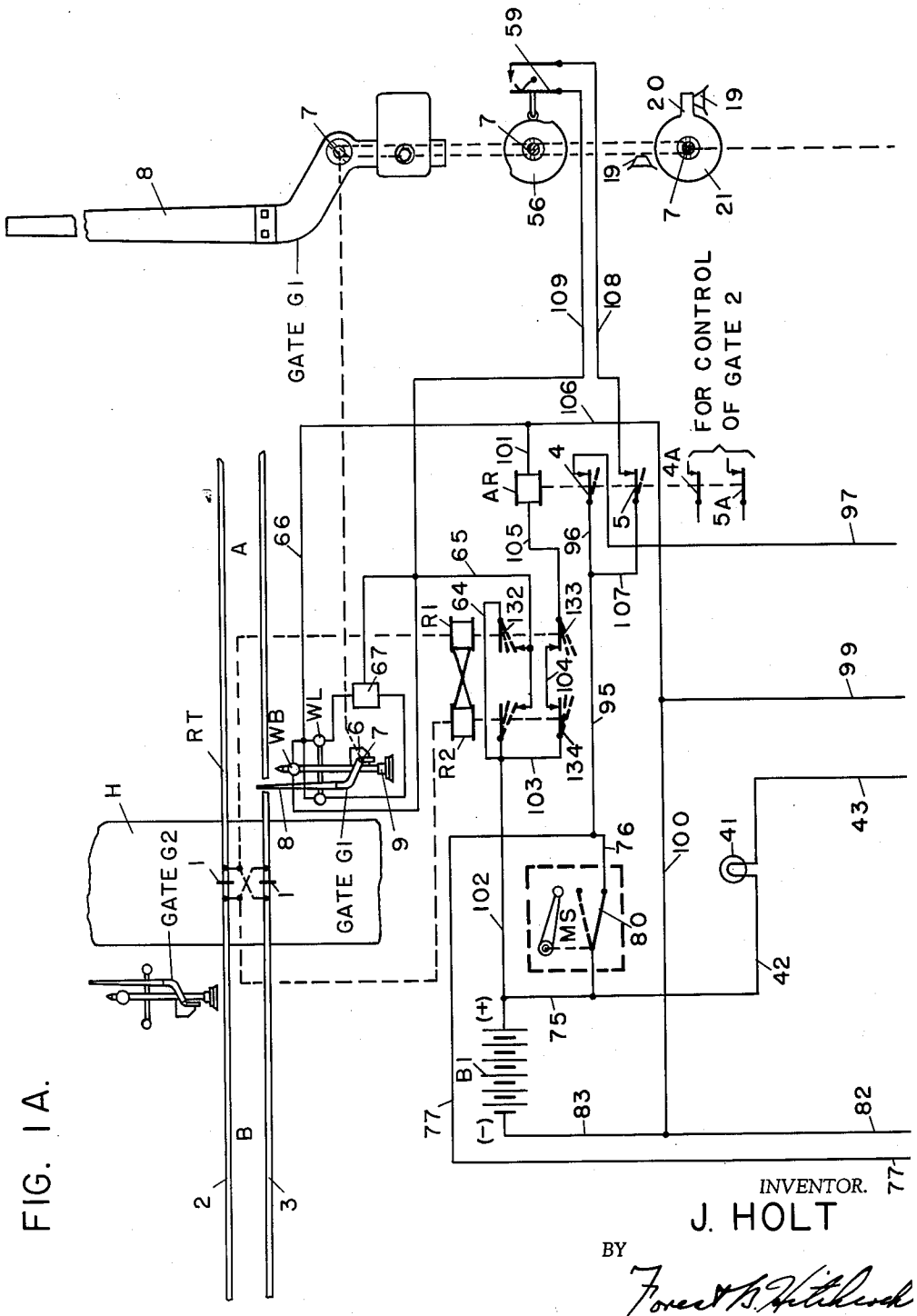



FIG. 1A.

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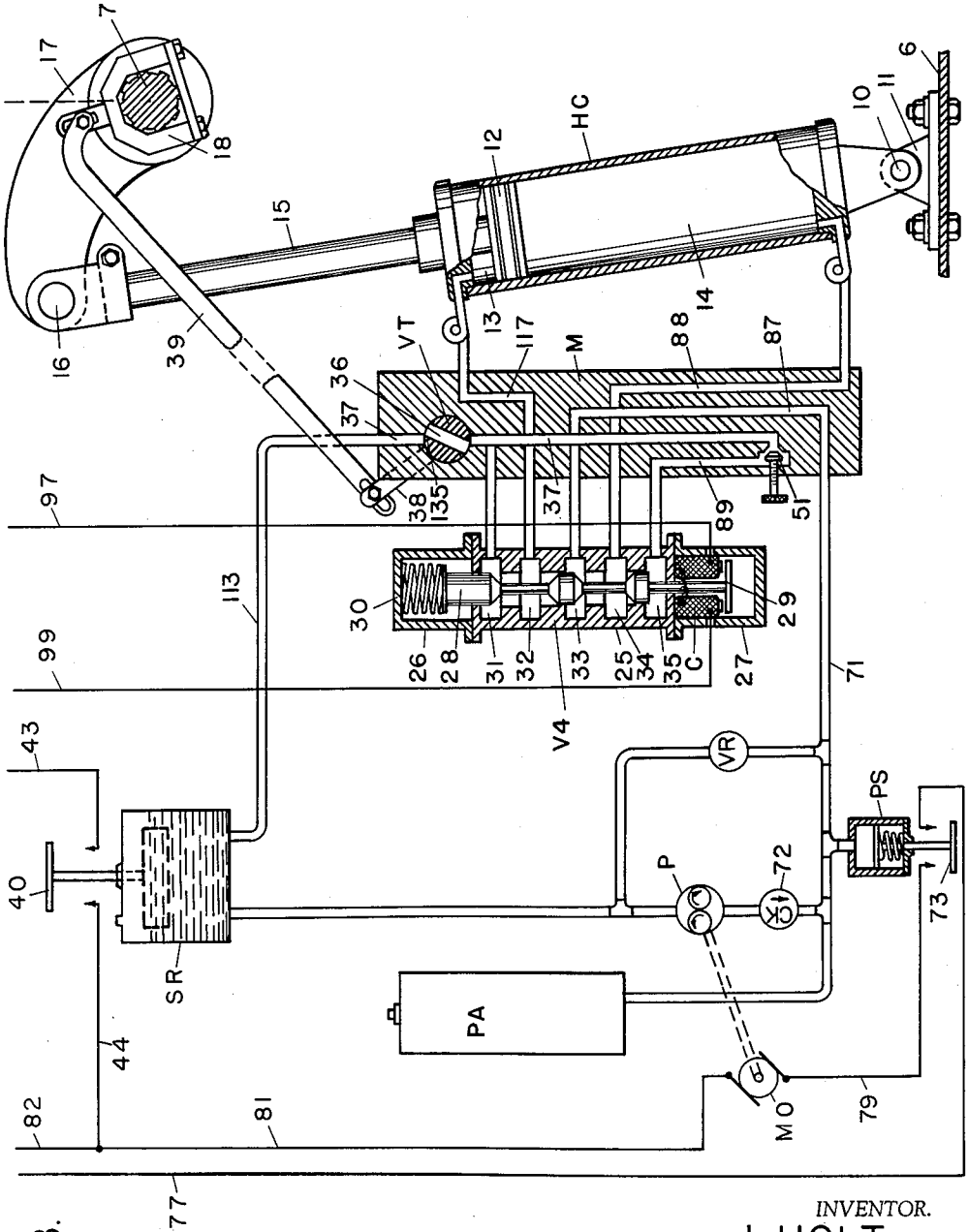



FIG. 1B.

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3,034,240

# HIGHWAY CROSSING GATE CONTROL SYSTEM FOR RAILROADS

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3 Claims. (Cl. 39—7)

This invention relates to railroad highway crossing gates and more particularly relates to an electrically controlled hydraulically operated gate mechanism.

In automatically operated railroad highway crossing gates of this general character, the gate arm is normally held in an upright clear position to permit highway traffic to cross the railroad tracks. Upon the approach of a train, the gate arm is lowered to a horizontal position to extend across the highway to block traffic. In some instances, a crossing gate is located on each side of the highway on opposite sides of the railroad track so that the traffic lane in one direction is blocked by one gate whereas the traffic lane in the other direction is blocked by another gate. In other instances, the gate arm may be long enough to block the entire highway.

In either case, with modern highways having increased width, longer gate arms are required which means that more mass must be moved in an efficient manner to prevent damage to the gate arms and mechanism. Also, the snow and sleet problems add greater weight to the longer gate arms and the force of the wind, whether in line or against the gate arm movement, severely affects the speed and steadiness of the gate arm operation and places severe strain on the operating mechanism.

The present invention proposes a railroad highway crossing gate which is efficiently operated by hydraulic power and electrical control in a manner whereby the gate arm movement is kept under complete control at all times regardless of operating conditions. Also, there is provided means to insure a slower smooth starting motion of the gate arm, increased acceleration through the intermediate movement, and a slower smooth stopping motion when the gate arm has reached its intended position. This mode of operation thus tends to prevent gate arm and mechanism damage due to abrupt starts and stops of long and possibly overweighted gate arms.

Generally speaking, the gate arm operating mechanism is powered by a hydraulic cylinder containing a piston and piston rod arranged to have hydraulic fluid under pressure applied to either one side or the other of the piston in accordance with the direction of movement desired. Such fluid is supplied from a pressure accumulator which is automatically charged when the pressure falls below a given setting. A sump reservoir is also provided to maintain the fluid supply and to receive the discharge fluid.

The piston rod is pivotally attached to a crank arm which is secured to the gate arm operating shaft and so arranged that movement of the piston will rotate the crank arm and cause the gate arm to rotate within its limitations of approximately 90° between a horizontal position and a vertical position.

Also operated by the crank arm is a throttle valve which is effective for each direction of movement of the piston. This throttle valve is connected to the crank arm by suitable linkage and is so arranged that with full hydraulic pressure on one side of the piston, the throttle valve controls the rate of discharge of fluid on the other side of the piston and thus regulates the speed of movement of the piston. The throttle valve is constructed and so regulated as to permit a slow speed starting movement, a rapid speed intermediate movement and a greatly reduced speed movement as the stop position in either direction is approached.



A suitable electromagnetic four-way hydraulic valve is employed to regulate the flow of pressurized fluid to the hydraulic cylinder and control the flow of the discharge fluid back to the sump reservoir. The vertical clear position of the gate arm is its normal position and the electro-magnetic four-way hydraulic valve will maintain fluid pressure on the so called up-side of the piston so that the gate arm will hold its vertical position under normal conditions. However, the gate arm is counterweighted so that due to gravity it would normally assume a horizontal danger position in case of a power failure or a loss of fluid pressure. Also, under such conditions, a cam and contact device on the gate arm shaft would operate the warning bell and warning lights.

Although the gate arm may move to a horizontal position due to its gravity bias, another feature of the present invention is the provision of a means whereby the gate arm is normally power controlled during its movement to a horizontal position if the gravity biased movement lags behind or exceeds a certain indicated time interval due to weather conditions. Such power driving means can be adjusted to a predetermined operating time by means of a manually operated restricted valve.

Another feature of the present invention is the provision of a pressure accumulator and an automatic means for keeping it constantly charged so that fluid under pressure is normally available to facilitate immediate gate operation. The constant fluid pressure supplied thereby to the hydraulic cylinder holds the gate arm securely in either of its operated positions, thus eliminating the necessity of a hold-clear device to normally hold the gate arm in its horizontal position.

There is also provided a manifold unit which, when inserted between the electromagnetic four-way hydraulic valve and the operating hydraulic cylinder, will connect the majority of fluid passages and thus eliminate many external piping connections.

Still another feature of the present invention is the provision of a float contact arrangement within the sump reservoir which will operate an indication lamp to provide a warning should the oil supply therein reach a dangerously low level.

Other objects, purposes and characteristic features of the present invention will be in part obvious from the accompanying drawings and in part pointed out as the description of the invention progresses.

In describing the invention in detail, reference will be made to the accompanying drawings wherein the invention has been shown diagrammatically rather than in detail, more for the purpose of illustration and understanding, and in which the different parts are referred to by distinctive reference characters. Due to limitations in size, the single illustration has been shown on two sheets of drawing and designated FIGS. 1A and 1B. When placed one above the other with FIG. 1A on top, the similarly marked wires and the gate arm operating shaft will be in line and may be connected together with pencil lines to form complete showing of the invention.

Referring now to the drawing illustrations, there has been shown diagrammatically in FIG. 1A a single railroad track RT having a highway H crossing thereover. The railroad track RT is provided with the usual insulated joints 1 at or near the center of the highway crossing so as to divide the railroad track into track sections A and B. These track sections A and B are provided with the usual highway crossing control circuits whereby the entrance of a train into a particular track section A or B will cause a shunt across the track rails 2 and 3 and deenergize its respective track relay R1 or R2. The deenergization of either track relay R1 or R2 causes operation of the warning devices WL and WB and deenergization of an actuating relay AR which controls the operation

of the highway crossing gates G1 and G2 through its contacts 4 and 4A, all in a manner to be explained hereinafter.

Although for the purpose of illustration there has been shown only one railroad track RT having control circuits governed by movement of trains in both directions, it is obvious that there may be two or more tracks at the highway crossing H and the control circuits may be such that they govern the movement of trains in one direction only on a particular track or both directions. In all instances, however, the crossing gates G1 and G2 will be operated to their horizontal positions to block the highway crossing H upon the approach of a train.

The highway crossing gates G1 and G2 are located one on either side of the highway crossing H and the railroad track RT and are positioned to block the highway traffic lanes. In the drawing illustration there has been shown only the control mechanism of the highway crossing gate G1 which is controlled through the contacts 4 and 5 of the actuating relay AR. It should be understood, however, that the control mechanism of gate G2 is exactly the same and is controlled through the contact 4A and 5A of the actuating relay AR. A battery B1 is provided to supply a source of energy and a control switch MS provides a means to cut the source of energy off or on depending upon whether or not the gate is in service. It should also be understood that an additional manual control switch could be provided to operate the gates manually and irrespective of the automatic control means shown.

Referring now to the gate operating mechanism as shown for the crossing gate G1, the various parts are suitably mounted in a mechanism casing 6 from which protrudes a gate arm operating shaft 7 which carries the gate arm 8. In actual practice, the mechanism casing 6 is adjustably mounted on a pole standard 9, all as shown in small scale in connection with the highway crossing layout portion illustrated in FIG. 1A of the drawing. For convenience in illustrating the invention, the hydraulic apparatus mounted in the mechanism casing 6 has been shown in a diagrammatic exploded view on the FIG. 1B portion of the drawings, the casing 6 being broken away and no attempt being made to locate the various parts accurately.

A hydraulic cylinder HC is shown pivotally mounted at one end at 10 on a supporting bracket 11 which in turn is suitably mounted on the inside of the casing 6. The hydraulic cylinder HC contains a piston 12 which divides the cylinder into two fluid pressure chambers 13 and 14. Attached to the piston 12 is a piston rod 15 which extends through the fluid chamber 13 and the top end wall of the hydraulic cylinder HC to a pin 16 where it is pivotally connected to a crank arm 17 which in turn is fixedly splined and held in position on the gate arm operating shaft 7. The parts are so proportioned that the application of fluid under pressure into either of the chambers 13 or 14 on its respective side of the piston 12 will rotate the shaft 7 through an arc of approximately 90° in a certain direction depending upon which side of the piston receives the pressure application. As the gate arm 8 is fixedly fastened to the shaft 7, this movement is utilized to operate the gate arm 8 from a vertical clear position to a horizontal danger indicating position, or vice versa as the case may be. As shown in FIG. 1A, suitably mounted bumper blocks 19, which cooperate with a stop arm 20 located on a gate shaft bushing 21, provide a means to limit the extreme gate arm operative positions.

The fluid supply to the chambers 13 and 14 of the hydraulic cylinder HC is controlled by an electromagnetic four-way hydraulic valve V4 and a manifold M. In practice, these three units may be bolted together to form a single assembly, with the manifold M in the center position, thus reducing to a minimum the number of external pipe connections.

The valve V4 comprises a body portion 25, two end cap portions 26 and 27 and a plunger 28. This plunger 28 is slidably mounted in the body portion 25 and has its ends extending into the end cap portions 26 and 27. A coil winding C having an armature 29 is attached to the plunger 28 at its end which lies within the end cap portion 27 whereas a coil spring 30 is inserted between the end cap portion 26 and the other end of the plunger 28. When the coil winding C is energized its armature 29 moves the plunger 28 in one direction against the bias of the spring 30; whereas the spring 30 forces the plunger 28 in the other direction when the coil winding C is de-energized. This movement of the plunger 28 opens and closes certain of the port chambers 31, 32, 33, 34 and 35 located within the body portion 25 of the valve V4.

The manifold M acts as a connecting element between the chambers 31, 32, 33, 34 and 35 of the valve V4, the chambers 13 and 14 of the hydraulic cylinder HC and the fluid supply from the pressure accumulator PA. The manifold M also houses a throttle valve VT, and a speed control valve 51.

The throttle valve VT is of the plug type and has a crosswise port opening 36 therein which cooperates with port openings 37 in the manifold M. It also has an operating handle 38 attached thereto. The handle 38 is connected by means of a link 39 to a clamp 18 which is adjustably fastened to the gate arm shaft 7, so that movement of the gate arm 8 causes rotation of the throttle valve VT. Also, the link 39 is adjustably fastened to the handle 38 at one end and to the clamp 18 at its other end so that the overall operating length of the link 39 may be varied to regulate the proper amount of movement of the handle 38. When the gate arm 8 is in motion, all exhaust fluid from the chambers 13 and 14 of the hydraulic cylinder HC must pass through the port 36 of the throttle valve VT. The size of the opening between the ports 36 and 37 varies in accordance with the position of port 36 and controls the amount of fluid passing therethrough at given positions. Two small V-shaped notches 135, disposed opposite to each other, are provided on each end of the port opening 36 to assure a definite passage of fluid therethrough in the extreme operative positions of the throttle valve VT. The arrangement shown is such that gate arm travel speed is slow at both the start and finish of the movement due to restricted port openings whereas the intermediate travel speed of the gate arm is faster due to unrestricted port openings in the throttle valve VT.

Also employed in connection with the regulation of the flow of fluid to and from the hydraulic cylinder HC is a speed control valve 51. The speed control valve 51 is adjustable and is used to control the flow of fluid from the chamber 14 of the hydraulic cylinder HC to the sump reservoir SR in order to regulate the speed of the midstroke of the piston on the down movement of the gate arm 8. As previously mentioned, the restricted openings in the throttle control valve VT regulate the speed of the starting and finishing stroke of both the up and the down movement of the gate arm 8. The restriction of fluid pressure on the midstroke during the down movement of the gate arm 8 is necessary because the gate arm 8 is normally gravity biased downward and the speed must be governed to prevent excess speeds and abrupt stops. On the upward movement of the gate arm 8 all the weight must be lifted and full power is required to maintain a minimum speed of operation.

The gate arm shaft 7 is provided with a cam 56 fixed thereto which operates its respective biased contact finger 59 to control the energization of the warning lights WL and the warning bell WB in the event of a failure of the fluid pressure which would permit the gate arm to descend by gravity to a horizontal danger position, all as explained more fully hereinafter.

The hydraulic fluid for operating the gate arm 8 is supplied through a pressure line 71 by a pressure ac-

cumulator PA which is precharged with gas and in which the fluid pressure is maintained by automatic pumping apparatus. This automatic pumping apparatus includes a gear pump P operated by an electric motor MO which is controlled by a pressure switch PS. A sump reservoir SR is provided to store the excess supply of hydraulic fluid. There is also provided a relief valve VR which vents the pressure line 71 to the sump reservoir SR in the event that the pressure exceeds certain limitations due to faulty pump operation. A check valve 72 inserted in the line between the pressure line 71 and the pump P prevents leakage of fluid from the pressure line 71 back through the pump P.

The pressure switch PS is connected into the pressure line 71 and is fluid pressure operated against a biasing spring, whereby a drop of pressure in the line 71 to a certain limit will cause its electrical contact 73 to close a circuit and operate the motor MO and the pump P. The circuit for the motor MO could be controlled through a motor relay contact rather than directly through the pressure switch contact 73 to obviate the possibility of the heavy motor starting load burning the highly sensitive pressure switch contact 73. However, the switch shown herein could be a heavy duty type toggle contact or mercury switch to prevent burning but has been illustrated as a simple contact 73.

The control circuit for the automatic operation of the pressure pump P may be traced as follows: from the positive (+) side of the battery $B_1$, wire 75 through the closed contact 80 of the manual controlled service switch MS, wires 76 and 77, through the pressure switch contact 73 in its closed position, wire 79, armature of the motor MO, wires 81, 82 and 83 to the negative (—) side of the battery B1. When the fluid pressure in the pressure accumulator PA and the pressure line 71 again reaches its prescribed level, the contacts 73 of the pressure switch PS will again open and stop operation of the pump P.

With reference now to the operation of the highway crossing gate apparatus described in detail above, as previously mentioned, the normal position of the gate arm 8 is its vertical clear position as shown on the drawings. Under normal operating conditions, the gate arm 8 will be maintained in this vertical position as long as the track sections A and B remain unoccupied by a train. This is true because the pressure accumulator is supplying a constant supply of hydraulic fluid under pressure to the chamber 14 on the underside of the piston 12 of the hydraulic cylinder HC, which pressure is maintained because the electro-magnetic four-way valve V4 is energized to its up position.

This source of fluid supply may be traced from the pressure accumulator PA through the supply line 71 to the port opening 87 of the manifold M, through the chambers 33 and 34 of the electromagnetic four-way valve V4 in its upward position and through the port opening 88 of the manifold M to the chamber 14 of the hydraulic cylinder HC.

Thus, with reference to the normal operation of apparatus just described, it can be seen that so long as the electromagnetic four-way valve V4 remains energized and in its up position, the gate arm 8 is retained in its normal vertical clear position. This energizing circuit for holding the four-way valve V4 up may be traced as follows: from the positive (+) side of the battery B1, wire 75 through the closed contact 80 of the manual controlled service switch MS, wires 76, 95 and 96, contact finger 4 and its front contact of the acting relay AR in its energized position, wire 97, through the coil windings C of the four-way valve V4 and wires 99, 100, and 83 back to the negative (—) side of the battery B1.

Let us assume now that a train enters the highway crossing track section A under normal conditions wherein the highway crossing gates G1 and G2 would be lowered to their horizontal danger indicating positions. Under this condition the train would shunt the track relay R1 and drop its armature and contact fingers 132 and 133 to a back contact position. This action would break the energizing circuit for the actuating relay AR at its open contact 133, which circuit, when closed, can be traced from the positive (+) side of the battery B1 through wires 102 and 103, contact finger 134 and its front contact of the relay R2, wire 104, contact finger 133 and its front contact of the relay R1, wire 105 through the winding of the relay AR, and wires 101, 106, 100 and 83 back to the negative (—) side of the battery B1. Also, with the track relay R1 now deenergized, the circuits through the usual flashing warning lights WL and warning bell WB are completed to warn approaching highway traffic that a train is approaching the intersection and that the crossing gates are about to be lowered. This procedure is standard practice and the simple circuits may be traced from the positive (+) side of the battery B1 through wires 102 and 64, contact 132 and its back contact of the relay R1, wire 65, through the warning devices WL and WB, wires 66, 106, 100 and 83 back to the negative (—) side of the battery B1. Energy to the flashing warning lights WL is regulated by a flashing device 67.

With the actuating relay AR now deenergized and its armature and contact fingers 4 and 4A dropped away and in their open positions, the energizing circuits for the four-way valves V4 which control the down movements of the gates G1 and G2 will now be open. As previously mentioned, the control systems for the two gates are identical and only the functions of the gate G1 which are controlled by the contact finger 4 of the actuating relay AR will be shown and described herein.

With the energizing circuit for the four-way valve V4 as described previously in detail now open at the contact 4 of the actuating relay AR, its armature 29 will drop away as it is biased downward by the spring 30. With the four-way valve V4 now in a down position, pressure behind piston 12 in the chamber 14 of the hydraulic cylinder HC is vented to the sump reservoir SR as the shifting of the valve plunger 28 will close the port opening between the chambers 33—34 and 31—32, and also open the port opening between the chambers 34—35, and 32—33.

With the four-way valve V4 in this down position, the supply of fluid under pressure from the main supply line 71 is closed to the chamber 14 and open to the chamber 13 of the hydraulic cylinder HC. The gate arm 8 will now start its normal downward movement to a horizontal position due to the loss of pressure in the chamber 14 and the application of pressure in the chamber 13 of the hydraulic cylinder HC. The path of fluid under pressure may now be traced from the supply line 71 to the port opening 87 of the manifold M, through the chambers 33 and 32 of the four-way valve V4 in its down position, and through the port opening 117 of the manifold M to the chamber 13 of the hydraulic cylinder HC.

Also, the fluid from the chamber 14 will now vent through the port opening 88 in the manifold M through the chambers 34 and 35 of the four-way valve V4 in its down position, through the port opening 89 of the manifold M, through the restricted speed control valve 51, through the port opening 37 in the manifold M and through the port 36 in the throttle valve VT, then through the main exhaust line 113 to the sump reservoir SR.

The rate of speed at which the gate arm 8 travels through its midstroke during its downward movement is controlled primarily by the adjustable restricted speed control valve 51 and secondly by the variable port opening 36 in the throttle valve VT. Under normal operating conditions, the speed control valve 51 is set to permit a certain rate of fluid flow therethrough so that a definite amount of time is required to exhaust the fluid from the chamber 14 during a downward movement of the gate arm 8. The rate of flow of this exhaust fluid to the sump reservoir SR is further controlled by the throttle valve VT which is operated in accordance with the gate arm move-

ment as previously explained. The control is such that the rotatable movement of the throttle valve VT positions its port 36 to restrict the opening and the flow of fluid therethrough at the start of the gate movement thus assuring a slow starting movement. As the gate arm movement progresses, the throttle valve VT rotates accordingly so that its port opening 36 lines up fully with the port opening 37 in the manifold M and permits the full flow of fluid therethrough, thus allowing maximum gate arm movement, as restricted by the valve 51, through its intermediate travel period. Again, as the gate arm movement approaches its horizontal danger position, the port opening 36 in the throttle valve VT starts to move out of line with the port opening 37 in the manifold M and thus restricts the flow of fluid therethrough so that the movement of the gate arm 8 is retarded to the extent that it slows up as it approaches its stop position. This assures a cushioned stopping movement and prevents damage to the gate arm 8 and its associated operating mechanism.

The crossing gate arms 8 of the gates G1 and G2 will remain in their horizontal danger positions so long as the train is travelling through the highway crossing track section A and over the highway crossing H. Upon passage of the train the track relay R1 will again become energized by means of its usual track circuit and cause its armature to be attracted and its contact finger 132 to open at its back contact and its contact finger 133 to close at its front contact, thus stopping operation of the warning devices WB and WL and energizing the actuating relay AR. With the actuating relay AR energized, its contacts 4 and 4A again make up with their front contacts as now shown on the drawing and the circuits are completed to energize the coils C of the four-way valves V4. As previously mentioned, only the apparatus for the gate G1 has been shown.

With the energizing circuit previously described for the coil C of the four-way valve V4 now closed, through the coil winding C and its armature 29 is attracted, thus causing its associated valve plunger 28 to shift to its upward position against the bias of the spring 30. With the plunger 28 of four-way valve V4 again in its upward position as shown on the drawings, fluid under pressure will again flow to the chamber 14 on the underside of the piston 12 so that the piston 12 and the gate arm 8 will start their upward movement. The fluid path is from the main supply line 71 through the port opening 87 of the manifold M, chambers 33 and 34 of the valve V4 and port opening 88 of the manifold M to the chamber 14 of the hydraulic cylinder HC, as previously described.

As the piston 12 moves upward, the fluid in the chamber 13 will exhaust to the sump reservoir SR through the port opening 117 through the manifold M, chambers 32 and 31 of the valve V4, port opening 37 in the manifold M and port opening 36 in the throttle valve VT, then through the main exhaust line 113. Here again, the exhaust route is through the throttle valve VT which assures a slow starting movement of the gate arm 8, a maximum intermediate movement and a slow retarding movement just prior to reaching its stop position. Under normal conditions, the gate arm 8 will continue its upward movement until it reaches its vertical clear position as now shown on the drawings.

With the gate arms 8 again in their normal vertical clear positions, they should remain in such positions until another train enters either of the highway crossing track sections A or B, whereupon the down cycle of the gates G1 and G2 again be repeated, all as illustrated and described hereinbefore. However, under abnormal conditions, such as a loss of fluid pressure or a power failure, certain provisions are made in the present invention so that the gate arms 8 will assume a horizontal danger indicating position to conform to standard railway signaling fail-safe practice.

If, due to a leak in the main pressure line 71 or any other part of the pressure system, a complete loss of fluid pressure should occur with the gate arm 8 in its vertical clear position, the pressure drop in the chamber 14 on the underside of the piston 12 of the hydraulic cylinder HC would permit the gate arm 8 to start down because of its gravity bias. When the fluid is completely exhausted, the gate arm 8 would eventually assume its horizontal danger indicating position and remain in such position until repairs were made.

When such a pressure loss occurs and the gate arm 8 does start a gravity movement downward, after approximately 15 degrees of movement the cam 56 on the gate shaft 7 would close its contacts 59, thus closing a circuit to activate the warning bell WB and the warning lights WL. This circuit may be traced from the positive (+) side of the battery B1, wire 75 through contact 80 of the manual control switch MS, wires 76, 95 and 107 to the front contact 5 of the actuating relay AR, wire 103 through the closed contacts 59, wire 109 to the controls for the warning bell WB and the warning lights WL, wires 66, 106, 100 and 83 back to the negative (—) side of the battery B1. Thus, even though there is no train in the highway crossing track sections A or B, the highway traffic is warned that the gate arm 8 is on the way down.

In the event that the pressure drop in the fluid supply is very minor, such as in the nature of a slow leak, the pressure accumulator PA would keep furnishing more pressurized fluid to the chamber 14 of the hydraulic cylinder HC so that the gate arm 8 would keep substantially in an upright position, possibly bobbing back and forth within a few degrees of rotation, and not enough to operate the contacts 59 on the cam 56. However, as the fluid supply eventually becomes exhausted, the gate arm 8 will move all the way down to its horizontal danger position.

As previously mentioned, the sump reservoir SR is provided with a float contact 40 which closes a circuit and lights a warning light 41 when the fluid supply in the sump reservoir SR reaches a certain low level. Thus, in any event, a warning may be given at the crossing location or in a remotely located tower that the fluid supply is becoming dangerously low so that an attendant may be dispatched to the scene to manually control the highway traffic while repairs are being made.

The control circuit for the warning light 41 may be traced from the positive (+) side of the battery B1, wires 75 and 42 through the warning light 41, wire 43, the closed float contact 40 of the sump reservoir SR, wires 44, 82 and 83 back to the negative (—) side of the battery B1.

Upon any kind of an electrical power failure which would cause the four-way valve V4 to become deenergized, the gate arm 8 would immediately start its downward cycle to a horizontal danger indicating position. However, in the event of a pump failure alone, either due to mechanical or electrical reasons, resulting in a lack of pressure, the gate arm 8 would remain in its then operated position. If the gate arm position happened to be its vertical clear position, it would be held there by trapped pressure maintained in the chamber 14 by reason of the check valve 72 until such a time as the four-way valve V4 was operated, whereupon it would assume a normal horizontal position and remain there.

Having thus shown and described one specific form which the present invention can assume and the manner in which it is to be performed, it is desired to be understood that such form was chosen more for the purpose of illustrating the principles and mode of operation rather than for indicating the full scope thereof. It should be further understood that various modifications, adapations and alterations may be applied to the specific form shown within the scope of the present invention, except as limited by the appending claims.

What I claim is:

1. In a system for hydraulically operating a highway crossing gate between first and second positions, a pressure source, a fluid supply, a cylinder, a piston moveable in said cylinder to two limit positions upon the selective

application of fluid pressure to opposite sides of said piston for moving said gate to either of its two positions, a two position valve effective for simultaneously directing said fluid under pressure to and exhausting said fluid from opposite sides of said piston for moving said gate between said first and second positions and pressure holding means responsive to the pressure of the fluid in said cylinder for cooperating with said two position valve to continuously maintain the fluid pressure on either side of said piston sufficient to hold said piston in both said limit positions.

2. In a highway crossing gate control system for railroads adaptable to protect at a highway crossing disposed over a railroad track having track sections on either side of said highway crossing with each track section having a track circuit including detection means for registering train presence, the combination with a highway crossing gate having a gate arm mounted for rotary movement between horizontal and vertical positions, said gate arm being biased to a horizontal position, of a supply of fluid, warning means actuated when said fluid supply approaches a below normal operating level, a hydraulic cylinder having a piston operatively connected to said gate arm, a common exhaust line from either side of said piston, a two position electromagnetic valve actuated by said track relay in response to train presence for providing a path for said fluid pressure to one said of said piston and for providing a path to said common exhaust for fluid on the opposite side of said piston for initiating a movement of said gate arm to said horizontal position and pressure holding means responsive to the presence of the fluid in said cylinder for cooperating with said two position valve to continuously maintain the fluid pressure on said piston sufficient to hold said gate arm in said horizontal position.

3. In a highway crossing gate control system for railroads in accordance with claim 2 wherein said warning means actuated when said fluid supply approaches a below normal operating level comprises a circuit through a float contact in said fluid supply and a warning light, said warning light being energized when the level of said fluid supply is such that said float contact establishes said circuit to said warning light.

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