

March 12, 1940.

J. W. SILVER

2,193,350

HIGHWAY SAFETY GATE

Filed April 27, 1936

4 Sheets-Sheet 1

Fig 1

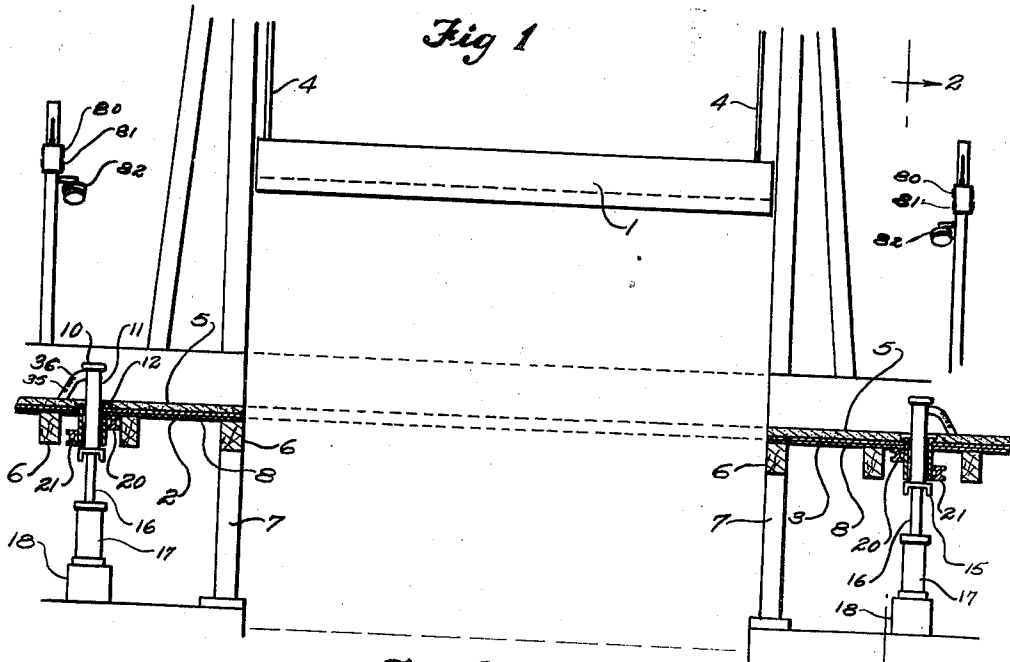
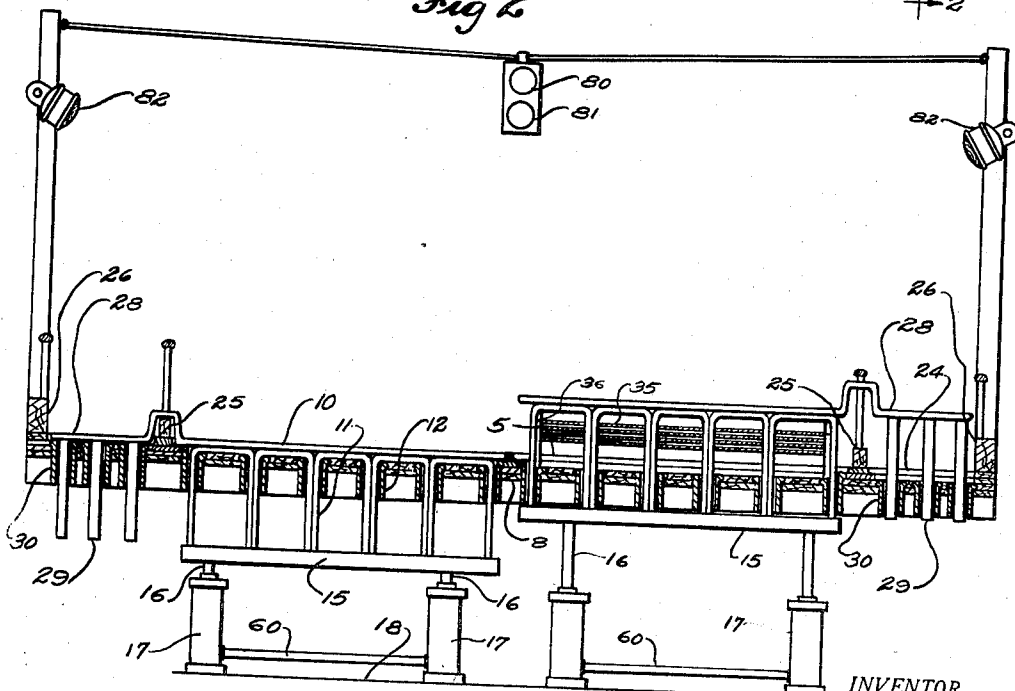


Fig 2



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Fig 3

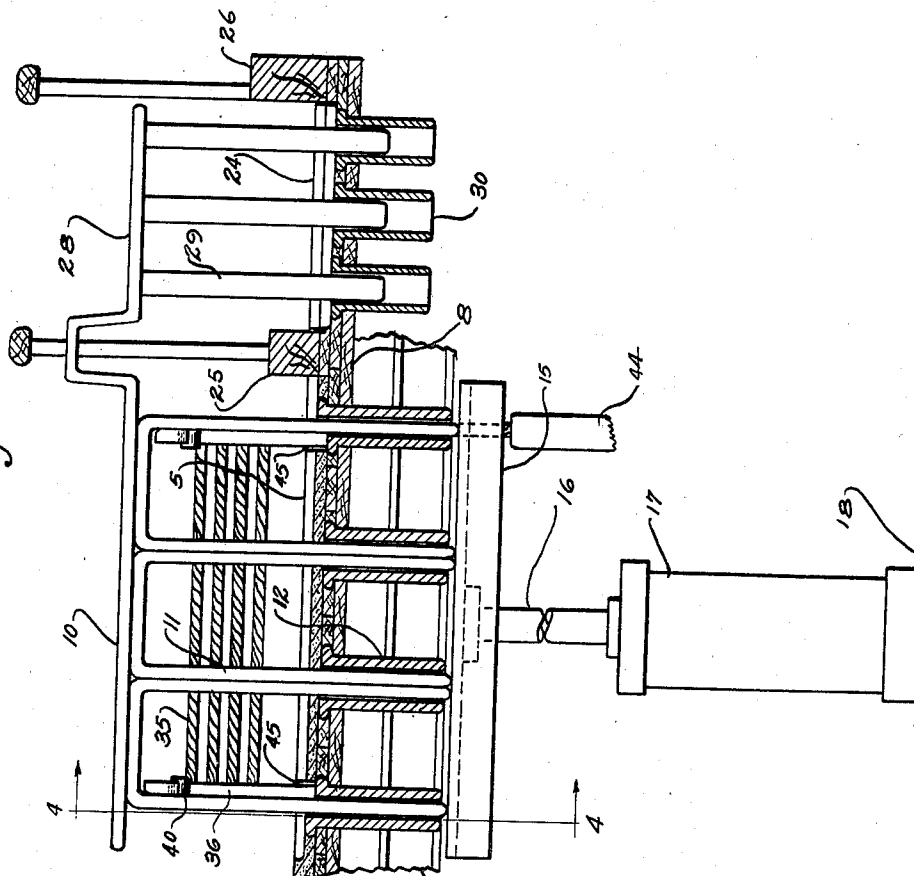
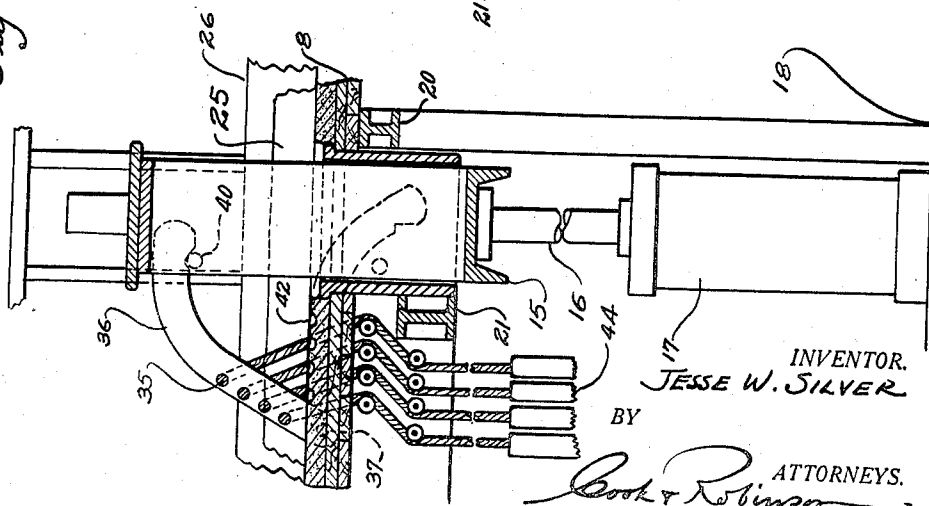


Fig 4



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Fig. 6

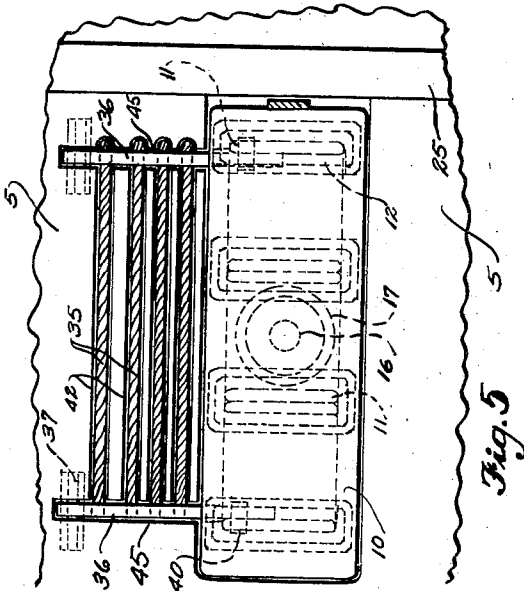
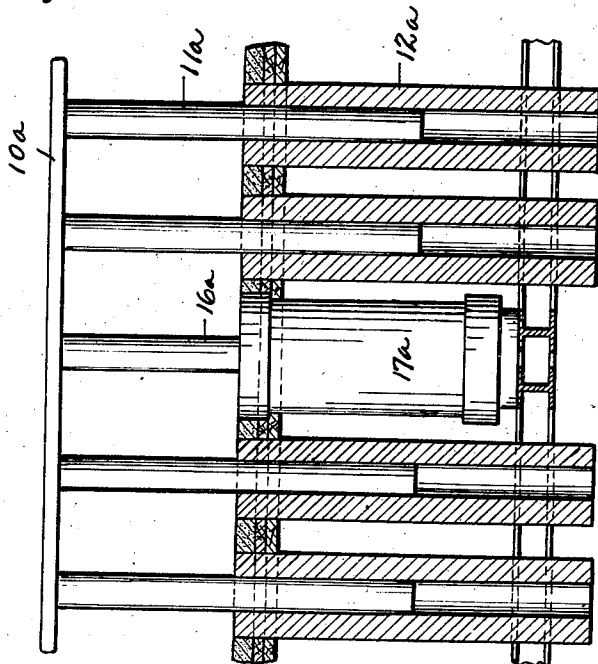


Fig. 8

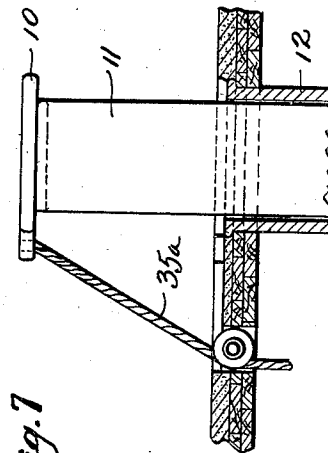
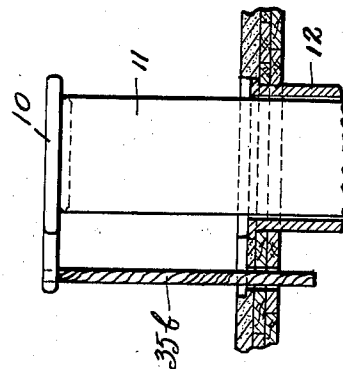


Fig. 7

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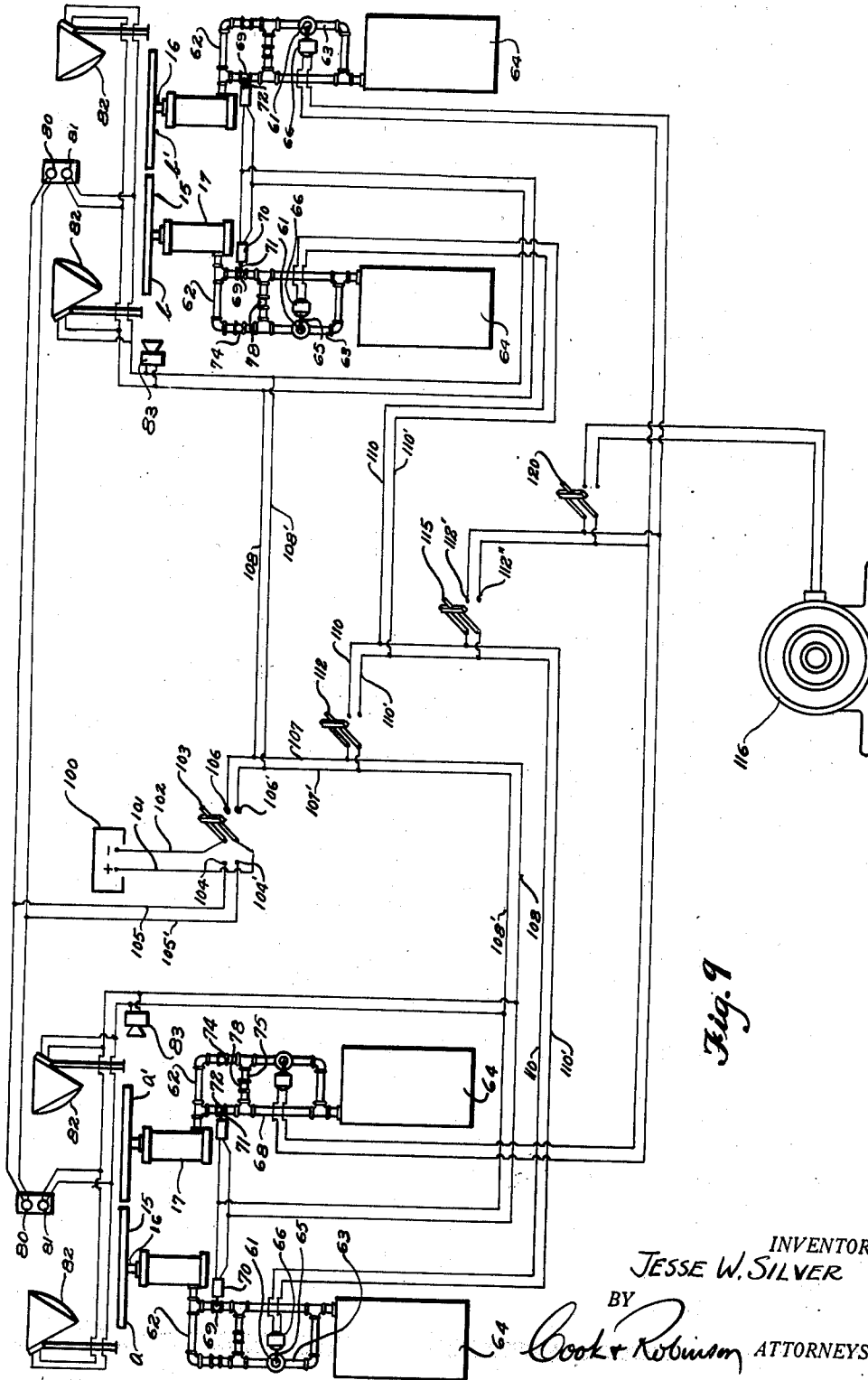


Fig. 9

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## UNITED STATES PATENT OFFICE

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## HIGHWAY SAFETY GATE

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Application April 27, 1936, Serial No. 76,587

6 Claims. (Cl. 39—6)

This invention relates to improvements in safety gates, and it has reference more particularly to gates of that character intended to serve, whenever it is so desired, as barriers to the flow of vehicular traffic; such gates, in the present instance, being designed for use on roads or highways; at approaches to railway crossings; on ferry slips; on ferry boats or at any other place where gates may be advantageously used as the means for blocking vehicular or pedestrian traffic to prevent the consequent results, such as for example of a vehicle moving into an open draw-bridge or colliding with a train.

It is the principal object of the present invention to provide a gate, of an impervious and impenetrable type, that may be normally disposed below the roadway and which may be mechanically actuated to a position above the roadway to serve as a barrier to traffic.

It is also the object of this invention to provide a gate, as above stated, which, in lowered position, will be disposed flush with the road surface and across which the traffic will pass; also a gate which, in lowered position, serves as a part of the road-bed.

Another object of the present invention is to provide a gate of a type of construction suitable to pneumatic, hydraulic, mechanical or electrical operation.

Still another object of this invention resides in the disposition of the gate and in the general design thereof whereby, in its association with the structures of approaches to bridges, or the like, it will add strength to rather than weaken the structure.

Still further objects of this invention reside in the provision for use of automatic controls, thereby to insure safety and serviceability as well as to facilitate operation; furthermore to provide adequate lighting and signaling means which will add to the safety of those approaching the gate.

Still further objects of the invention reside in the details of construction of the various parts, in their combination and mode of operation as will hereinafter be fully described.

In accomplishing these and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings wherein:

Figure 1 is a side elevation, with parts thereof in vertical section, illustrating a draw-bridge with which safety gates, embodied by the present invention, are associated; the bridge being shown

in elevated position, and the gates elevated to functional position.

Figure 2 is an enlarged, cross-sectional view substantially on the line 2—2 in Figure 1; one section of the gate being raised and the complementary section being lowered.

Figure 3 is a vertical section, lengthwise of the gate particularly illustrating the details of construction, the guides whereby the gate is mounted and the hydraulic means for moving it from lowered to an elevated position.

Figure 4 is a vertical cross-section, on the line 4—4 in Figure 3.

Figure 5 is a plan view of a part of the cable barrier.

Figure 6 is a sectional view of an alternative form of gate.

Figures 7 and 8 are sectional views showing cable barriers of alternative types.

Figure 9 is a view diagrammatically illustrating the control system.

Referring more in detail to the drawings, 1 designates in its entirety, a lift bridge that is suspended between the structural approaches 2 and 3 at opposite sides of the space that is spanned by the bridge. In the present illustration, the bridge is suspended by cables 4, or the like, which may be paid out or drawn in by any suitable mechanism, not herein illustrated, for the purpose of lowering or raising the bridge such as from the position illustrated in dotted lines in Figure 1, to its raised position.

In the present instance the approaches 2 and 3 are elevated and the road-bed 5 is supported by structural or frame members including cross beams 6, columns 7, and the planking 8. However, it is to be understood that the details of construction; the type of bridge, as well as the construction of the approaches, is not material to the present invention and may be varied in accordance with requirements to suit conditions or location.

The purpose of the present gate, as illustrated in its association with a bridge, is to provide for blocking off vehicular traffic and closing the roadway when the bridge is in raised or open position. In the event that gates of this character are used on a highway at a railway crossing, their mode of operation is the same as at the bridge; however structural conditions of the approaches to the crossing might necessitate a different arrangement of the structural members which support the gate actuating mechanism.

In the present instance as best illustrated in Figure 2, the gate is made in two sections, trans-

versally aligned across the roadway, so that one section may be raised while the other is retained in lowered position; the object being to provide for checking traffic in one direction, at one side of the roadway, while traffic at the opposite side, and moving in the opposite direction is not interrupted. The advantage of the sectional gate is apparent when considering its use at one side of a draw-bridge, or the like, since this construction permits traffic approaching the bridge to be checked by lifting one section, yet without preventing traffic which is on the bridge, but moving in the opposite direction, from continuing on across.

Referring now to the construction of the gate, as best seen in Figure 2, each section thereof comprises a top, longitudinal beam or rail 10 mounted at regular intervals upon vertical posts 11. These posts are slidably mounted for vertical movement in guide housings 12 which latter are rigidly and solidly secured in the frame or structural members of the approach. At their lower ends all of the posts 11 associated with one section of the gate rest on a horizontal beam 15 and this beam is mounted upon the upper ends of piston rods 13 reciprocally operable in vertically mounted hydraulic cylinders 17 which may be supported on a cross beam 18, as shown, or upon any other suitable foundation whereby the cylinders are securely and permanently mounted.

Before further describing the hydraulic means, it will be noted that the posts 11 fixed to top rails 10, are in the nature of flat vertical plates, disposed edgewise with reference to the direction of the roadway, and rest at their lower ends on the cross beam 15. If more desirable, cylindrical posts might be employed. Also, the housings are of metallic structure, and are fixed to cross beams 20 and 21. These beams are of channel iron construction, preferably, and are fixed solidly in the structure and, as is observed in Figure 4, the beam 20 is located at one side of the housings across the top portion thereof, while beam 21 is located at the other side and across the lower portions; the purpose of this arrangement being to most effectively brace the housing to withstand the effect of collision of a vehicle with the gate.

Furthermore, it is the intention that the construction be of such kind that it will effectively withstand collision of any vehicle which ordinarily travels the roadway.

Provision is made for the admittance of a hydraulic pressure medium into the lower ends of the cylinders to effect the lifting of the pistons and a consequent raising of the gate, to functional position, as later described.

In the illustration of Figure 2, sidewalks as at 24, for pedestrians are provided at each side of the highway. These sidewalks are set off by the guard rails 25 which extend parallel with and are spaced from the outside guards 26. In order to block off pedestrian traffic, gates for the sidewalks are also provided. Each of these gates comprises a horizontal bar 23 that is fastened to the top beam 10 of the adjacent gate section, on which depending bars 29 are fixed and are vertically movable in guide housings 30. These latter gates are merely extensions of the main gate sections for the highway, but since there is little danger of their being affected by vehicular traffic, it is not considered necessary that they be made of any unusual strength or even that they be supported by the horizontal beams 15. Therefore, in this instance, the lower ends of the posts or bars 29 are left free.

Associated with each of the sections of the main gates across a roadway are cable barriers which are in the nature of a shock absorber adapted to prevent undue damage to a vehicle should it collide with a raised gate. These cable barriers comprise a plurality of horizontal cables 35 which extend between supporting bars 36 connected with the opposite ends of the gate as illustrated in Figure 4. The bars 36 have ends pivotally fixed to supports 37 on the road bed at the outside of each gate for vertical swinging of the bars. The inner ends of the bars extend into over-lap relation with vertical posts at opposite ends of the gate section. The posts have studs 40 extended therefrom in such position that they will engage the bars when the gates are raised thereby to lift the bars to upwardly inclined positions as shown in Figure 4. Whenever a gate section moves to its lowered position, the bars swing downwardly into the roadbed and the cables are laid thereby into grooves or channels 42 provided therefor in the roadbed. It is to be understood that the roadway is recessed or slotted to receive the bars when they are lowered into the gates; such a recess being shown at 45 in Figure 5.

When a gate is actuated from a lowered position below the roadway to a raised position, the studs 40 engage with the swinging ends of the bars 36, and the latter move upwardly with the gate. This places the cables 35 across the roadway in advance of the gate. In the event that a vehicle collides with the cables its momentum will be sufficiently retarded that the gate or vehicle will not be unduly damaged by reason of the collisions.

In order that the cables may be retained relatively taut, yet be sufficiently resilient or yielding to cushion the shock of a vehicle colliding therewith, they are fixed at one end to one of the bars 36, but at their opposite ends, pass frequently through openings or seats in the supporting bar and are then extended downwardly through a slot in the roadway and have weights 44 suspended thereby. The weights are disposed below the roadway and are free of any support so that, at all times, they will retain their respective cables taut.

The gates are herein illustrated as being hydraulically operated. Since the power mechanism for actuating each gate is like that of the other, only one has herein been illustrated in detail, with the understanding that the description of this one will apply equally to the others.

Each gate is actuated from lowered to raised position by one or more hydraulic cylinders 17. When two are used, they are arranged as shown in Figure 2 and are connected across their lower ends by a pipe 60. This pipe is connected with a pump 61 by means of a pipe 62. A pipe 63 leads to the pump from a tank or source of pressure medium supply designated at 64. The pump may be of any suitable type and is operatively connected through gearing 65 for functional operation by an electric motor 66.

Energization of a motor 66 operates the pump 61 in a manner to forcibly deliver hydraulic medium from the supply 64 through pipes 62 and 60, into the lower ends of the cylinders 17, thereby to elevate the pistons in their respective cylinders and effect the lifting of the gate accordingly.

A pipe 63 connects the pipe 62 with the pipe 60 and this connection includes a valve 69 which is closed during the lifting of the gate but which may be opened for by-passing the hydraulic medium from the cylinders around the pump for

lowering the gate. The valve 69 is here shown as being operatively connected for adjustment from closed to open position by means of a solenoid 70. The solenoid has a sliding core 71 operatively connected in any suitable manner to a lever 72 for actuation of the valve to closed position incident to energization of the solenoid.

There is also a back check valve 74 in the pipe 62 to prevent return flow of liquid through the pump 61, and there is a pipe connection 75 between the pipes 62 and 63 containing a relief valve 78 which permits relief circulation of the pressure medium in the event of jamming of the gate while the pump is in operation.

It is to be understood that various automatic devices might be employed to control the operation of the system thereby to insure safety. While such control devices might be of many different kinds, I have, in Figure 9, diagrammatically illustrated a control system of a suitable character.

Referring now to Figure 9, a pair of gates are designated by reference characters *a* and *a'*. Another pair is designated by reference characters *b* and *b'*. These two pairs of gates respectively, would represent the gates at opposite ends of a bridge or at opposite sides of a railway crossing and would respectively control advancing and receding traffic moving in opposite directions at opposite sides of the road. Each of the gates is illustrated as being controlled by a hydraulic cylinder 17 and the cylinders are each indicated as being supplied with pressure medium from a supply 64 through the operation of a pump 61 under control of a motor 66.

In this connection, I have also illustrated signal lights for the warning of traffic, there being the conventional green and red lamps 80 and 81 associated with each approach to the bridge. Also there would preferably be flood lights 82 for each gate and a siren 83 or other audible signalling means at each end of the bridge or at each side of the crossing.

The general power supply or electrical energy for the system is designated at 100 and this is connected by wires 101 and 102 with a double throw switch 103. In normal position, this switch is closed against contacts 104—104' which are connected by means of wires 105—105' with the green light signal lamps 80 at opposite ends of the bridge. In its other position the switch 103 will be closed against contacts 106—106' from which circuit lines 107—107' lead to the flood lights 82 at the opposite ends of the bridge and also connect in circuit with the red light signal lamps 81 and the sirens 83 to visibly and audibly warn traffic that the bridge is about to be or is raised.

Connected with the circuit lines 107—107', are circuit lines 108—108' through which a circuit is made with the solenoids 70, so that, incident to closing the switch 103 for energizing the flood lights, the siren and the red signal lamps, the solenoids will be energized to close the valves 69, and also energize the flood lights 82.

The electric motors 66 which control the raising of the gates for approaching traffic at opposite ends of the bridge, are connected by wires 110—110' with the mains 107—107'. A normally open switch 112 controls the flow of current through this circuit to the motors. Likewise the motors 66, which control the gates across which receding traffic flows, are connected in circuit to the lines 110—110' by lines 112'—112' through a normally open switch 115. Likewise,

the control mechanism for the operation of the bridge, which is designated in its entirety at 116, is connected in circuit with the mains 112'—112' through a control switch 120.

This arrangement of switches and circuits requires a definite sequence in operations, briefly as follows:—

When the main switch 103 is thrown from its normal position, at which it closes a circuit to the green signal lights, to its opposite position, it then closes a circuit, through lines 107—107' which energizes all the flood lamps, the red signal lamps and the sirens. It likewise, through lines 108—108' energizes the solenoids 70 so that the valves 69 will be closed. After a predetermined period of time, the switch 112 may be closed manually or otherwise, thereby to set into operation the pumps which effect the closing of the gates *a*—*b* stopping approaching traffic at opposite ends of the bridge. After receding traffic has passed from the bridge and across the gates *a'*, the switch 115, may be closed thereby energizing the motors that effect the lifting of the gates *a'*—*b'*. After all gates have thus been lifted, the operator may then close the switch 120 to energize the bridge control mechanism.

It is to be understood that in the event that the present system was used at a railway crossing, the mechanism controlled by switch 120 would not be necessary. It is also to be understood that, preferably, automatic control devices, not herein illustrated, would be employed to de-energize the motor circuit co-incident with the movement of a gate to raised position. It is also intended that there shall be an initial upward movement of each gate which will place it just slightly above the roadway, followed by a period during which it remains stationary, then a continuing movement to raised position. The purpose being to prevent damaging collision of a vehicle with a gate should the vehicle have progressed too far before the warning signal was given to avoid overrunning the gate. Furthermore, it is intended that each gate shall be equipped with the usual danger signal lamps which become visible to traffic upon the initial upward travel of a gate.

In Figure 6, I have shown an alternative construction wherein the gate comprises a horizontal top plate 10a supported by a plurality of cylindrical posts 11a, which are contained in cylindrical guides 12a which extend from below the bridge to its floor surface. A centrally located hydraulic cylinder 17a has its piston rod 16a connected to the plate 10a.

In Figures 7 and 8, I have shown alternative types of barriers. In Figure 7, the barrier comprises a plurality of cables 35a attached at their upper ends to the top plate 10 and pass forwardly and downwardly therefrom over guide rollers in the roadway.

The device of Figure 8 is similar to that of Figure 7 except that the forward edge of the plate 10 is extended and the cables 35b are firmly suspended therefrom. In the device of both Figures 7 and 8, the cables would be suspended through the roadway and equipped at their lower ends with weights 44 whereby they will be retained angularly taut.

It should be quite apparent that details of the mode of operation might be altered without disposing from the spirit of the present invention, and for this reason, it is not desired that the claims should be restricted to the details herein shown but that they shall be given an

interpretation which is commensurate with the scope of the invention disclosed.

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

1. In combination, a roadway, a gate disposed transversely thereof, a supporting structure beneath the roadway, guide housings fixed in the supporting structure, and power means for actuating the gate between lowered and raised positions; said gate comprising a horizontal top plate adapted to be disposed flush with the roadway to serve as a part thereof when the gate is lowered, a plurality of vertical posts mounting said plate and vertically slidable in said guide housings, a horizontal beam engaging the lower ends of the posts and acted on by the power means to raise and lower the gate.

2. The combination with a gate that is movable from a position lowered flush with a roadway to a raised position, of a plurality of cables suspended from the gate through the roadway, weights on said cables below the roadway; said cables being operable, when the gate is raised, as yieldable barrier means.

3. The combination with a gate adapted to be moved from a position flush with a road surface, to a raised position, of a yieldable barrier in advance of the gate and movable into raised position in accordance with the raising of the gate; said barrier comprising spaced supports to be

moved by the gate and a plurality of cables extended across the roadway and attached at their ends to said supports to be lifted and lowered thereby.

4. The combination with a gate adapted to be moved vertically from a position flush with a road surface to a raised position, of a yieldable barrier in advance of the gate, comprising spaced bars, with ends pivotally fixed in the roadway forwardly of the gate, and having ends operatively connected with the gate whereby the beams are lifted with the lifting of the gate, and cables drawn taut between said beams.

5. A combination as in claim 4, wherein the cables have running supports across one beam and have weights suspended by said ends to retain them taut between the beams.

6. The combination with a roadway and guide housings in said roadway of a gate disposed transversely of the roadway; said gate comprising a horizontal top plate adapted to be lowered flush against the roadway for passage of traffic thereover, and posts fixed to said top rail and slidable in said housings, and a yieldable barrier comprising spaced beams extended forwardly of the gate and having ends operatively connected therewith to be elevated by lifting of the gate, and a plurality of cables drawn taut between the beams and adapted to be lifted and lowered with the movement of the gate.

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