

June 24, 1941.

E. G. LITTLE

2,247,129

HIGHWAY CROSSING GATE

Filed Oct. 5, 1938

3 Sheets-Sheet 1

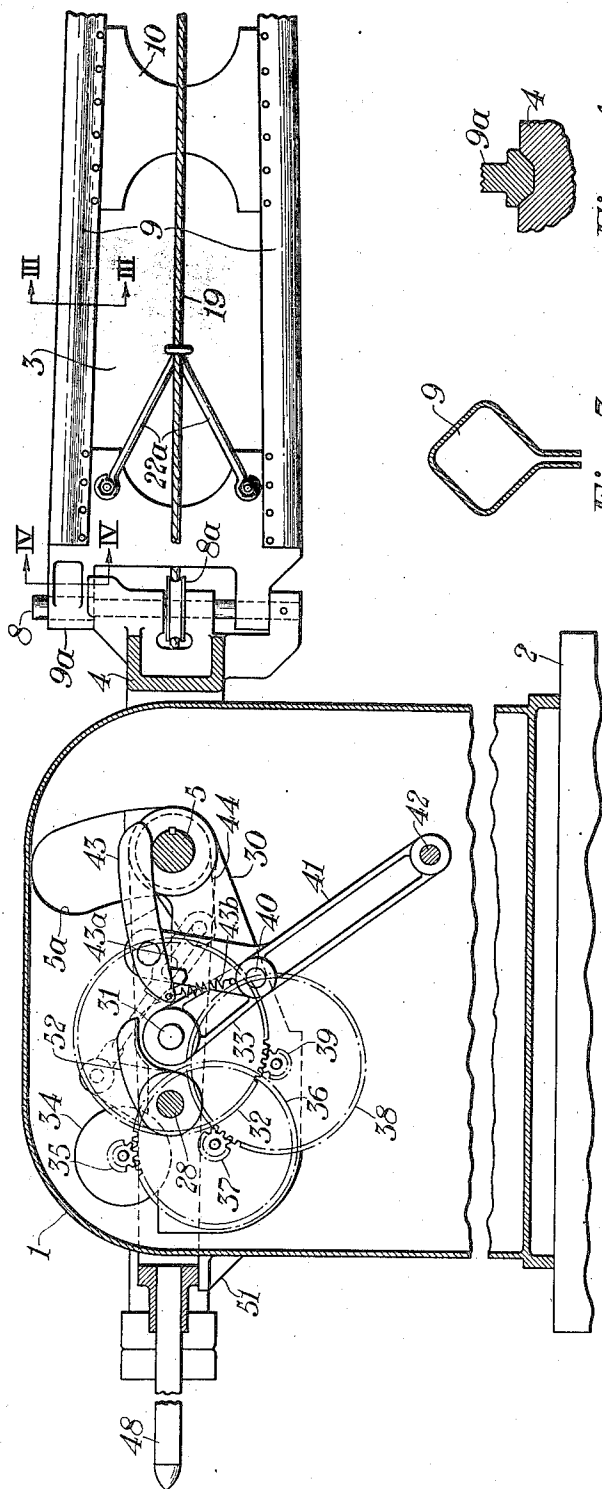


Fig. 1A.

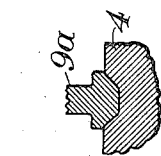


Fig. 4.

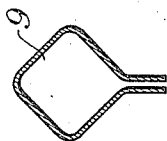


Fig. 3.

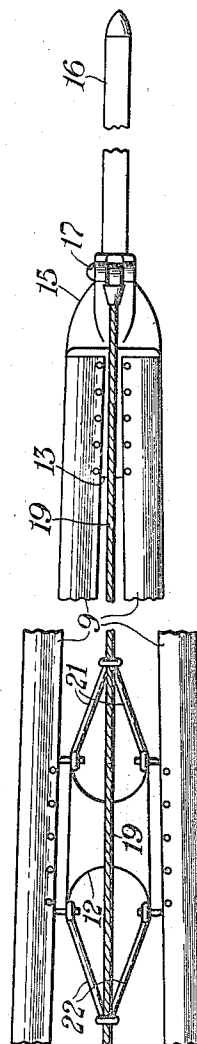


Fig. 1B.

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3 Sheets-Sheet 2

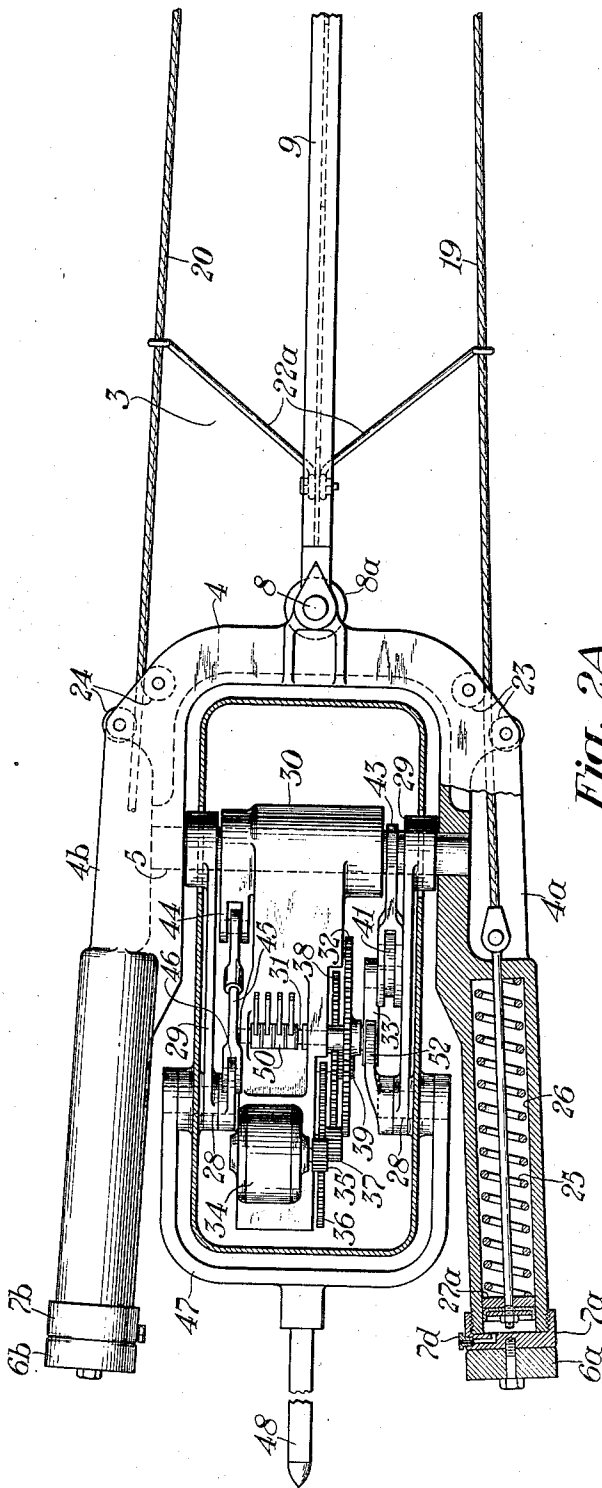


Fig. 2A.

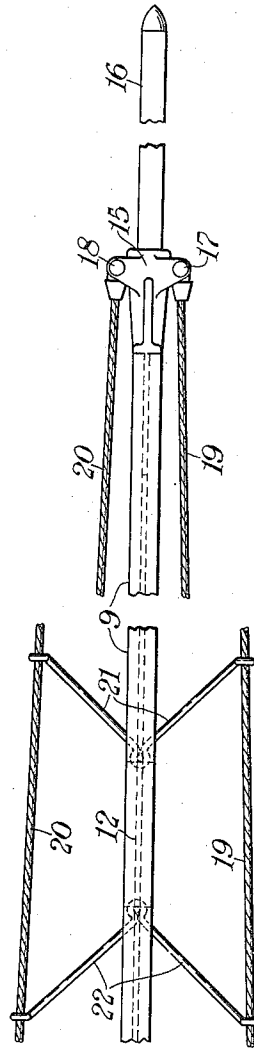


Fig. 2B.

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3 Sheets-Sheet 3

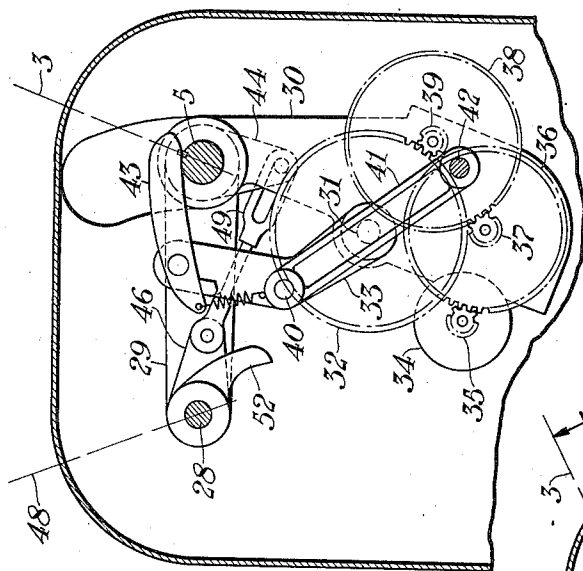


Fig. 6.

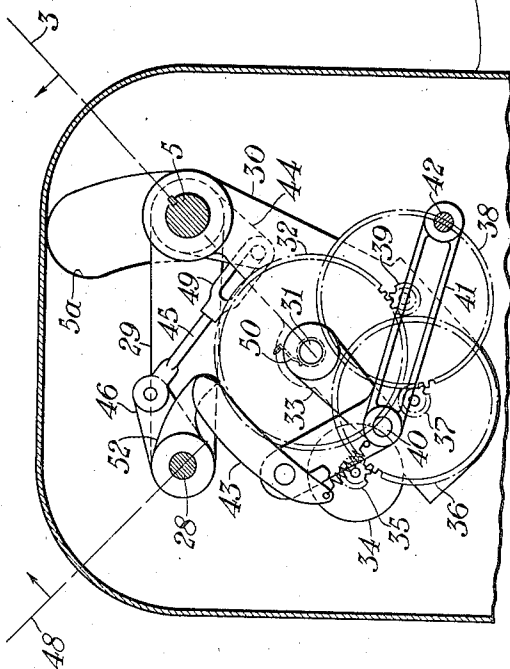


Fig. 5.

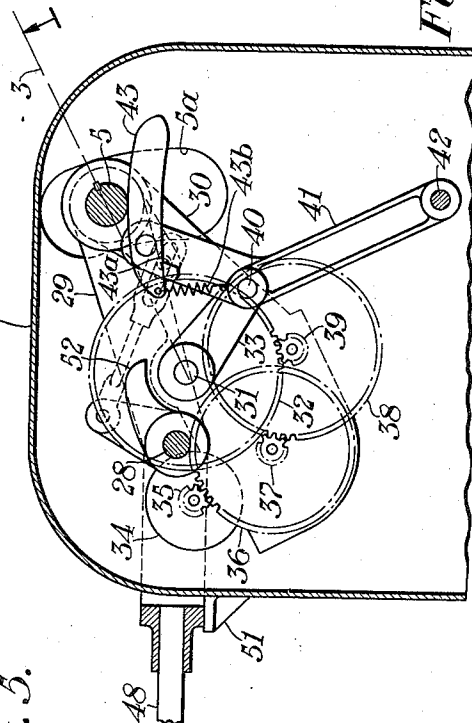


Fig. 2.

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2,247,129

HIGHWAY CROSSING GATE

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Application October 5, 1938, Serial No. 233,436

14 Claims. (Cl. 39-7)

My invention relates to highway crossing gates, that is, to gates having a highway obstructing arm adapted to operate between a raised or non-obstructing position, and a lowered or obstructing position, for preventing highway traffic from approaching the intersection of a highway with a railway.

An object of my invention is the provision of a novel and improved highway crossing gate which is operable to an obstructing condition, but which may be yieldingly deflected to a non-obstructing condition.

Another object of my invention is the provision of novel and improved gate operating means for a crossing gate whereby the operation of the gate arm is terminated in the event the arm strikes an obstruction in its normal path of travel, but which permits the operating means to assume a position which substantially corresponds to the position it would assume if the gate arm were not obstructed.

Other objects and advantages of my invention will appear as the specification progresses.

In the accompanying drawings, Figs. 1A and 1B are views, partially in vertical section and partially in vertical elevation, which, when placed end to end in the order named, illustrate one form of apparatus embodying my invention. In Figs. 1A and 1B, the gate arm 3 is shown in its lowered position, the operating means for the gate arm being in its raised position. Figs. 2A and 2B, when placed end to end in the order named, are top plan views with certain parts shown in section for better illustrating the construction thereof, showing the apparatus shown in Figs. 1A and 1B. Fig. 3 is a sectional view of one of the tubular members 9 forming arm 3, taken substantially on the line III—III of Fig. 1A. Fig. 4 is a sectional view taken substantially on the line IV—IV of Fig. 1A, showing a latching arrangement which may be used with my invention. Figs. 5, 6 and 7 are each views showing gate arm 3 and the operating means therefor in different positional combinations. In Fig. 5, the gate is represented operating to its raised position and the gate operating means is shown operating to its corresponding lower position. In Fig. 6, the gate operating means is shown in its lowered position, at which position of the operating means the gate arm is in its raised position. In Fig. 7, the gate operating means is illustrated in a position which it assumes if operation of the gate arm is prevented when the arm is being lowered, and which position of the operating

means substantially corresponds to its raised position.

Similar reference characters refer to similar parts in each of the several views.

Referring to Fig. 1A, a highway crossing gate embodying my invention is shown comprising a supporting housing 1, preferably fixed on a concrete base 2, and having pivotally mounted therein operating means for operating a gate arm 3 between a lowered and a raised position, the arm 3 in its lowered position obstructing the highway for preventing vehicles operating thereover from approaching the intersection, and in its raised position being clear of the highway for permitting the vehicles to approach the intersection. The arm 3 is operated to its raised position when the operating means is in its lowered position, and the arm 3 is in its lowered position when the operating means is in its raised position. As shown in Fig. 1A, the arm 3 is in its lowered position, the operating means being in its raised position.

Referring to Figs. 1A, 1B, 2A and 2B, a novel form of highway crossing gate arm 3 as shown comprises a U-shaped yoke 4 which is horizontally pivoted upon a rotatable shaft 5 cradled in the lower portion of an opening 5a provided in the housing 1, the yoke 4 being keyed to shaft 5 for rotation therewith. The legs 4a and 4b of yoke 4 are provided with balancing and adjusting weights 6a and 6b, respectively, and with air dashpots 7a and 7b, respectively. The arm 3 is attached to the yoke 4 by means of a vertical pin 8, the pivotal connection preferably being established substantially in the center of the base portion of the U-shaped yoke. As can best be seen in Figs. 1A, 1B and 3, the gate arm 3 preferably comprises tubular members 9 which may be formed cross sectionally as shown in Fig. 3 for the purpose of both strength and lightness, and which may be connected together by any suitable means, such as, for example, the brace plates 3a, 10, 42 and 43. As shown, an adapter pipe socket 15 is provided for the outer end of members 9, for supporting a single tubing member 16 forming the extreme outward portion of the gate arm.

Spring loaded cables 19 and 20 (see Figs. 2A and 2B) are provided one on either side of the gate arm 3, and each is connected at one end to the plunger rod of the associated air dashpot 7a or 7b, as the case may be, the other ends of cables 19 and 20 are connected to gate arm 3, the connection with the gate arm preferably being established near its outward end, and,

as shown, being established at the adapter pipe socket 15 by means of the pins 17 and 18. The cables 19 and 20 are laterally spaced from the members 9 by means of supporting arms 21, 22 and 22a. Each cable passes between a pair of pulleys 23, 23 or 24, 24 carried by the yoke 4. The cables 19 and 20 are spring loaded by means of compression springs disposed within recesses provided in leg yokes 4a and 4b forming the cylinders for air dashpots 7a and 7b, and serve to bias gate arm 3 to a centered condition, that is, a condition such that when lowered, the gate arm extends across the roadway substantially at a right angle with the highway. In this centered or obstructing condition of the gate arm, the member 9a engages the latch section provided in yoke 4 (see Fig. 4) for latching the arm 3 into its obstructing condition. As can be seen in Fig. 2A, the cable 19, for example, is connected with the plunger rod of dash-pot 7a, and a coil spring 25 disposed within recess 26 of yoke leg 4a bears against the piston head 27a and leg 4a, thereby establishing a biasing tension within the cable 19.

In the event gate arm 3 is lowered to its obstructing position so as to obstruct traffic operating along the highway, and the gate arm is struck in a horizontal direction, the gate arm will rotate about the vertical pin 8. The initial shock of the force striking gate arm 3 will be absorbed by the cable 19 or 20, with the result the gate withstands an initial force of quite large proportion without effecting damage to the arm. For example, when a force applied to the lower side of arm 3, as viewed in Fig. 2A, exceeds the spring bias exerted upon the arm by the cable 19 and the spring 25, the arm is swung horizontally, or upwardly as viewed in Fig. 2A, into a non-obstructing condition, the rotation of the arm acting upon the plunger rod of dashpot 7a and compressing the spring 25. When the force causing the rotation of arm 3 is removed, the compressed spring 25 acts upon the piston head 27a of the dashpot 7a, and thereby returns the arm 3 to its obstructing condition, the rate of the return movement of the arm under these conditions being constrained to the slow rate at which the air in dashpot 7a will flow through the restricted opening 7d of the dashpot, thus eliminating the possibility of damage to a vehicle or to the gate under these conditions. It should be noted that a pulley 2a is mounted on the vertical pin 8 for preventing the cable 19 or 20 from engaging the brace member 9a in the event that arm 3 is rotated substantially 90° from its normal obstructing condition.

It should be pointed out that marker lights and reflectors may be mounted upon the gate arm 3 in accordance with the usual practice. Since the gate arm is preferably formed having a tubular cross section, the circuit wires for the marker lights may be enclosed within one of the tubular members, whereby the wires are protected and insulated from damage and a separate conduit for that purpose is not required.

One advantage of my invention is the provision of a novel and improved crossing gate arm which when lowered is normally biased to its obstructing condition, but which is operable to a condition in which the arm is non-obstructing. A further advantage is the provision of a strong, yet light, gate arm, which is capable of resisting an initial shock without effecting damage to the arm.

The operating means for the gate arm is shown in Figs. 1A, 2A, 5, 6 and 7. Referring

to Fig. 2A, the reference characters 28 designate jackshafts which are journaled in housing 1. These jackshafts serve to pin supporting arms 29 to the housing 1, the other ends of the arms 29 journaling the rotatable shaft 5, to which shaft is affixed the U-shaped yoke 4. Also fixed to shaft 5 is a frame member 30, and supported in the outward end of the member 30 is the operating means for rotating the shaft 5. The operating means as here shown comprises a countershaft 31 journaled in the frame member 30, and having secured thereon a gear 32 and a crank arm 33. The gear 32 is operatively connected with a power element, here shown as an electric motor 34, by means of a train of gears 35, 36, 37, 38 and 39, the motor 34 being supported and fastened to the frame member 30. The crank arm 33 is pin connected by means of a pin 40 to a connecting member 41 (see Fig. 1A) which member is in turn pinned to the housing 1 by means of a pin 42.

The shaft 5 is adapted to be engaged by a latch member 43, which is pin connected with the connecting member 41, in the lowered and raised positions of the mechanism for holding shaft 5 cradled in housing 1. As will appear more clearly hereinafter, the latch member 43 is controlled to permit shaft 5 to rotate about the jackshafts 28 in the intermediate position of the mechanism. The latch member 43 is normally biased by means of a spring 43b (see Fig. 7) into engagement with a stop 43a provided on member 41, thereby establishing a latching connection with shaft 5.

The rotatable shaft 5 is provided also with a crank arm 44 connected through a connecting member 45 and a slidable member or link 49 to a crank arm 46 fastened to the upper jackshaft 28, as viewed in Fig. 2A. This upper jackshaft 28 is operatively connected through a U-shaped yoke 47 to a sidewalk arm 48 which is adapted to be operated, in a manner to be made clear hereinafter, between a lowered or obstructing position in which the arm is illustrated in Fig. 1A, and a raised or non-obstructing position. A latch member or dog 52 is secured to the upper jackshaft 28 for a purpose to be made clear presently. The function of slidable member 49, referred to previously, also will be explained as the description proceeds.

Motor 34 incorporated into the operating means of arm 3 is adapted to be controlled by any of the well-known types of control circuits in which control of the operating mechanism of the gate arm is established either manually through the medium of manually operable switches, or automatically through the medium of track relays. Inasmuch as the particular type of control circuit employed to control the operation of motor 34 forms no part of my present invention, no control circuit for motor 34 is represented in the drawings. It should, however, be pointed out that in accordance with the usual practice, a circuit controller is provided for the operating means of arm 3 to cooperate with the control circuit in controlling the operation of motor 34. One such circuit controller, designated by the reference character 50, is represented in Fig. 2A as being mounted on countershaft 31 forming a part of the operating means of shaft 5 and arm 3. The circuit controller 50 is provided with contacts selectively controlled in accordance with the position of arm 3, and which contacts function, as will be made clear presently, to terminate operation of motor 34 when-

ever due to the rotation of shaft 5, arm 3 is conditioned to be in its lowered or its raised position.

In describing the operation of the operating means for gate arm 3, I shall assume that the apparatus is in the condition shown in Fig. 1A. In this condition of the apparatus, the operating means is in its raised position, and the gate arm 3 is in its lowered or obstructing position, so that highway traffic is prevented from approaching the intersection. As shown, the centers of countershaft 31 and of the pins 40 and 42 of the connecting member 41 are preferably in alignment so that any external force exerted upon the gate arm 3 tending to force the gate arm to its raised position must act against connecting member 41, with the result that operation of the arm may be effected only by a rotation of the gear 32 acting through the shaft 31 and the crank arm 33 to actuate the connecting member 41.

When motor 34 is controlled by its control circuit to operate gate arm 3 to its raised position, the actuation of the motor is transmitted through the previously mentioned train of gears to actuate gear 32 in a clockwise direction, as viewed in Fig. 1A, and thereby rotate the crank arm 33 in a clockwise direction. Since crank arm 33 is pinned to the pivotally pinned connecting member 41, the actuation of the crank arm 33 rotates the connecting member 41 to the left about the fixed pin 42, with the result that frame member 39 is swung downwardly about rotatable shaft 5, gate arm 3 is swung upwardly about shaft 5, and latch member 43 is actuated out of engagement with the shaft.

Fig. 5 illustrates the maximum swing to the left of connecting member 41. At this point, arm 3 is swung to approximately 45° above the horizontal. As can be seen in Fig. 5, the rotation of shaft 5 is transmitted through crank arm 44, connecting member 45 and crank arm 46 keyed to shaft 28 to raise the sidewalk arm 48, which is attached to shaft 28 through the yoke member 47 (see Fig. 2A).

Further clockwise rotation of gear 32 and crank arm 33 results in the connecting member 41 swinging back to the right, until the centers of pins 40 and 42 of member 41 and the center of the countershaft 31 are in alignment, as illustrated in Fig. 6, at which point the arm 3 is in its raised position, and an external force applied to arm 3 will not effect the rotation of crank arm 33. When arm 3 reaches its raised position, controller 50 becomes effective to terminate operation of motor 34 and hence of arm 3, and the controller also is effective to condition motor 34 to operate arm 3 to its lowered position whenever the control circuit becomes operative to control the arm to its lowered position. As can be seen in Figs. 1A, 5 and 6, the rotation of crank arm 33 about shaft 31 causes the gate arm 3 to move in modified harmonic motion, with the result that although the rate of movement at the start and termination of operation is relatively slow, rapid movement of the arm is effected intermediate its extreme positions without danger of shock or impact resulting from rapid movement of the arm at the start or termination of movement.

The operation of the operating means for lowering the arm is similar to the operation just described for raising the arm, as may readily be seen from an inspection of the drawings, and further detailed explanation is deemed unnecessary except to point out that motor 34 is then driven

in a reverse direction. Since the rotation of motor 34 is reversed, gear 32 operates in a counterclockwise direction for effecting the lowering of the arm, and the connecting member 41 again swings to the left about pin 42, with respect to shaft 31.

In the event that the operating means is lowering the gate arm 3, and a force is applied to the arm opposing such operation, the operating means will continue to operate toward its raised position without effecting further operation of the arm. Referring to Fig. 7, the apparatus as shown illustrates the operating means operating the arm to its lowered position, but the arm 3 is engaged by an obstruction. As can be seen in Fig. 7, when the arm 3 strikes an obstruction, the rotation of gear 32 and crank arm 33 continues by virtue of the actuation of the motor 34, but further movement of arm 3 is not effected, the rotatable shaft 5 now rotating in its supporting arms 29 about the jackshafts 28. It is apparent that since shaft 5 is free to rotate about jackshafts 28 (being normally held cradled in housing 1 by virtue of the proportioning of the parts) the operating means continues to operate without effecting operation of the gate arm, until the operating means assumes substantially the position in which it is illustrated in Fig. 7, and at which position the motor circuit controller 50 opens the operating circuit to terminate operation of motor 34. The parts are preferably so proportioned that when the obstruction in the path of travel of arm 3 is removed, the arm will assume its lowered position by virtue of a gravity bias. It follows that operation of the gate arm is terminated in the event the arm strikes an obstruction, thereby preventing damage to the obstruction and gate arm.

It should be noted that since the operating means for arm 3 is mounted on frame member 39 and rotates about the shaft 5, the operating means partially fulfills the function of a counterweight for the gate arm 3. It should further be noted that when the sidewalk arm 48 is in its lowered or obstructing position so that it rests against a stop 51 provided on housing 1, a latch member 52 provided on jackshaft 28 engages the countershaft 31, thereby locking the sidewalk arm against actuation other than an actuation of the operating means. The slidable member 49 interposed in the connection of sidewalk arm 48 to gate arm 3 functions in the event of an obstruction in the path of travel of arm 48, to enable the arm to be held motionless during the initial stages of lowering the arm from its raised position without interfering with the operation of gate arm 3. In this manner, there is minimized the possibility of injury to pedestrians who might be under the sidewalk arm when it is caused to operate. During the later stages of lowering the sidewalk arm, where there is less likelihood that a pedestrian on the sidewalk might be struck by arm 48 in descending, the countershaft 31 rising against latch member 52 might force arm 48 down and thus render link 49 ineffective to hold the arm motionless if a force is applied to the arm opposing the lowering of the arm.

One advantage of a crossing gate operating mechanism embodying my invention is the provision of novel and improved means effective upon interposition of a force opposing operation of the gate arm, for terminating the operation of the gate arm while permitting the operating mechanism to assume a position substantially

that to which the gate arm is controlled, whereby after the force opposing operation of the gate arm is removed, the gate arm and operating means are caused to assume the positions to which the arm is controlled.

Although I have herein shown and described only one form of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination, a crossing gate arm operable between a raised and a lowered position, a rotatable shaft operatively connected with said arm for operating the arm, a supporting housing in which said shaft is journaled, operating means for rotating said shaft comprising a frame member secured to said shaft and having a power element mounted thereon, a crank arm operatively connected with said power element, and means for pivotally connecting said crank arm with said housing for effecting the rotation of said shaft to impart modified harmonic motion to said gate arm.

2. In combination, a crossing gate arm operable between a raised and a lowered position, a rotatable shaft operatively connected with said arm for operating the arm, a supporting housing, means for supporting said shaft in said housing, operating means including a power element mounted on said shaft for counterbalancing said arm, a crank arm operatively connected with said power element, and means for pivotally connecting said crank arm with said housing for effecting the rotation of said shaft to impart modified harmonic motion to said gate arm.

3. In combination, a crossing gate arm operable between a raised and a lowered position, a rotatable shaft mounted in a supporting housing and operatively connected with said arm for operating the arm, a frame member secured to said shaft, operating means including a power element mounted on said frame member, and an eccentric driving connection between said operating means and said supporting housing whereby said frame member rotates said shaft to impart harmonic motion to said gate arm.

4. In combination, a crossing gate arm adapted to be controlled to a raised and to a lowered position, a supporting housing, operating means operatively connected with said arm for operating the arm and having raised and lowered positions corresponding respectively to the lowered and raised positions of said arm, and means for pivotally mounting said operating means in said housing, operable upon the interposition of a force applied to said arm opposing operation of the arm to its lowered position to terminate operation of said arm while permitting said operating means to operate to its raised position, whereby when said force is removed said arm will assume the position to which it is controlled.

5. In combination, a crossing gate arm adapted to be controlled to a raised and to a lowered position, a supporting housing, a rotatable shaft operatively connected with said arm for operating the arm, operating means having raised and lowered positions corresponding respectively to the lowered and raised positions of said arm and operatively connected with said shaft for rotating said shaft, and means for pivotally mounting

said shaft and said operating means in said housing operable upon the interposition of a force applied to the arm opposing operation of said arm to its lowered position to terminate operation of the arm and to permit said operating means to operate to its raised position, whereby when said force is removed said arm will operate to the position to which it is controlled.

6. In combination, a crossing gate arm adapted to be controlled to a raised and to a lowered position, a rotatable shaft operatively connected with said arm for operating said arm to its raised or lowered position, a supporting housing, means for pivotally mounting said shaft in said housing, operating means mounted on said shaft and having raised and lowered positions corresponding respectively to the lowered and raised positions of said arm, and means for operatively connecting said operating means with said supporting housing operable upon the interposition of a force applied to said arm opposing operation of the arm to its lowered position to terminate operation of the arm while permitting said operating means to operate to its raised position, whereby when said force is removed said arm will assume the position to which it is controlled.

7. In a crossing gate operating mechanism, the combination of, a supporting housing, supporting arms pinned at one end to said housing for rotation thereabout, a rotatable shaft journaled in the other end of said supporting arms and adapted to rotate a highway crossing gate arm between two extreme positions, a frame member affixed to said shaft for rotation therewith; and operating means mounted on said member for rotating said shaft comprising, a jackshaft journaled in said frame member, means operatively connected with said jackshaft for rotating said jackshaft, a crank arm fixed to said jackshaft, and a connecting member pinned at one end to said crank arm and pinned at the other end to said housing for rotation thereabout.

8. In combination, a crossing gate arm adapted to be operated between a raised and a lowered position, a rotatable shaft operatively connected with said arm for operating the arm to its raised and lowered positions, a supporting housing, means for pivotally mounting said shaft in said housing whereby said shaft is capable of rotating about a fixed point on said housing, and operating means operatively connected with said shaft for normally effecting operation of said arm without effecting rotation of said shaft about said fixed point and effective upon an interposition of a force applied to said arm opposing operation of said arm for effecting rotation of said shaft about said fixed point without effecting operation of said arm.

9. In combination, a crossing gate arm adapted to be operated between a raised and a lowered position, a rotatable shaft operatively connected with said arm for operating the arm to its raised and lowered positions, a supporting housing, means for pivotally mounting said shaft in said housing whereby said shaft is capable of rotating about a fixed point on said housing, operating means operatively connected with said shaft for normally effecting operation of said arm without effecting rotation of said shaft about said fixed point and effective upon an interposition of a force applied to said arm opposing operation of said arm for effecting rotation of said

shaft about said fixed point without effecting operation of said arm, and latching means operative when said arm is in its raised or lowered position for preventing said shaft from rotating about said fixed point.

10. In combination, a crossing gate arm operable between a raised and a lowered position, a rotatable shaft operatively connected with said arm for operating the arm to its raised and lowered positions, a supporting housing, mounting means including supporting arms pivotally pinned to a fixed point on said housing and journaling said shaft for mounting said shaft in said housing whereby said shaft is capable of rotating about said fixed point, and operating means operatively connected with said shaft for normally effecting operation of said arm without effecting rotation of said shaft about said fixed point and effective upon an interposition of a force applied to said arm opposing operation of said arm for effecting rotation of said shaft about said fixed point without effecting operation of said arm.

11. In combination, a crossing gate arm operable between a raised and a lowered position, a rotatable shaft operatively connected with said arm for operating the arm to its raised and lowered positions, a supporting housing, mounting means including supporting arms pivotally pinned to a fixed point on said housing and journaling said shaft for mounting said shaft in said housing whereby said shaft is capable of rotating about said fixed point, operating means including a power element, means for mounting said operating means on said shaft, and means including a connecting member pivotally pinned to said housing and operatively connected with said operating means for normally effecting operation of said arm without effecting rotation of said shaft about said fixed point and effective upon an interposition of a force applied to said arm opposing operation of said arm for effecting rotation of said shaft about said fixed point without effecting operation of said arm.

12. A highway crossing gate comprising, in combination, a supporting housing provided with arcuate slots disposed in alignment in opposite sides thereof, supporting members pivoted to said housing about the centers of said slots, a rotatable shaft normally cradled in the lower ends of said slots and journaled in said supporting members for rotation about the centers of said slots, a crossing gate arm operatively connected with said rotatable shaft for swinging movement into and from a lowered obstructing position, an electric motor supported by said shaft, and an eccentric driving connection between said motor and said housing for rotating said shaft to impart

harmonic motion to said arm normally without causing said shaft to rotate about the centers of said slots but effective upon interposition of a force applied to said arm opposing movement thereof to rotate said shaft about slot centers, whereby without effecting further movement of said arm continued operation of said motor is effected until said motor completes its normal operating cycle.

13. In an operating mechanism for a highway crossing gate, the combination with a highway crossing gate arm mounted in a supporting housing for swinging movement into and from a lowered obstructing position in response to rotation of a shaft operatively connected to said arm, said housing having oppositely disposed arcuate slots for cradling said shaft, of supporting members pivoted at one end about the centers of said slots and at their other ends journaling said shaft for rotation about said slot centers, a motor supported by said shaft, an eccentric connection between said motor and said housing for effecting rotation of said shaft in said slots normally without causing said shaft to rotate about said slot centers but effective upon interposition of a force applied to said gate arm opposing movement thereof to effect rotation of said shaft about said slot centers, and a latch operatively connected to said rotatable shaft and effective in the lowered position of said arm to latch said shaft in said slots against rotation about said slot centers but ineffective during operation of said arm into its lowered position to prevent rotation of said shaft in said slots about said slot centers.

14. In combination, a supporting housing, a crossing gate arm adapted to be operated between a raised and a lowered position, a rotatable shaft supported by said housing and operatively connected with said arm for operating the arm between its raised and lowered positions, operating means including a power element mounted on said shaft, and means for operatively connecting said operating means to said housing comprising a crank arm operatively connected to said power element and a connecting member pinned at opposite ends respectively to said crank arm and said housing, said crank arm and connecting member being arranged in such manner that both ends of said connecting member align with the axis of said crank arm when said gate arm is in either its raised or its lowered position, whereby to effect operation by said power element of said gate arm between its raised and lowered positions and preventing operation of said arm by an external force applied to the arm in either its raised or lowered position.

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