May 23, 1933. A. KREMSER ET AL 1,910,220

MECHANICALLY OPERATED GATE

Filed Oct. 21, 1931 2 Sheets-Sheet 1

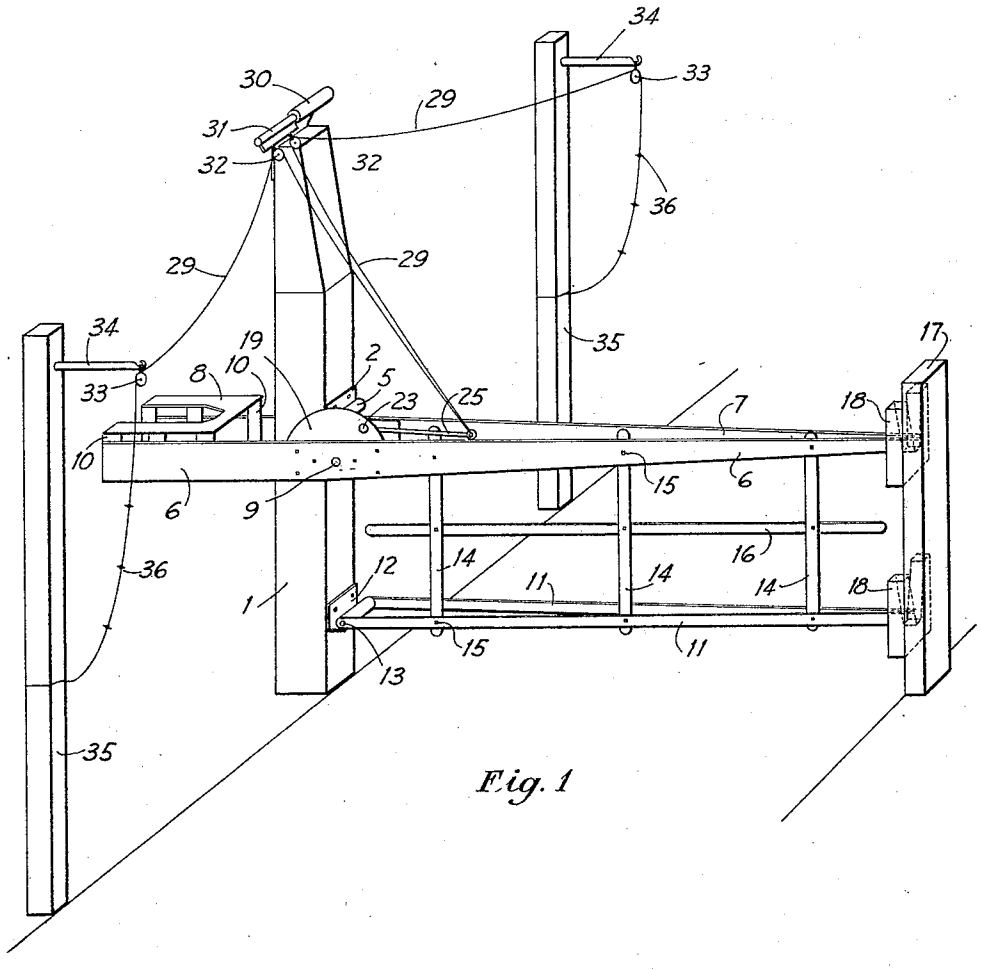

Fig. 1

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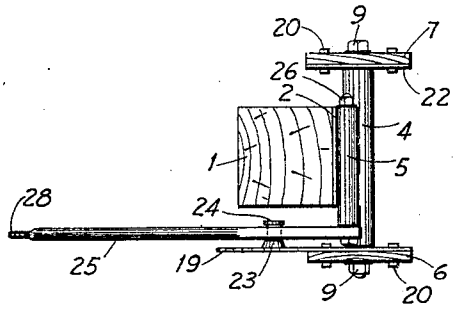

Fig. 4

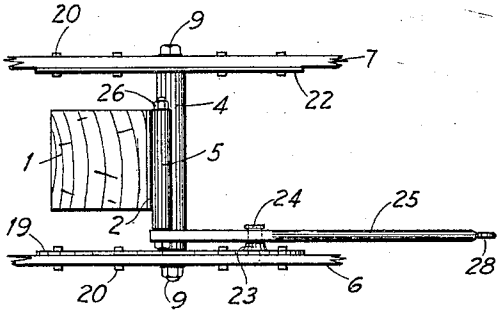

Fig. 2

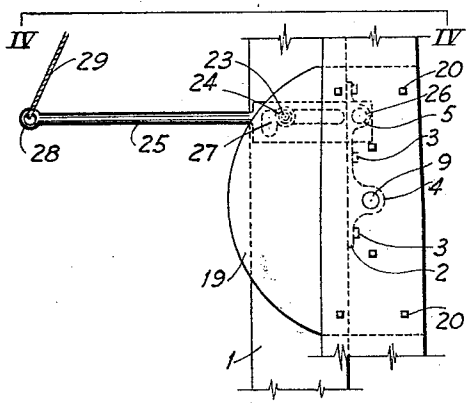

Fig. 5

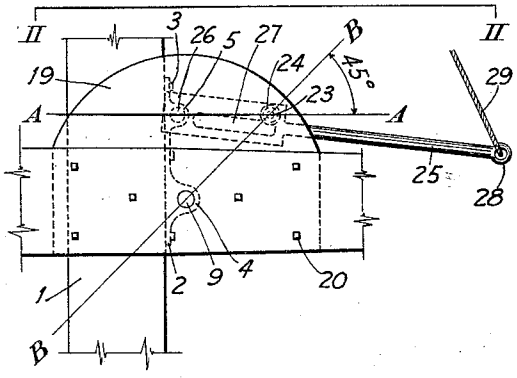

Fig. 3

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UNITED STATES PATENT OFFICE

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MECHANICALLY OPERATED GATE

Application filed October 21, 1931. Serial No. 570,166.

This invention relates to gates, particularly those used on farms or ranches and in outlying districts, where roads are infrequently traveled and are often crossed by a number of fenced property lines. With the usual type of plain hinged gate at these crossings it is necessary for a traveler along such a road to stop his conveyance and leave it at least once to open and shut such a gate, often at great inconvenience. The use of a mechanically operated gate which can be opened from one point and later closed from a different point without leaving a conveyance, at once suggests itself to avoid this procedure.

Many mechanically operated gates have been built for this service, but unsatisfactory features are found in the design of all such gates which we have encountered. Some of these gates are rendered at least partly inoperative by winds, some require an excessive amount of clearance for swinging, while others are adversely affected by accumulations of snow, weeds or earth that may build up around some portion of the gate or the area over which it travels. A disadvantage found in nearly all mechanically operated gates is the lack of complete control from both sides. In other words, after such gates have been opened by operating the actuating mechanism on one side, it is necessary to operate the mechanism on the opposite side. Under some circumstances this may be extremely inconvenient.

It is an object, therefore, of this invention to provide a mechanically operated gate whose operation is not affected by winds in any direction.

A further object is the provision of a mechanically operated gate which opens vertically, thus giving unlimited overhead clearance, and requiring no dead area in which to swing.

Another object is to provide a mechanically operated gate which can be opened or closed from either or both sides.

A still further object of this invention is to provide a mechanically operated gate which is easy to operate and which will always return to either the completely open or completely closed position even though the person operating it fails to supply the required force to the actuating mechanism.

A further and important object of this invention is to provide a mechanically operated gate which is simple, inexpensive and easy to make, which contains a minimum of moving parts and which will not be affected or damaged by accumulations of sand, snow or ice on those parts.

Various other objects and advantages will be more fully apparent from the following description and drawings which illustrate a preferred embodiment of this invention.

We do not limit our invention to the design shown in the drawings as it is apparent that alterations and changes can be made in both materials and construction without departing from the spirit of the invention.

In the drawings:

Fig. 1 is a three-quarter view of one form of our mechanically operated gate, shown in the closed position.

Fig. 2 is a plan on line II—II of the mechanism illustrated in Fig. 3.

Fig. 3 is a detail elevation of the hinge and actuating mechanism in its closed and locked position, showing its relation to the main post of the gate.

Fig. 4 is a plan on line IV—IV of the mechanism illustrated in Fig. 5.

Fig. 5 shows a detail elevation of the hinge and actuating mechanism in the position it will assume when the gate is open.

In Fig. 1 of the drawings, 1 represents a substantial wooden post set in the earth at one side of the roadway across which the gate normally extends. On the side facing the roadway and at a suitable height a metal hinge support plate 2 is attached to the post 1 by means of lag screws 3. Plate 2 is fitted with two horizontal bearings 4 and 5, arranged as shown on Figs. 3 and 5. Bearing 4 is the lower and is set out from the face of the post, whereas bearing 5 is above 4 and is close to the post. Thus the center lines of these bearings are horizontally as well as vertically displaced, for a purpose which will be explained later.

Wooden bars 6 and 7, forming the main arm of the gate, are arranged as shown, one

on each side of post 1. The two ends which extend across the roadway are preferably brought together and bolted, while the other ends, on the opposite side of post 1, are provided with a suitable counterweight 8 to balance the weight of the gate. The bars 6 and 7 are pivoted on a steel bolt 9 which, with bearing 4, forms a hinge for the bars and allows them to move vertically through approximately 90 degrees. If desired, simple and inexpensive radial ball bearings may be used in this hinge to decrease friction and make the operation easier and more positive.

In the case of a gate of large span, the counterweight 8 is of such proportions and exposed area as to counterbalance the effect of winds traveling in a direction parallel to the plane of the gate. It is obvious that winds at right angles to the gate have no effect on its operation and would not tend to close it if it were to be left open, nor to resist its opening. The center of gravity of the counterweight is to the left of the axis of bars 6 and 7 when the gate is in the vertical or open position, for a purpose to be described later. The weight 8 in the example shown is a flat steel plate cut out to allow it to straddle the lower rails or wires of the fence (not shown) when the gate is open and standing vertically, and is set out from the bars by means of spacers 10, to allow the bars to stand vertically on each side of the post 1 without interference therewith. A further reason for this displacement is to provide a counterclockwise turning moment which holds the gate in its open position without the use of a latching device. Separate weights on each bar, displaced as just explained, could be used if desired.

In order to prevent the passage of small animals, such as hogs or sheep, beneath the bars 6 and 7, a panel is provided beneath the bars as shown in Fig. 1. The lower bars 11 of this panel are hinged to the post 1 by the hinge 12 and the bolt 13. Vertical stiles 14 are provided to support the remainder of the bars 11 and are pivoted at both sides by means of bolts 15 to allow the parts of the panel to remain parallel as the gate is opened and closed. Additional horizontal bars 16, also pivotally connected to the stiles, may be provided.

Directly across the roadway from post 1 is set a second shorter post 17, which is provided with one or more vertically grooved cleats 18, into which the ends of bars 6, 7 and 11 rest when the gate is in the closed or lowered position. These cleats 18 support the gate laterally in this position and prevent opening or damage from side thrust from either direction.

The latching and actuating mechanism is attached to the bar 6 and is particularly illustrated in Figs. 2, 3, 4 and 5. Referring to Figs. 2 and 3 which show the mechanism in closed position, a steel plate 19 is attached to the inside of the bar 6 by means of bolts 20. Bolt 9, previously referred to, is supported in the lower and outer bearing 4 on plate 2, and passes through a hole in plate 19, making a hinged support for bar 6. A rectangular plate 22 is fastened on the bar 7, on the opposite side of post 1, and provides a bearing for the other end of bolt 9.

A steel stud 23, which may be welded to plate 19, extends inwardly therefrom. On this stud is mounted a circular cam roller or follower 24, preferably a simple radial ball bearing assembly. An actuating lever 25, which is flat for a portion of its length, is hinged on a bolt 26 which passes through bearing 5 of the hinge plate 2. An L-shaped cam slot 27 is formed in the flat portion of lever 25, with the axis of the longer arm of the slot parallel to the axis of the lever and passing through the center of bearing 5, and with the shorter arm of the slot extending upwardly. Cam follower 24 moves within the slot and forms the operative connection between the actuating lever 25 and the gate bars 6 and 7. This L-shaped slot receives the cam follower 24 in its shorter section when the bars 6 and 7 and the lever 25 are in the position shown in Fig. 3, i. e. when the gate is shut and the actuating lever is in its extreme right hand position. For this reason the clear length of the shorter arm of the slot must be greater than one half the diameter of cam follower 24. The reception of the cam follower 24 in the shorter or latching section of the cam slot 27, wherein it is held by the weight of the lever 25, provides a lock to hold the gate in its closed position, as any upward motion of the outer ends of bars 6 and 7 is transformed into a thrust of cam follower 24 against the left side of the short cam slot toward the bolt 26. The outer end of actuating lever 25 is formed into an eye 28 for attaching the actuating ropes 29.

In opening and closing the gate it will be apparent that the greatest turning or lifting effect will be exerted upon the actuating lever and in turn upon the gate structure when the axis of lever 25 is at right angles to actuating ropes 29 at the beginning of the opening and the closing operation. Due to the cam follower being located within the shorter or locking section of the cam slot when the gate is in the closed position, the actuating lever 25 does not actually begin to raise or open the gate until it has been moved through a sufficient distance to free the cam follower from the locking section of the slot, or, in other words, until the cam follower rests upon the lower surface of the longer section of said slot. Hence, for the closed position of the gate the actuating lever will lie slightly below its position for exerting the greatest turning or lifting effect. In the illustration as shown in Figures 3 and 5 of the drawings we have

not shown the actuating lever 25 as resting in the position to give maximum turning effect when the gate is opened or closed, but instead have shown the actuating lever as being approximately in the horizontal position for the open and closed position of the gate.

In Figures 3 and 5 of the drawings the stud 23 is show as being located so that when the axis of bars 6 and 7 is horizontal (the closed position of the gate) the line A—A and the line B—B which pass, respectively, through the centers of stud 23 and upper hinge plate bearing 5 and the centers of stud 23 and lower hinge plate bearing 4, make an angle of 45°. With this relationship the actuating lever 25, after the cam follower has been released from its locking position within the slot, will move through 180° while the gate is moving through 90° from its closed and horizontal position to its open and vertical position. Moreover, with such relationship it will be noted that when the actuating lever is in its extreme position corresponding to the open position of the gate, the cam follower does not rest in the shorter section of the slot, or, in other words, does not lock the gate in its open position. Furthermore, when the line A—A passing through stud 23 and upper hinge plate bearing 5 is horizontal the actuating lever will occupy a position slightly below the horizontal for the closed position of the gate and a substantially horizontal position for the open position of the gate.

If the stud 23 is so located that the lines A—A and B—B, referred to above as passing through its center and the centers of the upper and lower hinge plate bearings 5 and 4 respectively, make an angle less than 45°, the actuating lever 25 will move through less than 180°, whereas if this angle be greater than 45° the actuating lever 25 will move through more than 180° when the gate is being moved through 90° or from its closed to its open position, or vice versa. It will be apparent, therefore, that by varying the position of the line A—A, as from the horizontal to an inclined position, and by varying the position of the center of stud 23 on the line A—A so as to vary the angle which the line B—B makes with the line A—A, various desired operating characteristics of the gate may be obtained. One result of such variation may be that the gate may be made to open more easily than to close and vice versa. Another result may be that the horizontal distance by which the upper hinge plate bearing 5 is offset from the lower hinge plate bearing 4 may be varied and may in fact be completely eliminated without causing the cam follower to take the locking position within the shorter portion of the cam slot or such a position in the shorter portion of the cam slot as to lock the gate in its open position. Various changes of this nature will be apparent to a skilled mechanic and need not be enumerated here.

At the top of post 1 is mounted a bracket 30 which is shaped at its upper end as shown in Fig. 1 to form a bearing or journal for a shaft 31. Shaft 31 is mounted to oscillate in the bearing of bracket 30 and extends outward therefrom on the side toward the actuating lever 25. Attached to shaft 31 are two sheaves or pulleys 32, set in the plane of the shaft and adapted to receive the ropes 29, which pass upward from the eye 28 of the actuating lever 25. The ropes then lead in opposite directions along the roadway, as shown in Fig. 1, and are further supported by sheaves 33 mounted on brackets 34 near the tops of posts 35, which latter are at convenient distances from the main post 1. Hand-holds or toggles 36 may be provided to facilitate grasping and pulling downward on the ropes 29, and the ends of the ropes are preferably tied or otherwise fastened to their respective posts as shown, to prevent their displacement by wind.

The bearing of bracket 30 is offset from the rear face of the post 1 to the center line thereof for a purpose to be explained later. The top of the post is beveled on three of its sides, as illustrated in Fig. 1, to prevent that actuating rope which crosses the post from chafing thereon, and also to allow the converging ends of the gate bars 6 and 7 to pass the face of the post and stand vertically in the open position. The oscillating shaft 31 which supports the sheaves 32 allows them to remain in line with those sections of ropes 29 which lead upward from the actuating lever 25, in both the open and closed positions of that lever.

It has already been explained how the cooperation of the actuating lever cam slot 27 with the cam follower 24 on the moving part of the gate, locks the gate when it is in the closed position. In opening the gate, by pulling downward on either of the actuating ropes 29, the actuating lever 25 is rotated counterclockwise about bolt 26. The pull should preferably be continued until the lever and rope are almost in a straight line, whereupon the rope is released. The first part of the rotation (see Fig. 3) allows the cam follower 24 to free itself from the locking or short portion of the L-shaped cam slot 27. As the counterclockwise rotation of the actuating lever 25 continues, the lower surface of the long section of the cam slot 27 bears upward against the came follower 24, and as the latter is attached to the plate 19 and bar 6, which is in turn bolted to bar 7, the gate structure is rotated approximately 90 degrees about bolt 9 to its vertical or open position.

The actuating lever 25, as already stated, is connected to the plate 19 and bar 6 by the cooperation of the cam slot 27 in said lever

and the cam follower 24 mounted on the gate structure. As the lever 25 is raised by the actuating rope 29 to an approximately vertical position, at which point the bars 6 and 7 are at approximately 45°, the counterbalance moment and the momentum of the gate will serve to move the bars 6 and 7 to a vertical position, carrying lever 25 approximately 90° further, or to the position shown in Fig. 5. As already pointed out, the center of gravity of the counterweight 8 is so positioned that it is to the left of the vertical line through the bars 6 and 7 and the hinge bolt 9 when the gate is open, and the counterclockwise turning moment caused thereby holds the gate open. Therefore, no locking device is necessary for this position.

Closing the gate is effected by a downward pull on either of the actuating ropes 29, which causes the actuating lever 23 to rotate clockwise (see Fig. 4) about its pivot bolt 26, thereby giving cam follower 24 a clockwise motion and overcoming the counterclockwise turning moment due to the center of gravity of the counterweight 8 being to the left of its support. The pull is continued until the actuating lever 25 is almost in line with its actuating rope 29 leading over the sheave 32, whereupon the rope is released, the momentum of the gate carrying the parts to the closed and locked position as shown in Figs. 1 and 3.

It will now be apparent why the center of bearing 5 is displaced to the left of a vertical line through the center of bearing 4. Referring to Fig. 5, if these were located on the same vertical line, so that lever 25 would rotate about a pivot vertically above bearing 4, the cam follower 24 would take a position in or above the branch or depending section of the slot 27, when the gate was in its open position. Then, if the lever 25 were moved upward so as to close the gate, the right side of the shorter portion of the cam slot would engage the cam follower, thus locking the gate in this open position and preventing its being closed by use of the actuating lever.

As it is, the left displacement of the center of bearing 5 with respect to a vertical line through bearing 4 prevents the cam follower from dropping into the short arm of the cam slot 27 and confines its contact to the longer or axial portion of the slot, thus permitting the closing operation to proceed as soon as the actuating lever 25 is rotated in a clockwise direction.

Referring to Figs. 1 and 3, it will be noted that a vertical line through the bearing 5 and bolt 26, on which the actuating lever 25 is pivoted, is to the right of the center line of the post 1 on which line the sheaves 32 are mounted. Thus, if the actuating ropes 29 are pulled and held so that they are in a straight line with lever 25, both the ropes and the lever will be inclined to the left. If the ropes are then released the lever will tend to rotate to the left or counterclockwise, under the action of gravity. This tendency, together with the positioning of the counterweight 8 to the left of a vertical line through the center of the bearing bolt 9 (when the gate is in a vertical or open position) affords definite opening of the gate even though the manual operation be so slow that it will actually stop with the rope 29 and the actuating lever in a straight line. It is obvious that this is a desirable feature, as it eliminates the possibility of incorrect operation allowing the gate to drop on persons passing through.

While a specific construction embodying our invention has been described and illustrated, it is to be understood that the invention is not limited to that specific device. All such modifications and changes as come within the scope of the appended claims are embraced thereby.

We claim:

1. In a mechanically operated gate hinged to open vertically, the combination of a post, a counterweighted gate structure hinged to said post and provided with a cam follower support projecting therefrom, a cam follower mounted on said support, an actuating lever hinged to said post and operatively connected to said gate structure by means of a slotted opening which carries said cam follower, the axis of the hinge on said actuating lever being parallel to and displaced horizontally from the axis of said gate structure, said slotted opening being provided with a branch extending approximately at right angles to the main portion of said slotted opening and positioned to receive the cam follower when the gate is in its closed position and to lock said gate.

2. In a mechanically operated gate hinged to open vertically, the combination of a post, a counterweighted gate structure hinged to said post and provided with a cam follower support projecting therefrom, a cam follower mounted on said support, an actuating lever hinged to said post and operatively connected to said gate structure by means of a slotted opening which carries said cam follower, the axis of the hinge on said actuating lever being parallel to and displaced horizontally from the axis of the hinge of said gate structure, said slotted opening being provided with a branch extending approximately at right angles to the main portion of said slotted opening to receive the cam follower when the gate is in the closed position, the axis of support for said cam follower lying approximately in a horizontal line passing through the axis of the hinge of said actuating lever and in a line passing through the axis of the hinge of said gate structure, which latter line is inclined approximately 45° to said horizontal line, whereby said actuating lever rests in approximately a hori-

zontal position in both the closed and open positions of said gate.

3. In an actuating mechanism for a gate hinged to open vertically, the combination of two vertically separated horizontal bearings having horizontally displaced axes and mounted on a vertical post, a gate structure supported by the lower bearing, an actuating lever supported by the upper bearing to open and shut said gate and provided with a slot for a cam follower, said slot having a branch at approximately right angles to its axis adapted to lock said gate in its closed position, said lever being adapted to rotate through 180 degrees, a cam follower mounted on said gate structure and moving in said slot to operatively connect the gate structure to said actuating lever, said cam follower projecting horizontally therefrom and lying on a horizontal line through the upper bearing when the gate is open and closed, actuating ropes connected to said lever for moving the same from its open and closed positions, and adapted to be operated from either side of said gate, and sheaves offset from a vertical line through the upper bearing and located at the top of said post adapted to support said actuating ropes.

4. In an actuating mechanism for a gate hinged to open vertically, the combination of two vertically separated horizontal bearings having horizontally displaced axes and mounted on a vertical post, a gate structure supported by the lower bearing, an actuating lever supported by the upper bearing to open and shut said gate, and provided with a slot for a cam follower, said slot having a branch at approximately right angles to its axis, and adapted to lock said gate in its closed position, said lever lying approximately horizontally in its extreme positions, a cam follower mounted upon said gate structure and moving in said slot to operatively connect the gate structure to said actuating lever, said cam follower lying on a horizontal line through the upper bearing when the lever is horizontal, actuating ropes connected to said lever for moving the same from its open and closed positions and adapted to be operated from either side of said gate, and sheaves offset from a vertical line through the upper bearing and located at the top of said post adapted to support said actuating ropes.

5. In an actuating mechanism for a gate hinged to open vertically, the combination of two vertically separated horizontal bearings having horizontally displaced axes and mounted on a vertical post, a gate structure supported by the lower bearing, an actuating lever supported by the upper bearing and cooperating with a cam follower to open and shut said gate, said lever lying approximately horizontally in its extreme positions and adapted to lock said gate in its closed position, a cam follower mounted on said gate structure and moving in said slot to operatively connect the gate structure to said actuating lever, said cam follower lying on a horizontal line through the upper bearing when said lever is in its extreme positions, actuating ropes connected to said lever for moving the same from its open and closed positions, and supporting means for said actuating ropes.

6. In a gate hinged to rotate from a horizontal to a vertical position, the combination of two vertically separated horizontal bearings, a gate structure supported by the lower bearings, an actuating lever supported by the upper bearing to open and shut said gate and adapted to lock said gate in its closed position, said lever lying approximately horizontally in its extreme positions, means mounted on said gate structure to operatively connect the same to said actuating lever and with the center of said means lying on a horizontal line through the upper bearing when said lever is in its extreme positions, and actuating means for said lever adapted to be operated from either side of said gate.

7. In a gate hinged to rotate from a horizontal to a vertical position, the combination of two vertically separated horizontal bearings; a gate structure supported by the lower bearing, an actuating lever supported by the upper bearing, said lever adapted to rotate through 180 degrees to open and shut said gate, a cam follower mounted on said gate structure to operatively connect the same to said actuating lever, said cam follower lying on a horizontal line through the upper bearing when said lever is in its extreme positions, and actuating means for said lever adapted to be operated from either side of the gate.

8. In an actuating mechanism for a gate hinged to open vertically, the combination of two vertically separated horizontal bearings, a gate structure supported by the lower bearing, an actuating lever supported by the upper bearing to open and shut said gate and adapted to lock said gate in its closed position, means mounted on said gate structure to operatively connect the same to said actuating lever, the center of said means lying on a horizontal line through the upper bearing and upon a 45 degree line through the lower bearing when the gate is open or closed, and actuating means for said lever to move the same from its open and closed positions.

9. In an actuating mechanism for a gate hinged to open vertically, the combination of two vertically separated horizontal bearings, a gate structure supported by the lower bearing, an actuating lever supported by the upper bearing adapted to lock said gate in its closed position and lying approximately horizontally in its extreme positions; means mounted on said gate structure to operatively connect the same to said actuating lever, the center of said means lying on a horizontal line

through the upper bearing when said lever is in its extreme positions, and actuating means for said lever.

10. A mechanically operated gate hinged at one end on a horizontal bearing so as to rotate about said bearing from its horizontal and closed position to a vertical and open position, a cam follower rigidly fixed to said gate, an actuating lever mounted on a horizontal bearing separated vertically from the first named bearing and having a cam slot in which said cam follower moves to open and close said gate said slot and follower adapted to lock said gate in its closed position.

11. In combination with a mechanically operated gate, two vertically separated horizontal bearings, a gate structure supported at one end by the lower of said bearings so as to rotate about said bearing from the horizontal and closed position of the gate to the vertical and open position of the gate, a cam follower rigidly fixed to said gate structure, an actuating lever mounted on the upper of said bearings and having a cam slot in which said cam follower moves to open and close said gate.

12. A gate mounted on a horizontal bearing and adapted to be rotated about said bearing from a horizontal to a vertical position and characterized by a construction in which a separately mounted pivoted cam is utilized to cooperate with a cam follower rigidly fixed to the gate to open and close the gate and to lock it in its closed position, said cam adapted to be rotated to substantially the same angle on each side of the vertical while moving the gate from its horizontal to its vertical position.

Signed at San Francisco, California, this 15th day of October 1931.

ALOIS KREMSER.

Signed at Richmond, California, this 9th day of October 1931.

JOHN R. MacGREGOR.