(No Model.)

3 Sheets—Sheet 1.

G. E. HAWKS.

SAFETY GATE FOR DRAW BRIDGES.

No. 332,899. Patented Dec. 22, 1885.

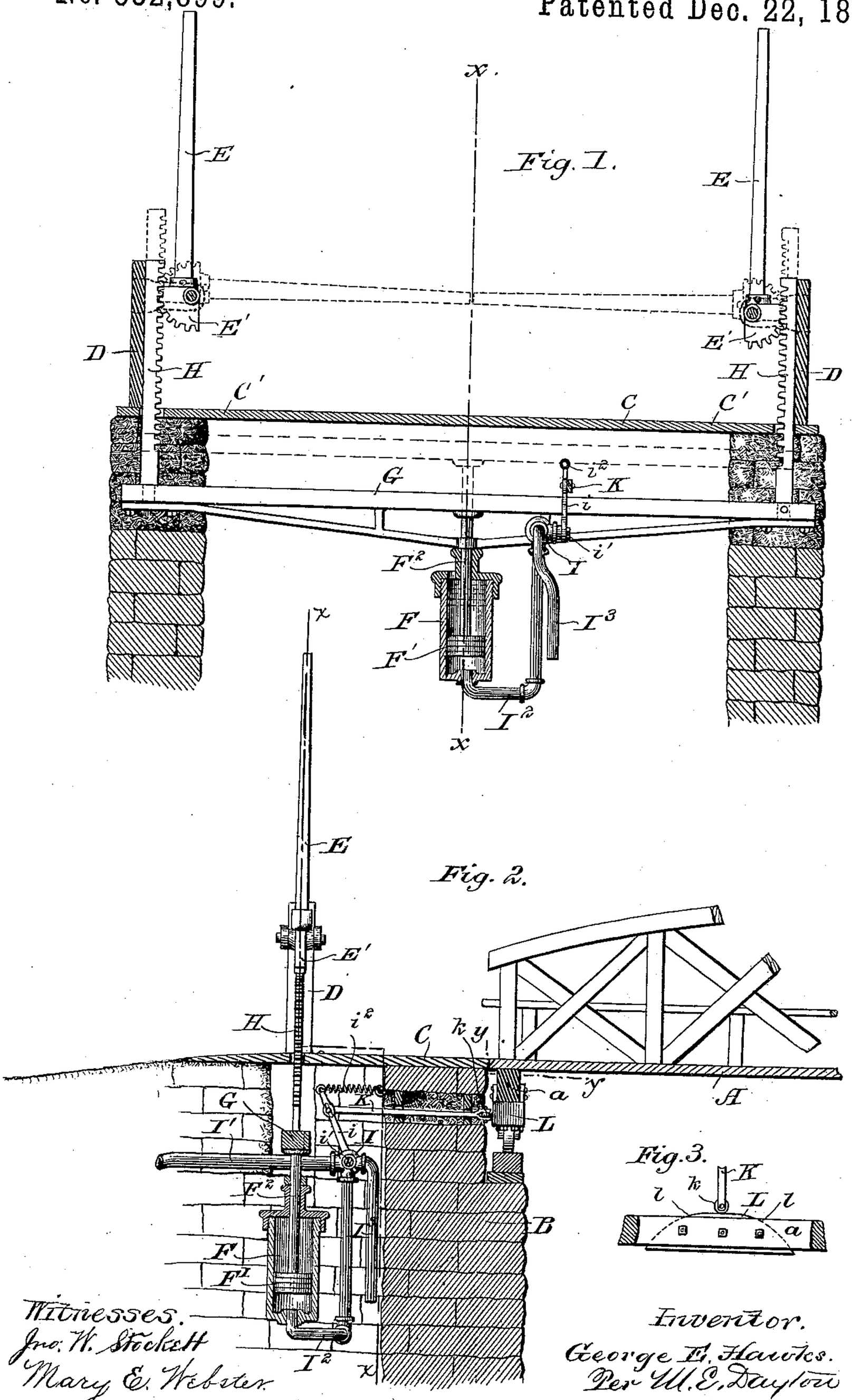

Fig. 1.

Fig. 2.

Fig. 3.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 4.

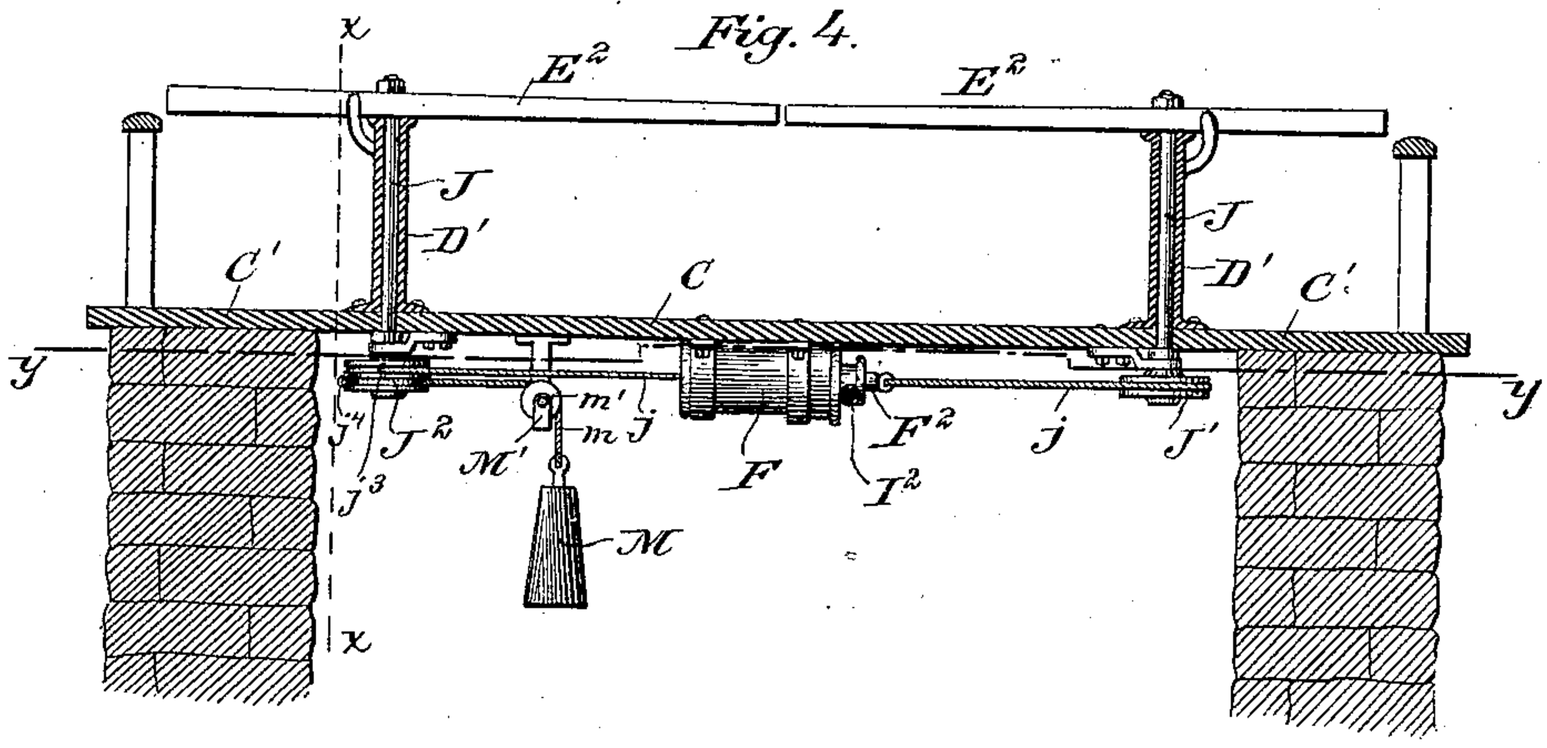

Fig. 5.

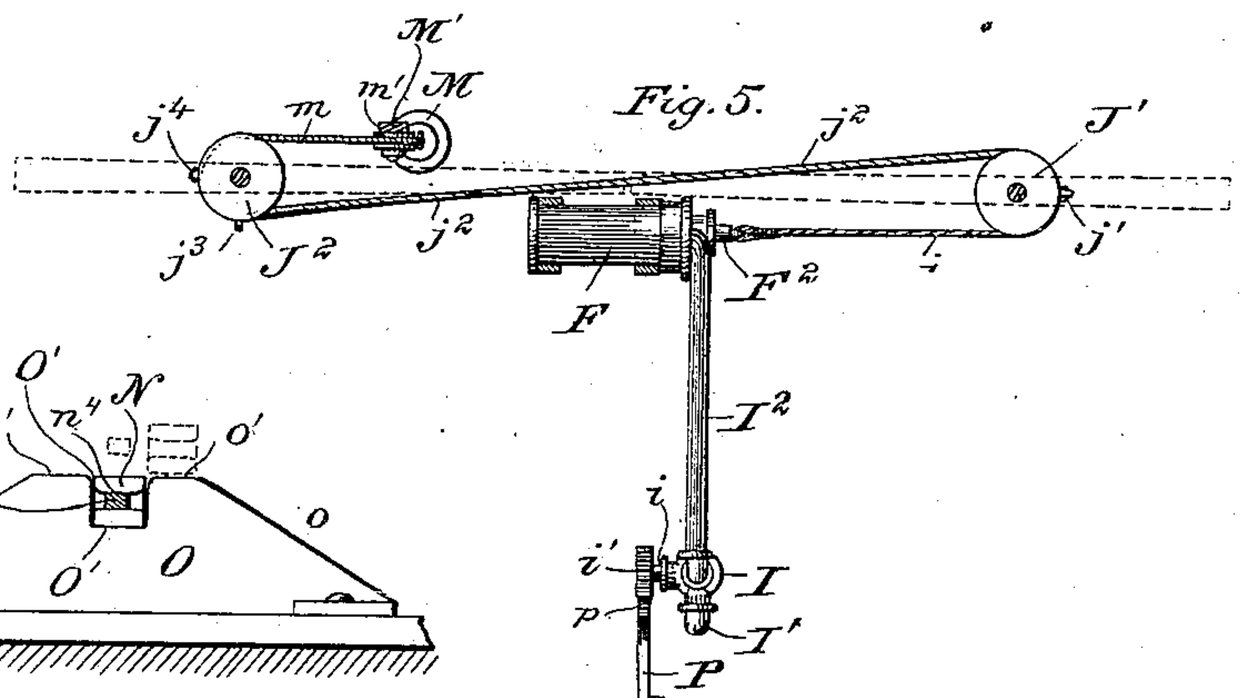

Fig. 7.

Fig. 6.

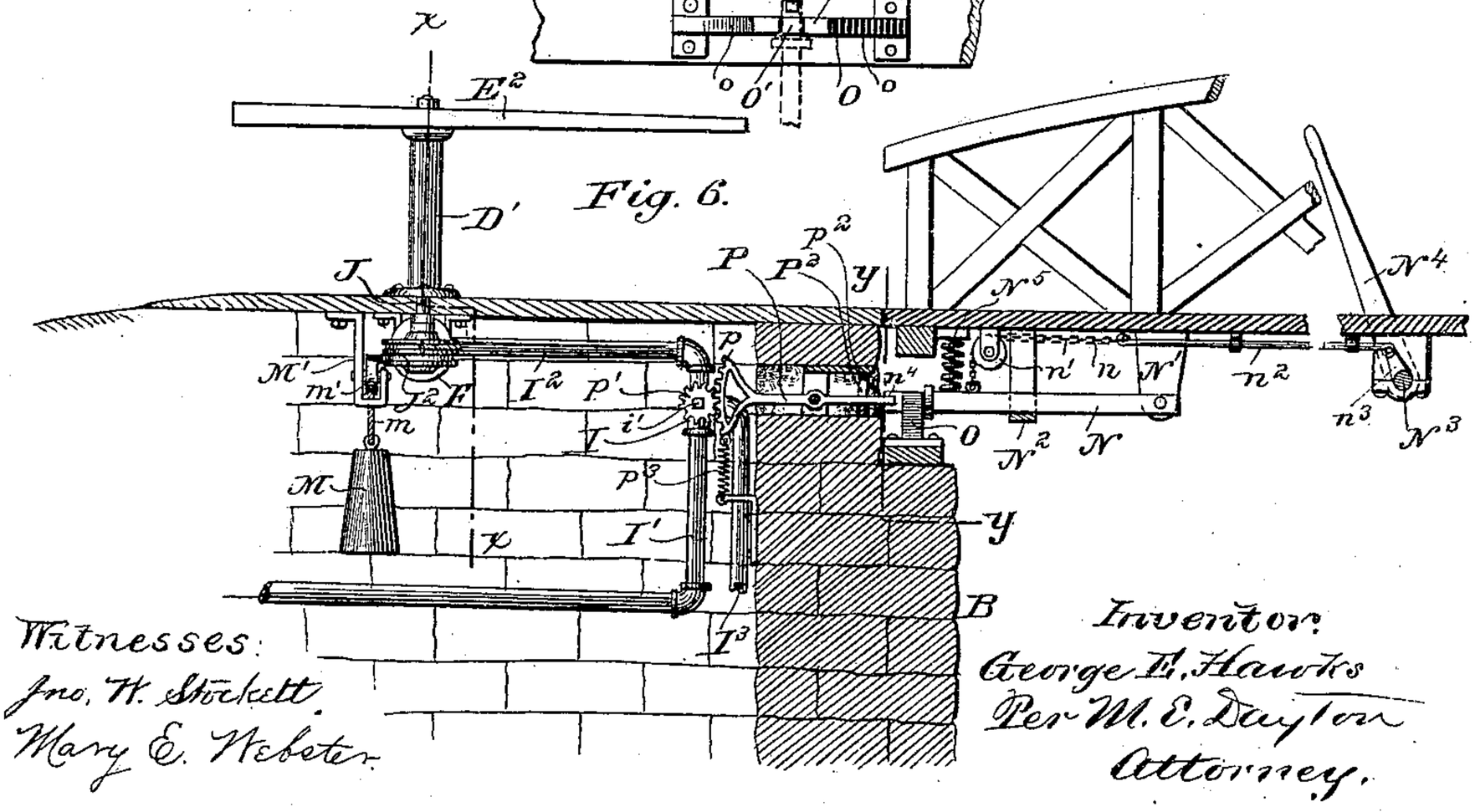

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Fig. 8.

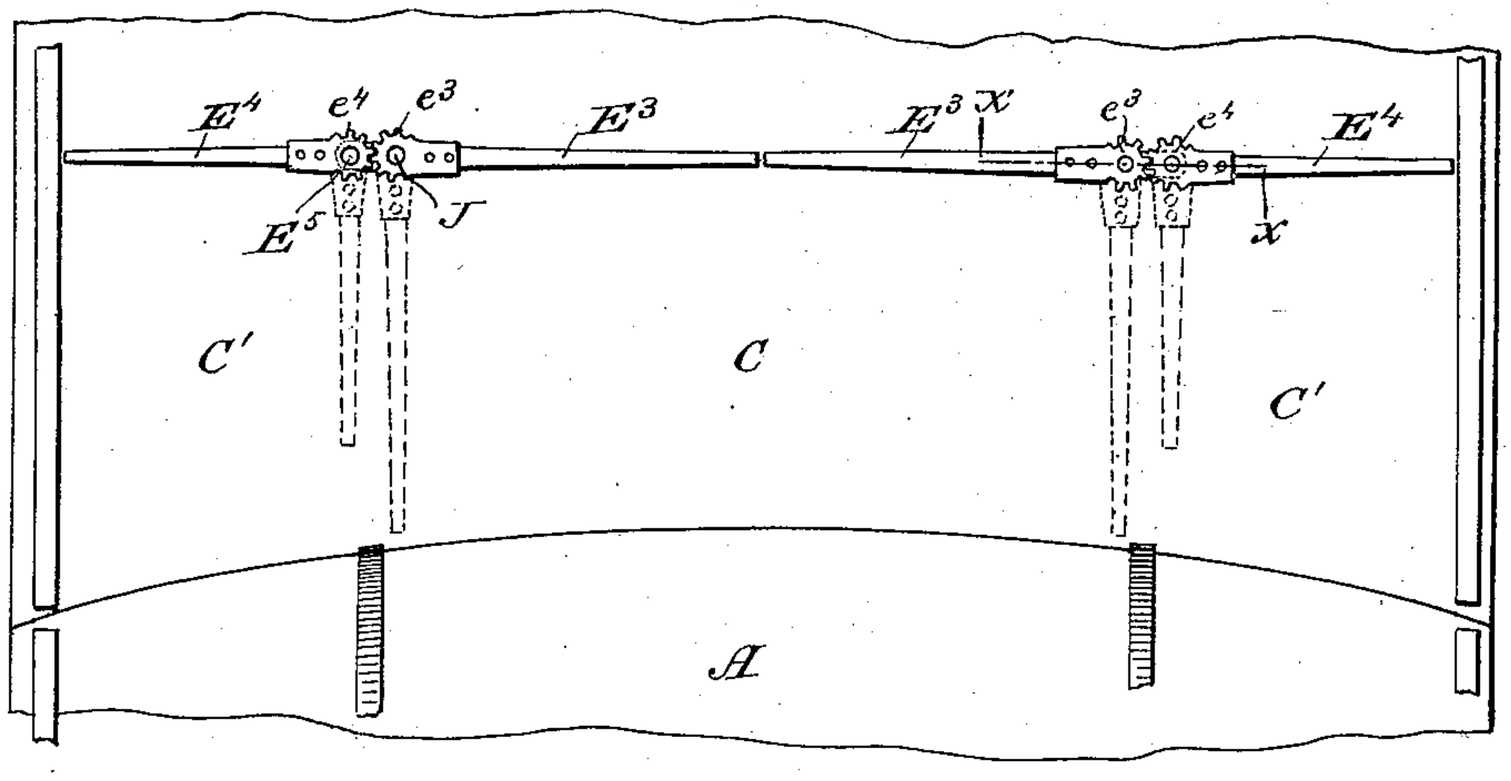

Fig. 9.

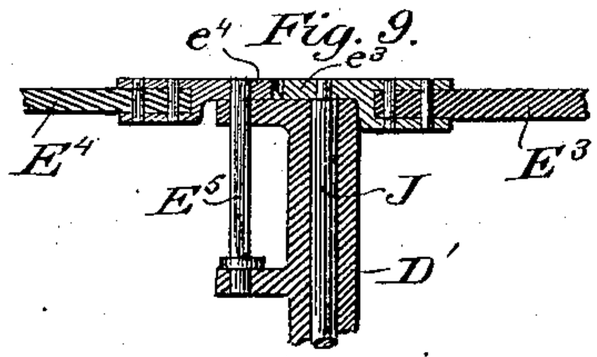

Fig. 10.

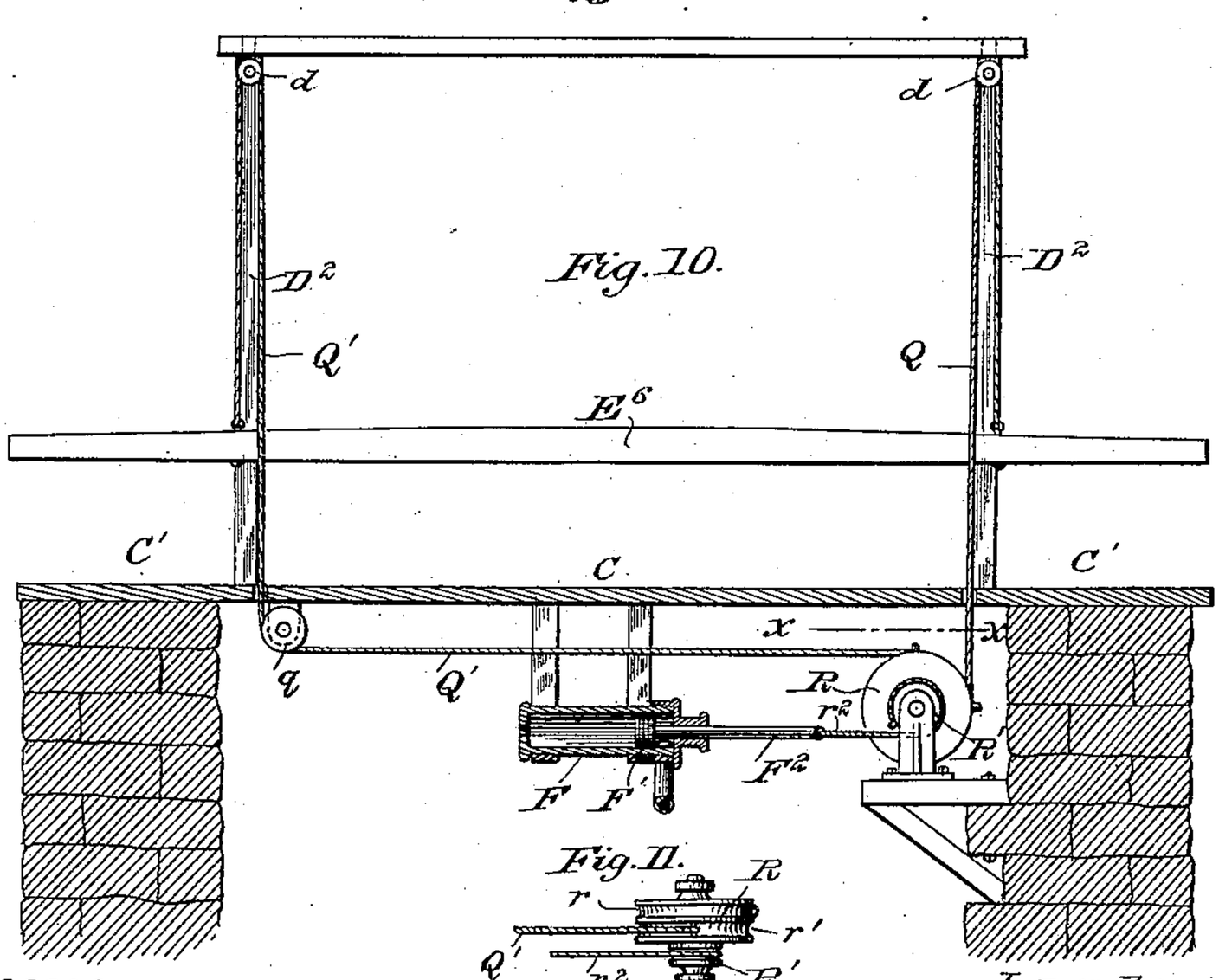

Fig. 11.

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UNITED STATES PATENT OFFICE.

GEORGE E. HAWKS, OF HIGHLAND PARK, ILLINOIS, ASSIGNOR OF ONE-HALF TO EDGAR A. HILL, OF SAME PLACE.

SAFETY-GATE FOR DRAW-BRIDGES.

SPECIFICATION forming part of Letters Patent No. 332,899, dated December 22, 1885.

Application filed September 24, 1883. Serial No. 107,172. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. HAWKS, of Highland Park, in the county of Lake and State of Illinois, have invented certain new and useful Improvements in Safety-Gates for Roadways; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to safety gates or guards, such as are placed at the approaches to swing-bridges and at railway-crossings. Its object is to provide for the operation of the gates by means of some available and continuously-operating hydraulic force, whereby the necessity for direct manual effort, or of force operating, for example, through the movement of the bridge, is avoided; and it consists in the matters hereinafter described, and pointed out in the claims.

As a preferable means of applying hydraulic pressure for the purpose above stated, a water-motor is employed, consisting, essentially, of a cylinder provided with a suitable piston and piston-rod, said cylinder being connected by a valved passage with a city water-main affording a constant supply of water under pressure, and the water-motor being applied to operate a gate by connecting the piston-rod thereof with the gate through the medium of suitable intermediate connections. The gates mentioned are either moved in both directions by the movement of the piston in the cylinder or, as preferably constructed, the said gates are moved in one direction only by the movement of said piston, and weights or springs are applied to move them in the opposite direction.

As a preferable form of valve for controlling the inlet and exhaust passages of the hydraulic cylinder above mentioned, an ordinary three-way valve is used, which is constructed to bring the interior of said cylinder into communication either with the supply-pipe or exhaust-passage, as desired. In the case of a swinging bridge, the valve is preferably operated automatically by the movement of the ends of the bridge in opening and closing it.

In order that the power required for opening the valve, when the construction last mentioned is used, shall not be added to that required in starting the bridge in its opening movement, devices operating independently of the force used in giving lateral movement to the bridge are provided for actuating such valve. Such means, as preferably constructed, consist of a spring or weight applied to throw the valve in one direction as the bridge is opened, and devices upon the bridge constructed to reverse the valve and to hold it at the opposite limit of its movement in opposition to the force of the spring or weight when the bridge is closed. When the cylinder and its connections are so constructed that the gates are moved in but one direction by the admission of water to said cylinder, the spring mentioned is preferably arranged to normally retain the valve in position to allow ingress of water to the cylinder, and the devices upon the bridge are constructed to actuate the valve, so as to cut off the water therefrom, the connections between the piston and gates being arranged in such manner that the gates will tend to remain open (either by their own weight or by a weight or spring applied to them) when the water is cut off from the cylinder, and in such manner, also, that the gates will be closed by the admission of water thereto. By this construction the said gates will remain open when the bridge is closed, and will be closed automatically by the movement of the bridge in opening it.

Suitable devices are also provided by this invention for transmitting the motion of the cylinder-piston to two pivoted gates, so as to move them in opposite directions, and for other purposes, as will be hereinafter set forth.

In the accompanying drawings, Figure 1 is a vertical cross-section through the roadway or approach to a bridge, taken upon line *x x* of Fig. 2, and showing a device embodying my invention for operating the gates. Fig. 2 is a central longitudinal section of the same, taken upon line *x x* of Fig. 1. Fig. 3 is a detail horizontal section taken upon line *y y* of Fig. 2. Fig. 4 is a vertical cross-section through the roadway or approach to the bridge, taken upon line *x x* of Fig. 6, and

showing another form of the device for operating the gates. Fig. 5 is a sectional plan view taken upon line *y y* of Fig. 4. Fig. 6 is a longitudinal vertical section of the end of the bridge-approach and the abutment, taken upon line *x x* of Fig. 4, showing the devices upon the abutment for operating the gates. Fig. 7 is a detail vertical section taken upon line *y y* of Fig. 6. Fig. 8 is a plan view of the end of the adjacent parts of the approach to the bridge, showing a modified form of swinging gates. Fig. 9 is a detail vertical section taken upon line *x x* of Fig. 8, showing the top of one of the posts for supporting the gates and the portion of the gate-bars adjacent thereto. Fig. 10 is a vertical transverse section through the bridge-approach, showing means for operating a horizontally-movable gate. Fig. 11 is a detail sectional plan view taken upon line *x x* of Fig. 10.

As illustrated in the drawings, A is the end of a swinging draw-bridge, which is supported upon a central pier, and is constructed to rotate thereon in either direction in a well-known manner. B is one of the walls or abutments which support the approaches to the bridge, and with which the bridge comes in contact when it is closed. C indicates the surface of the roadway, and C′ the foot-paths adjacent thereto upon the approach to the bridge.

In the form of the device embodying my invention illustrated in Figs. 1, 2, and 3 two posts or supports, D, are located at either side of the bridge-approach, and to the upper ends of said posts are pivoted two arms, E, which are constructed to swing in a vertical plane, and are adapted to be placed in a horizontal position, so as to meet at the center of the roadway and close the approach to the bridge, and to be raised to a vertical position, so as to leave said approach open. Beneath the roadway C, and centrally between the posts D, is located a cylinder, F, which is provided with a piston, F′, and piston-rod F^2, the latter being connected at its upper end to a cross-bar, G, extending to either side of the bridge-approach, with its extremities beneath the posts D. To the ends of the said bar G are connected two vertical rack-bars, H, which are constructed to move in suitable guides in the posts D, and are engaged at their upper ends with two toothed segments, E′, secured to the arms E concentrically with the pivotal points thereof, said segments being so arranged with reference to the arms that when the piston-rod, the bar G, and the rack-bars H, are at the downward limit of their movement said arms will be raised to a vertical position, and when the said rack-bars and the bar G are lifted by the upward movement of the said piston-rod the said arms will be thrown downwardly into a horizontal position.

The piston and piston-rod mentioned are raised for the purpose of operating the gates E by means of hydraulic pressure in the cylinder F, obtained by means of suitable pipe-connections between said cylinder and the mains of a city water-works or other source or means of water-supply, a suitable valve, I, being connected with said cylinder and constructed to permit an inflow of water to the cylinder when it is desired to close the gates and to cut off the water and allow it to escape from the cylinder, so as to permit the bar G and the piston to descend by the weight of the several parts therewith connected, and thus cause the gates to open. The valve I, as preferably constructed, is in the form of an ordinary three-way valve, which is desirably operated by the movements of the bridge in opening and closing the latter.

As illustrated in Figs. 1 and 2, the valve I is connected with the main of the city water system by means of a supply-pipe, I′, to the cylinder F by means of a pipe, I^2, and to an outlet or exhaust pipe, I^3, said valve being constructed in a well-known manner to bring the pipe I^2, leading to the cylinder, either in communication with the supply-pipe I′ or the exhaust-pipe I^3.

For the purpose of operating the valve I, a lever, *i*, is connected with the stem *i′* thereof, and to said lever is connected one end of a coiled spring, i^2, the opposite end of which is secured to a stationary part of the abutment, and which tends to keep said valve in position to close the communication between the supply-pipe and the cylinder and to afford egress for the water in the cylinder through the exhaust-pipe I^3. To said lever I is also attached a horizontal rod, K, which extends outwardly through the abutment-wall B, with its end in a position adjacent to and beneath the swinging end of the bridge. Upon the end of the bridge, in the same horizontal plane with and in position to engage the rod K, is placed a block, L, which, as shown, is bolted to the lower cross-piece, *a*, at the end thereof, and is provided with two oppositely-inclined surfaces, *l*, the said block being constructed to move said rod K inwardly in opposition to the action of the spring i^2, so as to throw the lever *i* in position to cut off communication between the supply-pipe and the cylinder when the bridge is closing, and to release said rod and permit the valve to be moved so at to allow water to enter said cylinder when the bridge is moved laterally in either direction in opening it. The bar K is preferably provided with a roller, *k*, constructed to bear upon the inclined surfaces *l* in the movement of the bridge, so as to prevent lateral deflection in the end of said bar, which would otherwise be consequent upon the frictional contact of said surfaces therewith.

In the above-described device the cross-bar G and connecting parts are made sufficiently heavy to lift the bars E when they are permitted to descend by the exit of the water from the cylinder F. Instead of this construction, however, the said bars may be both opened

and closed by water-pressure. A suitable valve and passages will preferably be provided for this purpose, the said valve being operated in such case by the movement of the bridge, in the same manner as before described.

In Figs. 4, 5, 6, and 7 the gates are shown in the form of horizontally-swinging bars E′, which are pivoted to posts D′ at a point intermediate to their ends, the parts of said bar inside of and outside of the posts extending, respectively, across the roadway C and footpath C′, as shown. The bars E′ are secured to the upper end of vertical rods J, which are extended downwardly through the said posts to a point beneath the roadway, and are provided upon their lower ends with pulleys J′ and J², to which the power is applied by which the said rods are rotated and the bars E moved.

In the device shown for applying hydraulic pressure to operate the bars a cylinder, F, is used, which is provided with a piston, F′, and a piston-rod, F², as before described, the water-outlet pipe I² in this case, however, being connected with the end of the cylinder adjacent to the piston-rod, so that said rod is drawn into the cylinder by the action of the water-pressure. The axis of the said cylinder is preferably arranged tangentially with reference to the periphery of the pulley J′, and the piston-rod F² is connected with one end of a rope or chain, *j*, which passes around the said pulley at its opposite end, and is secured thereto by means of an eye, *j′*, secured in said pulley, or other fastening device, so as to give a positive movement to said pulley when the said piston-rod is retracted. Motion from the pulley J′ is transmitted to the pulley J² by means of a rope or chain, *j²*, which passes partially around the pulley J′ at its side opposite to that over which the rope *j* passes, and is extended diagonally to the pulley J², around which it passes in an opposite direction, its end being connected therewith by means of an eye, *j³*, so that when the pulley J′ is rotated in one direction by the movement of the rope *j* the pulley J² will be thereby turned in the opposite direction.

In the construction shown the gates are moved in one direction only by the water-pressure upon the piston connected with the rope *j*; and in order to move the gates in an opposite direction when the water is allowed to escape from said cylinder a weight, M, is connected to the end of a rope, *m*, which is trained over a pulley, *m′*, mounted in a stationary hanger, M′, said rope being extended partially around a second groove in the pulley J², and connected therewith at its ends by means of an eye, *j⁴*, as shown. By this construction the weight M tends to revolve the pulleys J′ and J² in the direction opposite that in which they are moved by the action of the piston in the cylinder F, so that when water is allowed to escape from said cylinder the piston-rod will be drawn outwardly and the said pulleys revolved so as to open the gates.

The means shown in Figs. 4, 5, 6, and 7 for operating the valve I are constructed to operate in connection with the locking device by which the bridge is held in position when closed. The locking device shown in said figures is one ordinarily used, and consists of a projection or block, O, located upon the bridge-abutment and provided with a notch, O′, and a latch-bar, N, which is constructed to engage said notch. The said latch-bar is pivoted at its end which is toward the center of the bridge, to a projection, N′, thereon, and is supported in a vertical position by means of a suitable stop, N², secured to the frame of the bridge near the free end of said bar, the said free end of the bar being located in position to engage the notch O′ in the block O, and said block being provided with oppositely-inclined surfaces *o*, constructed to encounter and lift the end of the bar, so as to permit it to pass to the notch O′ during the closing of the bridge, in a well-known manner.

The means shown for lifting the free end of the latch-bar N, so as to release the bar from the notch O′ when it is desired to open the bridge, are devices ordinarily used for this purpose, and consist of a chain, *n*, which passes over a pulley, *n′*, located upon the bridge-structure above the latch-bar N, said chain being connected with said latch-bar at one end and at the other end with a rod, *n²*, which extends to the middle of the bridge or other point thereon convenient to the attendant, and is connected with an arm, *n³*, upon a cross-shaft, N³, which is provided on one end with a lever, N⁴, by the movement of which lever said shaft may be rotated, and, through the medium of the several connections described, the end of the latch-bar lifted from engagement with the notch O′.

For the purpose of operating the valve I from the locking device described, the latch-bar N is extended past the inner face of the block O, and is provided upon its end with a transverse horizontal groove or notch, *n⁴*, constructed to engage the end of a vertically-swinging lever, P, which is pivoted in the abutment-wall with its end projecting therefrom in position to enter said groove or notch. The inner end of the lever P is, as shown, provided with a segmental rack, *p*, constructed to engage a pinion, *p′*, upon the stem *i′* of the valve I, and thereby operate said valve when the lever is moved; but the connection between the said bar P and the valve may be made in any other desired or convenient manner—as, for instance, the valve may be located below the inner end of the said lever P and provided with a horizontal arm connected by means of a suitable pitman with the said lever. The lever P is held, as shown, in suitable guides, P², at its end adjacent to the latch-bar N, so as to permit such end to move freely in a vertical direction, but to prevent side motion therein. The connections between the

lever P and the valve I are so arranged that when the latch-bar N is placed in the notch O′, and the end of the said lever P is engaged with the latch-bar, communication between the induction-pipe and the cylinder F will be closed, and when the latch-bar is lifted and the outer end of the lever P is raised, the valve will be moved so as to admit water to the cylinder. The inner end of the lever P is preferably connected to one end of a coiled spring, p^2, the other end of which is attached to a projection upon the abutment below the said end of the lever, so that said spring tends to keep the outer end of the lever at the upper limit of its movement and the valve I open or in position to admit water to the cylinder.

A stop, p^3, is preferably placed at the upper end of the guides P^2, for the purpose of limiting the upward movement of the outer end of the lever P under the action of the spring p^2, and the block O is provided with short horizontal surfaces o' adjacent to the notch O′, over which the end of the latch-bar moves horizontally for a short distance in approaching the said notch, the stop p^3 being located in position to retain the end of the lever P horizontally in line with the notch n^4 in the bar N when the latter is resting upon one of the said surfaces o', so that when the said bar is approaching the notch O′ in closing the bridge it will automatically engage the end of said lever, as illustrated by the dotted lines, Fig. 7.

By this construction, when the latch is lifted and released from the notch for the purpose of allowing the bridge to turn, the lever P will be actuated and water will be admitted to the cylinder, so as to close the gates. After the latch is lifted the side movement of the bridge will carry the latch-bar away from and out of engagement with the end of the lever P, which will be held in its elevated position and in contact with the stop p^3 by the spring p^2 during the time that the bridge is open. In the closing of the bridge the end of the latch-bar will first strike one of the inclined surfaces o of the block O, and will be thereby lifted to the horizontal surface o', over which it will move horizontally, and in so doing will engage the end of the lever P, (which is held by the spring p^2 against a stop, p^3, and in proper position to engage it, as before mentioned,) and as it falls into the said notch will carry the end of the said lever downwardly with it, and by the reverse movement of the pinion p', occasioned by such movement of the lever, will close the induction-pipe and permit the escape of water within the cylinder and allow the gates to open by the action of the weight M.

In case the weight of the latch-bar N is not sufficient to throw the end of the bar P downwardly in opposition to the action of the spring p^2, a spiral or other spring, N^5, may be interposed between the upper surface of the said latch-bar and a stationary part of the bridge, said spring tending to depress the said bar and rendering its return to the notch O′ certain.

Instead of the construction above described, by which a single cylinder is connected with the gate-arms upon opposite sides of the roadway, a separate cylinder may be applied to operate each arm. When two cylinders are used in the device shown in Figs. 1 and 2, they would preferably be placed beneath and operate directly upon the vertical rack-bars, and in the device shown in Figs. 4, 5, and 6 the piston-rods of the cylinders would be connected directly with the pulleys J′ and J^2, or otherwise arranged, so as to independently operate the gate-arms.

When two cylinders are used, the entrance of water to both of them may be controlled by a single valve or by two valves operated independently by a projection upon the bridge. In the latter case, as a preferable construction, the device for operating the valves would be laterally separated, so that one gate will be opened or closed before the other one, the valve-operating devices upon the abutment and the bridge being relatively so arranged that when the bridge is opening the gate at the side of the approach with which the end of the bridge is in contact longest will be closed last, and when the bridge is closing the gate at the side of the approach which the bridge first encounters will be first opened. The advantage of this construction is that one of the gates will remain open, to permit pedestrians who have remained upon the bridge after it has begun to move to pass therefrom, and, similarly, one gate will open before the other, to permit passage to the part of the bridge which first overlaps the abutment when the bridge is closing.

Instead of the construction previously described in the horizontally-swinging bars used to form the gates, each of said bars may consist of two arms, E^3 and E^4, as indicated in Figs. 8 and 9, said arms being pivoted to posts D′, between the roadway C and the footwalk C′, similar to those shown in Figs. 4, 5, and 6. The inner and longer arms, E^3, are in this case arranged to close the roadway, and the outer and shorter arms, E^4, are extended across the foot-path, said arms being provided upon their adjacent ends with intermeshing toothed segments $e^3 e^4$, constructed of equal diameters, and so arranged that the movement of one arm through a certain arc will move the other arm a corresponding distance. The arms E^3, as shown, are pivoted upon the upper ends of vertical shafts J, which are constructed and may be rotated in the manner described in connection with the form of device shown in Figs. 4, 5, and 6, and the arms E^4 are pivoted upon short vertical shafts E^5, having bearings in the upper ends of the posts D′, as shown clearly in the detail, Fig. 9.

The gate-bars, when constructed in the manner last described, will usually be made to ro-

tate forwardly toward the bridge when opened, so that in closing them each of the several arms will move toward the abutment, so that persons or vehicles approaching the bridge will be forced backwardly or away from the bridge.

In Fig. 10 still another device for applying hydraulic pressure for opening a safety-gate is shown. In this case the gate is composed of a single horizontal bar, E^6, which is lifted above the roadway, to afford passage beneath it. As shown in said Fig. 10, the said bar is supported upon two vertical posts, D^2, which are secured upon the sides of the roadway at the approach to the bridge, and are provided upon their upper ends with pulleys d^2, over which are placed ropes Q Q', which are attached at one end to the said bar E^6, pass over said pulleys d^2, and extend vertically downward through the flooring of the roadway, and are connected at their ends to a large drum or pulley, R, which is provided with grooves $r\,r'$ for said ropes Q and Q', respectively. Upon the said drum R is rigidly secured a smaller pulley, R', over which is placed a rope, r^2, attached to the piston-rod F^2 of a cylinder, F, similar to that before described.

As preferably constructed, the drum R is located beneath one of the posts D^2, the rope Q extending vertically downward from the pulley d^2 to said drum, and the rope Q' being trained over a pulley, q, beneath the roadway and extended horizontally to said drum, as shown.

The drum R is preferably made of such diameter that one rotation thereof will give sufficient movement in the ropes Q and Q' to lift the bar E^6 a desired height above the roadway. In case, however, it is desired to use a smaller drum, the several grooves therein may be made spiral and the drums turned more than once around with the same result. The entrance of the water to the cylinder F in the case last mentioned may be controlled by the movements of the bridge in the same manner as before described.

I am aware that water or other liquid has been used for transmitting manual power for actuating a gate or other similarly-operating device from a point at which the manual power is applied; and I am also aware that compressed air has been similarly used for transmitting power, the air in the latter case being compressed periodically by the operator, and used when needed to actuate the gate.

My invention differs from the devices above referred to, in that it contemplates the use of force derived from a water-supply under continuous pressure for actuating the movable gates, whereby the necessary power for this purpose is always present, and no application of manual force by the attendant is at any time required.

I claim as my invention—

1. The combination, with a gate and a street water-main affording a constant supply of water under pressure, of a water-motor actuated by a supply derived from said water-main, and constructed and applied to move the gate in one direction, and a weight or spring applied to move the gate in the opposite direction, substantially as described.

2. The combination, with a swing or draw bridge, a gate, and a street water-main affording a constant supply of water under pressure, of a water-motor, actuated by a supply derived from the street-main, said motor being controlled by the movements of the bridge, and constructed and applied to operate the gate, substantially in the manner and for the purpose described.

3. The combination, with a bridge, a gate, and a pipe communicating with a source or means of water-supply giving continuous pressure in said pipe, of a cylinder provided with a suitable piston and piston-rod, a valve or valves for controlling the inlet and outlet of said cylinder, means operated by the movement of the bridge for controlling said valve, and connections between the piston-rod and gate whereby the movement of said rod is transmitted to the gate, substantially as described.

4. The combination, with a swing or draw bridge, a gate, and a pipe communicating with a source or means of water-supply giving continuous pressure in said pipe, of a water-motor actuated by a supply derived from said pipe and constructed and applied to operate the gate, a valve constructed to control the flow of water to the said motor, and means upon the bridge constructed to automatically operate the said valve when the bridge is moved, substantially as described.

5. The combination, with a swing or draw bridge, a gate, and a pipe communicating with a source or means of water-supply giving continuous pressure in said pipe, of a water-motor actuated by a supply derived from the said pipe, and constructed and applied to operate a gate, a valve constructed to control the flow of water to the said motor, a spring constructed to retain said valve at one limit of its movement, and means upon the bridge constructed to hold the valve at the opposite limit of its movement in opposition to the action of the spring, substantially as described.

6. The combination, with two oppositely-swinging gates and a pipe communicating with a source or means of water-supply giving continuous pressure in said pipe, of a cylinder provided with a suitable piston and piston-rod, a valve for controlling the inlet and outlet of said cylinder, pulleys rigidly connected with the gates, and suitable ropes connected with said piston-rod and passing over said pulleys, substantially as and for the purpose set forth.

7. The combination, with two oppositely-swinging gates and a pipe communicating with a source or means of water-supply giving continuous pressure in said pipe, of a cylinder

provided with a suitable piston and piston-rod, a valve or valves for controlling the inlet and outlet of said cylinder, pulleys rigidly connected with the gates, ropes connected with the said pulleys, and constructed to move the gates in one direction, and a weight applied to move the gates in the opposite direction, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

GEORGE E. HAWKS.

Witnesses:

M. E. DAYTON,

JESSE COX, Jr.