(No Model.) 3 Sheets—Sheet 1.

W. L. SCAIFE.

LOCK GATE AND DAM.

No. 419,287. Patented Jan. 14, 1890.

Fig. 1.

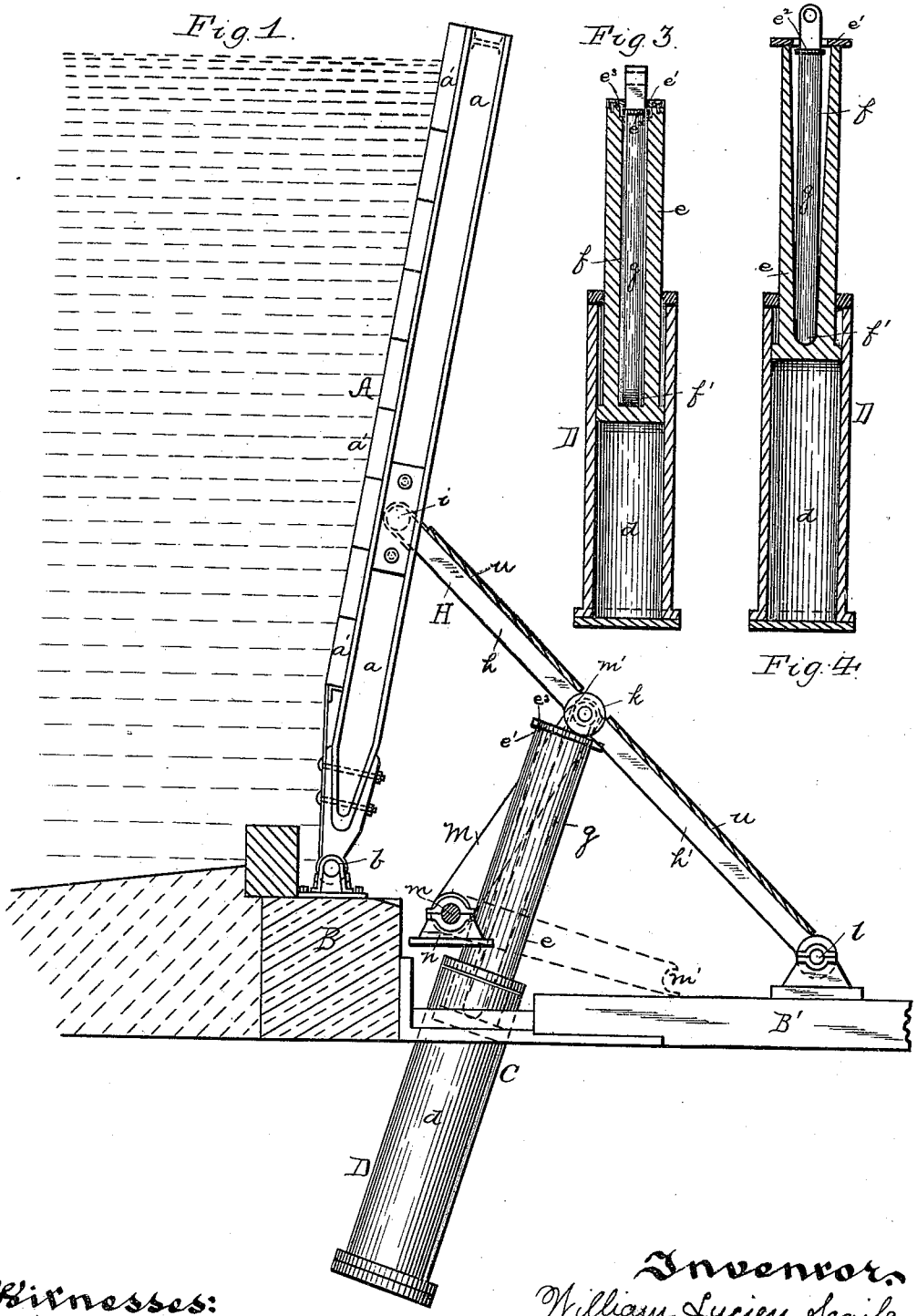

Fig. 3.

Fig. 4.

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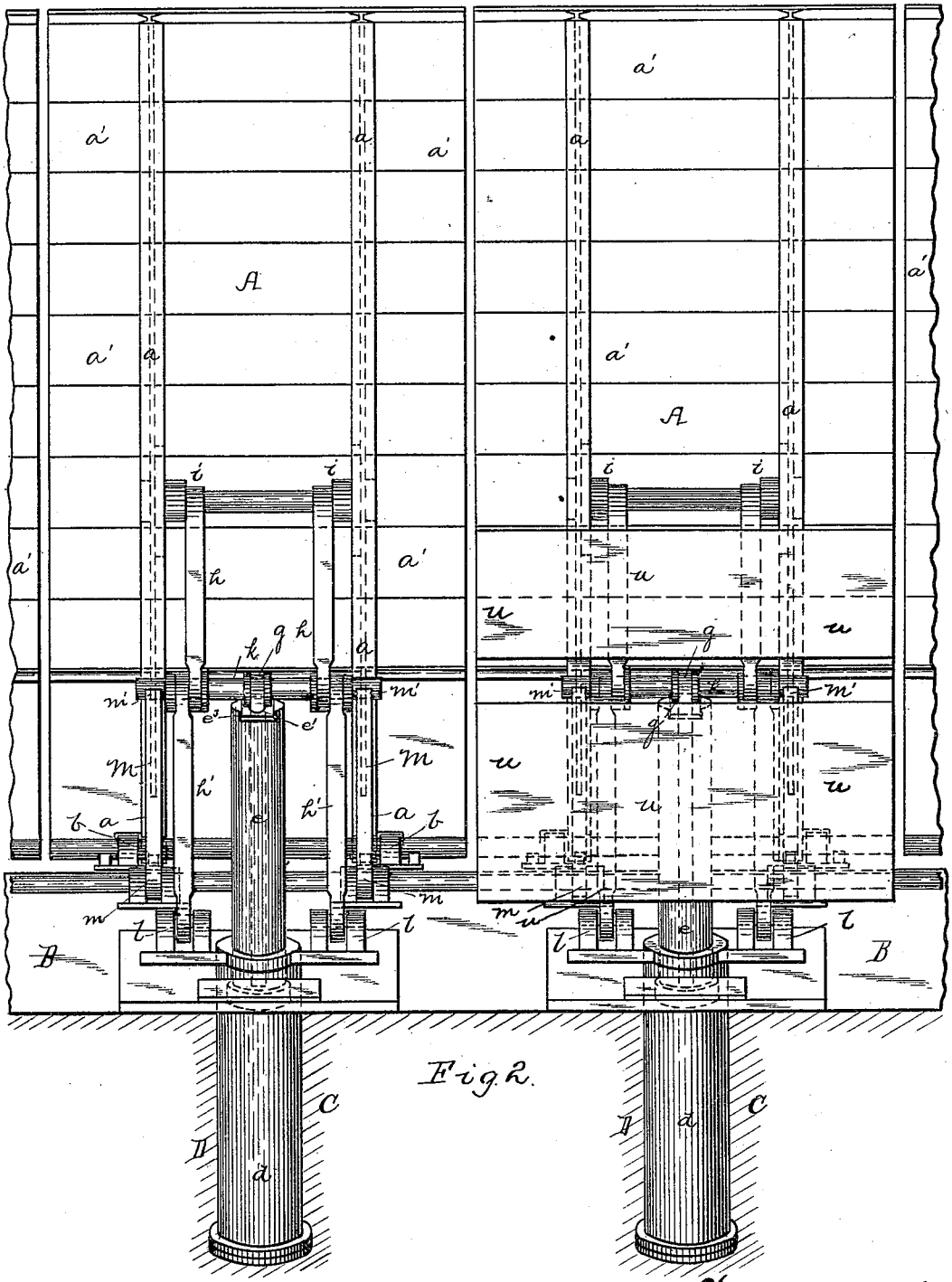

Fig 2.

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Fig. 5.

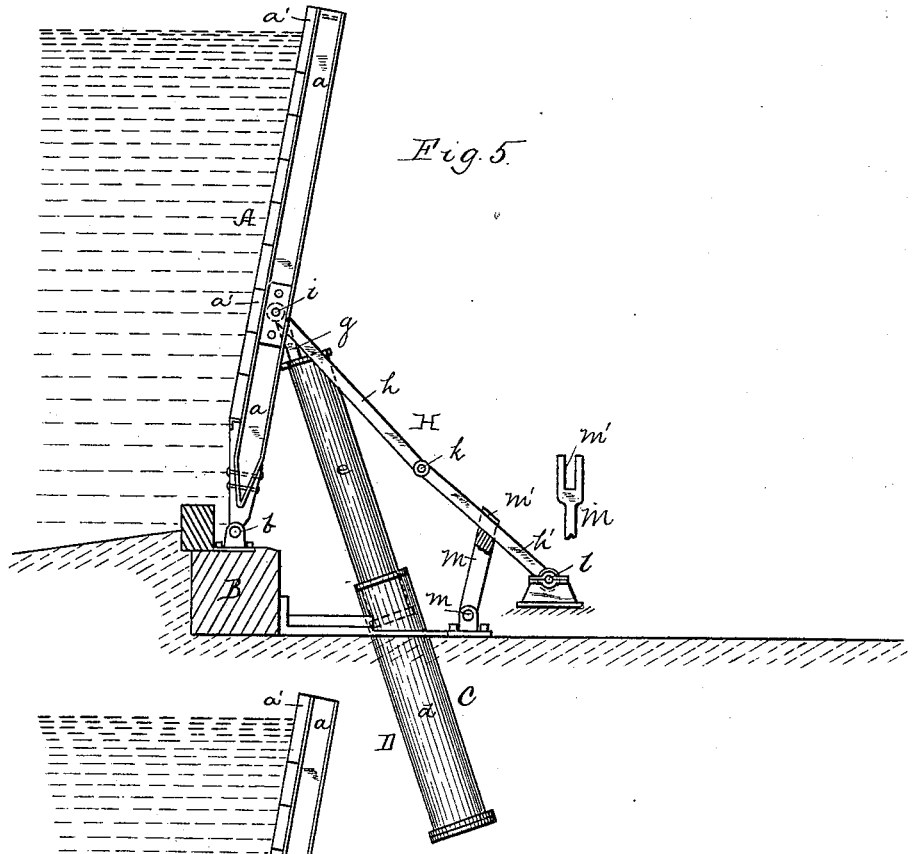
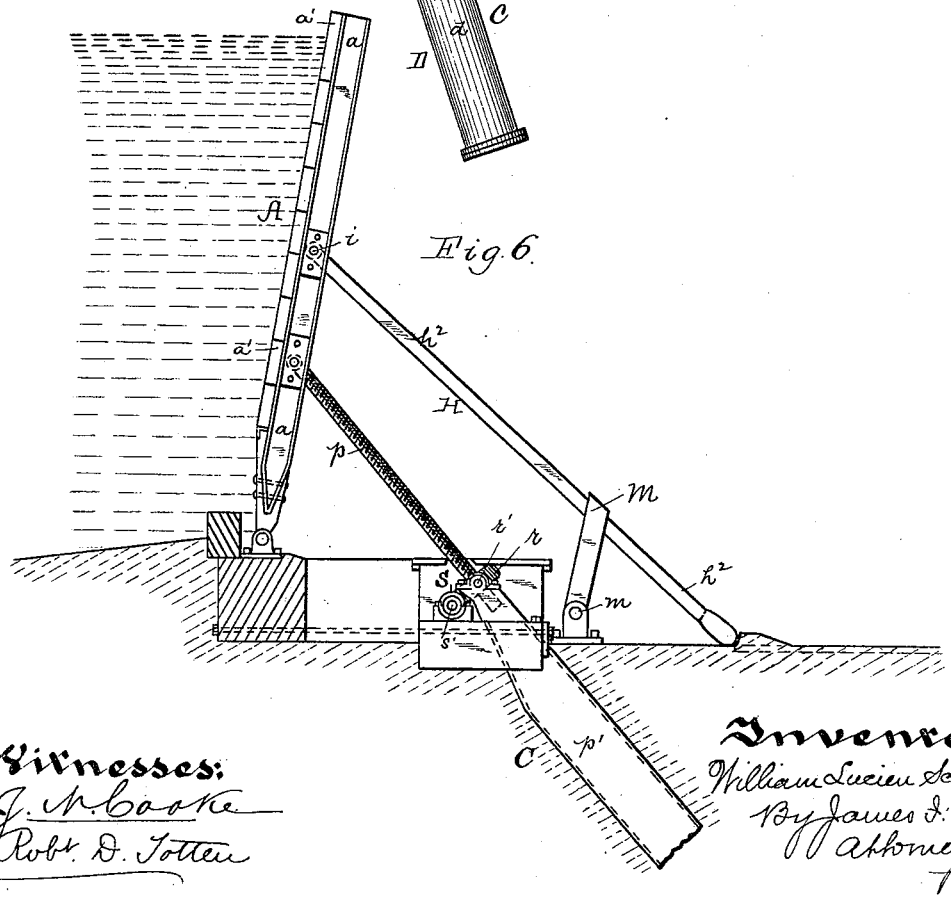


Fig. 6.



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UNITED STATES PATENT OFFICE.

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LOCK-GATE AND DAM.

SPECIFICATION forming part of Letters Patent No. 419,287, dated January 14, 1890.

Application filed December 6, 1888. Serial No. 292,787. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM LUCIEN SCAIFE, a resident of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Lock-Gates and Dams; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the movable dams or lock-gates to be employed in connection with canals or in rivers where a navigable way is provided which can be opened when the body of water is sufficient to float through the boats or crafts without the necessity of locking them through the dam, its objects being to provide a lock-gate or movable dam in which the several gates can be raised and lowered from the side of the lock or navigable way without the necessity of employing manual power to operate the gates, so that the gates may be at all times under the control of the operator and can be quickly raised or lowered, as may be desired, and also to arrange such gates so that where such power is applied to them they can be operated without requiring a high floor or weir for the support of the lifting mechanism and can be supported in their raised position by means independent of the raising mechanism, so preventing injury to such mechanism on account of the heavy pressure and jars necessarily sustained by the movable gates.

To these ends my invention consists, generally stated, in combining with the lock-gate having its axis at the base thereof a mechanical lift or motor acting to raise the gate and a prop acting to support the gate independently of the motor.

It also consists in combining with the gate a hydraulic jack provided with a ram or plunger and a movable connecting-rod fitting within and journaled at the base of and swinging within the plunger, whereby I dispense with the usual cross-head and slides employed with such mechanism, reduce the space necessary for containing the same, and I am enabled to use such lifting mechanism with a floor low enough for a navigable way or pass.

It also consists in certain other improvements in the construction of the dam, as will be hereinafter more fully set forth.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a side elevation of a movable gate or dam embodying my invention. Fig. 2 is a front view thereof. Figs. 3 and 4 are detail views of the hydraulic jack or plunger, and Figs. 5 and 6 are side views showing other forms or modifications of my said invention.

Like letters of reference indicate like parts in each.

In the preferred form of my lock-gate or movable dam, which is shown in Figs. 1 and 2, the gate A is formed of the I-beams *a*, having their axis at the base thereof, being journaled at the base in the pillow-blocks *b*, secured to the sill B. The body of the gate is formed of heavy planking *a'*, which is bolted to the beams *a*, the several gates fitting close to each other, as shown in Fig. 2. The gate is provided with a suitable mechanical lift or motor C, which in Figs. 1, 2, and 5 is shown in the form of a hydraulic jack, this form being well suited for the purpose, while in Fig. 6 the lift or motor is shown in the form of a screw operated by a worm-wheel, which is in turn rotated by a worm on a shaft running along the floor of the dam or lock. The hydraulic jack D is formed of the cylinder *d* and the ram or plunger *e*, this ram or plunger being formed hollow and closed at its base, as shown, a pocket *f'* being formed at the base of the hollow portion *f*, and the connecting-rod *g* resting against or being journaled in said pocket *f'* and its upper end being connected either to the prop H, as in Figs. 1 and 2, or directly to the gate A, as in Fig. 5. To provide for the movement necessary in the upper end of the connecting-rod as it is forced outwardly to raise the gate, the hollow portion *f* of the ram is made upwardly-flaring, so that sufficient space is left at the upper end of the ram to permit the swinging of that end of the connecting-rod when the lower end is journaled at the base of the ram, as above set forth. In order to protect this hollow portion *f* of the ram from the sand or dirt carried over by the water passing over or through the dam, I employ the cover-plate *e'*, which fits in suitable dovetail guides e^3 at the upper end of the ram *e*, and is so held in place and acts to cover or

close the hollow portion of the ram, this plate having in it a suitable hole or opening corresponding in shape to that portion of the connecting-rod g, which connecting-rod extends through this opening, and as it swings from one side to another draws said plate back and forth within its guides e^3, the plate closing the upper end of the ram no matter what position it may be drawn to. The connecting-rod g is preferably held within the hollow ram or plunger e by means of a collar e^2 on the rod g below the cover-plate e', and the rod can be removed from the ram by unscrewing the guide-plates e^3, which are bolted on the top end of the ram. The collar g also assists in preventing the entrance of dirt or sand within the hollow of the ram.

The prop or buttress for the gate is shown in two different forms, the form preferred being a toggle-joint and lever supporting the same—such as shown in Figs. 1, 2, and 5—though an unjointed bar may be employed, as shown in Fig. 6. The toggle form of prop H is clearly shown in Figs. 1 and 2, and consists of the arms h h', jointed at k and supported by the lever M, the upper arms h being connected to the gate at i and the lower arms h' being connected to the floor B' at l, being journaled thereto in pillow-blocks. In order to properly brace each gate, I generally employ two of these props for each gate and connect them together to the gate and to the floor by cross-shafts, as shown, this form of prop being found to be sufficiently strong to properly brace and support the gate. In Figs. 1 and 2 the connecting-rod g of the hydraulic jack engages with the cross-shaft k, forming the knee of the toggle-joint, and in raising the gate the pressure is applied to said knee, and by straightening the toggle it acts to raise the gate, while when the gate is to be lowered as the fluid under pressure is permitted to escape from the jack the toggle-joint folds together and fits under the gate, which lies flat on the sill and floor, as can easily be seen in the construction shown in the drawings.

In order to support the toggle-arms n n' independently of the hydraulic jack, to avoid the necessity of maintaining a heavy hydraulic pressure during all the time that the gate is held in its raised position, and to prevent the gates from lowering on account of possible leakage at any point of the hydraulic-pressure system, I employ the levers M, which are secured to a shaft m, mounted in pillow-blocks n on the floor B, said shaft m being turned by any suitable power applied at the side of the navigable way. Said levers M are arranged to be raised and to support the toggle-arms, the levers in Figs. 1 and 2 having their upper ends formed hollowed or forked, as at m', forming a seat to engage with the prop, and in said Figs. 1 and 2 this seat extending across the end of the lever M in such direction that it engages with the cross-shaft or knee k of the toggle-joint.

In Fig. 5 is shown substantially the same construction, except that the hydraulic jack D acts directly upon the gate, its connecting-rod g engaging therewith instead of with the toggle-arms, and that the lever M is mounted in the shaft m, which is placed nearer the lower end of the toggle-arms, each lever M engaging directly with the lower arm h' of the toggle-joint, and the seat m' extending in such direction across the end of the lever that the forks on each side of said seat may fit on each side of the arm h'. In Fig. 6 the same general combination is employed; but the lift C, instead of being formed of a hydraulic jack, is composed of the screw p, which engages directly with the gate and passes through the worm-wheel r, mounted in a ring which turns on suitable journals r'. The journals extend within the wheel, which is formed dish-shaped or hollow to receive the ring and journals, so that the worm-wheel can both turn in the ring and swing on the journals while it is held in engagement with the worm S, which is secured to the shaft s', mounted in suitable pillow-blocks on the floor, the shaft being rotated by suitable power at the side of the lock or navigable way, and by the rotation of the worm-wheel forcing the screw p up or down, and so raising or lowering the gate. The screw p can enter the tubular holder p', and is protected therein from injury. Another form of prop is also shown in connection with this figure, the prop H being formed of a single arm h^2, connected to the gate and having its lower end free to slide over the floor, and as the gate is raised the lower end of the prop dropping over a buffer, which sustains the weight of the gate, and in order to raise this prop free of the buffer I employ the lever M on the shaft m, mounted in pillow-blocks on the sill, as above described.

In order to exclude dirt and débris from the lower side of the dam, containing its movable parts, I employ sheathing-plates, as at u, secured to the props of the gates, these sheathing-plates being supported on the two props of each gate and corresponding in width to the gates, so that they form an apron or slide over which the mass of rubbish, brush, or timbers will pass without interfering with the working parts below.

When my improved lock-gate or dam is in use, the form shown in Figs. 1 and 2 is raised by admitting the fluid under high pressure from a pump, accumulator, or other source to the several cylinders of the hydraulic jacks, either through a pipe common to them, or through a pipe for each cylinder, or through a combination of pipes. The rams e are forced out of the cylinders, and through the connecting-rods g they raise the props H, and as they straighten out the toggle-joints raise the gates A, the said connecting-rods g swinging on their pivotal points or journals at the base of the hollow rams e, and the hollow portions f of said rams permitting sufficient move-

ment of the connecting-rods to enable them to straighten out the toggles of the props. In the latter position the toggles are not quite straight, so that they may move downward when the water is allowed to escape from the jacks. The pressure of the fluid within the jack can be used to sustain the gate after raising it, and where it is employed as a lock-gate which is frequently operated it is desirable that it shall be sustained by such pressure. Where, however, the gates are employed in a movable dam, as above referred to, which is operated but seldom, as it is not desirable to depend on such pressure within the cylinders to sustain the props H, I raise the levers M by the shaft *m* until the seats *m'* at the ends thereof engage with the toggle-arms, and by slightly lowering the rams *e* the said toggle-arms are lowered onto the levers M, which sustain the toggle-arms independently of the motors or lifting mechanism, and so relieve the latter of all heavy strains and jars, which might bend or otherwise injure the lifting mechanism and render it inoperative. In this way I am enabled at any stage of water first to lower or raise singly or simultaneously any number of gates by hydraulic or like powerful means, operated from the side of the lock or navigable way, and subsequently to support said gates in their raised position by means entirely independent of the lift or motor. When it is desired to lower the gates, the pressure in the hydraulic jacks is raised, so as to lift the toggle-props from the supporting-levers M, and through the shaft *m* those levers are dropped out of the way, and the gates can then be lowered by the jacks either quickly or gradually, as may be desired.

In the form of apparatus shown in Fig. 5 the operation is substantially the same, as the gates are raised by the hydraulic jacks, and in so doing they open out the joints of the props or toggles, and as soon as they are raised to their highest position the levers M are raised, so that they act to support said toggles, when the pressure in the jack may be removed or lessened. In the apparatus shown in Fig. 6, when it is desired to raise the gate, by rotating the shaft *s'* by power applied from the side of the navigable way, the worms thereon are rotated, causing the worm-wheels *r* to turn, and so force upwardly the gates by means of the screw *p*, and as the gates are being raised in this manner the props H are being drawn forward by the gate until their ends drop over the buffers *t*, and by rotating the shafts *s'* in the opposite direction a few turns all weight or pressure will be removed from the screws *p* and be sustained by the props H. When it is desired to lower the gates, all that is necessary is to first raise them slightly by the rotation of the worm-wheels, as above set forth, thus drawing them free from the buffers *t*, and then through the levers M raise the free ends of the props above said buffers, thus leaving the gates free to be lowered by the rotation of the worm-wheels in the opposite direction.

I am thus enabled by my improvements to operate these movable dams and lock-gates from the side of the lock or navigable way, bringing them entirely under the control of the operator, and at the same time to brace and support the gates by means entirely independent of the lift or motor, so that injury to that part of the apparatus on account of the sustaining of strains or jars is prevented.

The connections between the gate and the hydraulic jack enable me to arrange the apparatus within a comparatively small space and to provide for the use of such jacks in the navigable ways of rivers without materially changing their courses when the dam is lowered.

The apparatus is simple in construction and not liable to get out of order, and it gives at all times complete control of the lock-gate or dam to the operator without the necessity of handling the gates or wickets by manual labor within the stream, which greatly detracts from the value of a movable dam in navigable streams.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In lock-gates or dams, the combination, with a gate having its axis at the base thereof, of a mechanical lift or motor acting to raise the gate and prop mechanism acting to support the gate independently of the motor, substantially as and for the purposes set forth.

2. In lock-gates or dams, the combination, with the gate, of a hydraulic jack provided with a ram or plunger and a movable connecting-rod fitting within, journaled at the base of and swinging within the plunger, substantially as and for the purposes set forth.

3. In lock-gates or dams, the combination, with a gate having its axis at the base thereof, of a prop formed of a toggle or two jointed arms connected to the gate and floor and a mechanical lift or motor for raising the gate, substantially as and for the purposes set forth.

4. In lock-gates or dams, the combination, with the gate having its axis at the base thereof, of the support connected thereto and the lever having its axis on the floor and engaging with said support, substantially as and for the purposes set forth.

5. In lock-gates or dams, the combination, with a gate having its axis at the base thereof, of a toggle or jointed arms connected to the gate and floor and a lever pivoted to the floor and engaging with said prop to support it, substantially as and for the purposes set forth.

6. In lock-gates or dams, the combination, with the gate having its axis at the base thereof, of a toggle or jointed arms connected to the gate and floor, the mechanical lift or

motor having its connecting-rod jointed to the knee of the toggle, substantially as and for the purposes set forth.

7. In lock-gates or dams, the combination, with the gate having its axis at the base thereof, of the toggle or jointed arms connected to the gate and floor, the mechanical lift or motor having its connecting-rod jointed to the knee of the toggle, and the lever having its axis on the sill and engaging with said toggle, substantially as and for the purposes set forth.

8. In lock-gates or dams, the combination, with the gate having its axis at the base thereof, of the support connected thereto and the lever having its axis on the sill and provided with a hollowed or forked end to engage with the support, substantially as and for the purposes set forth.

9. In lock-gates or dams, the combination, with the gate having its axis at the base thereof, of the supporting-arms connected to the gate and the sheaths secured to said arms and extending between two such arms, substantially as and for the purposes set forth.

10. In lock-gates or dams, the combination, with the gate, of a hydraulic jack provided with a hollow ram or plunger, a connecting-rod fitting within and journaled at the base of said plunger, and a cover-plate fitting around said rod and sliding at the top of the plunger, substantially as and for the purposes set forth.

11. In lock-gates or dams, the combination, with the gate, of a hydraulic jack provided with a hollow ram or plunger, a connecting-rod fitting within and resting in a pocket at the base thereof, a cover-plate fitting around said rod and sliding at the top of said plunger, and a collar on said connecting-rod under said cover-plate, whereby the rod is held within the ram, substantially as and for the purposes set forth.

In testimony whereof I, the said WILLIAM LUCIEN SCAIFE, have hereunto set my hand.

WILLIAM LUCIEN SCAIFE.

Witnesses:
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