2 Sheets—Sheet 1.

D. RISHER, Jr.

Lock-Gate.

No. 212,506. Patented Feb. 18, 1879.

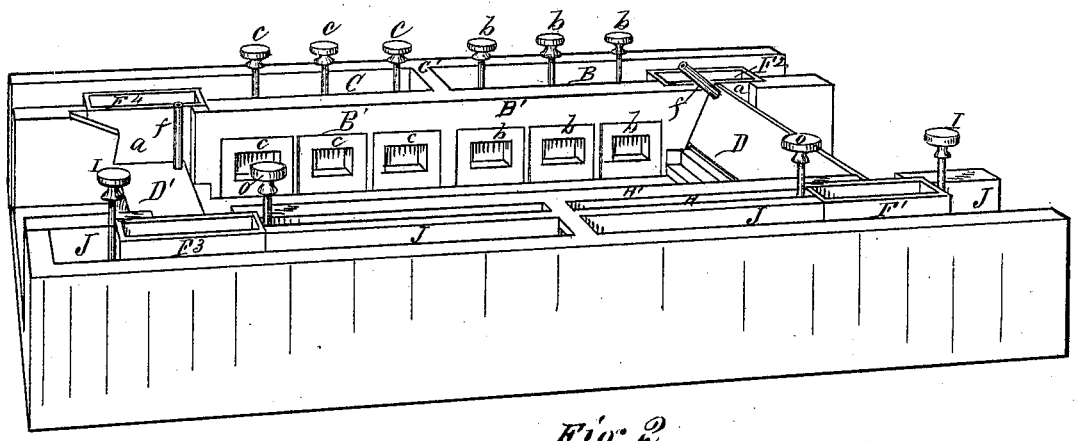

Fig. 2.

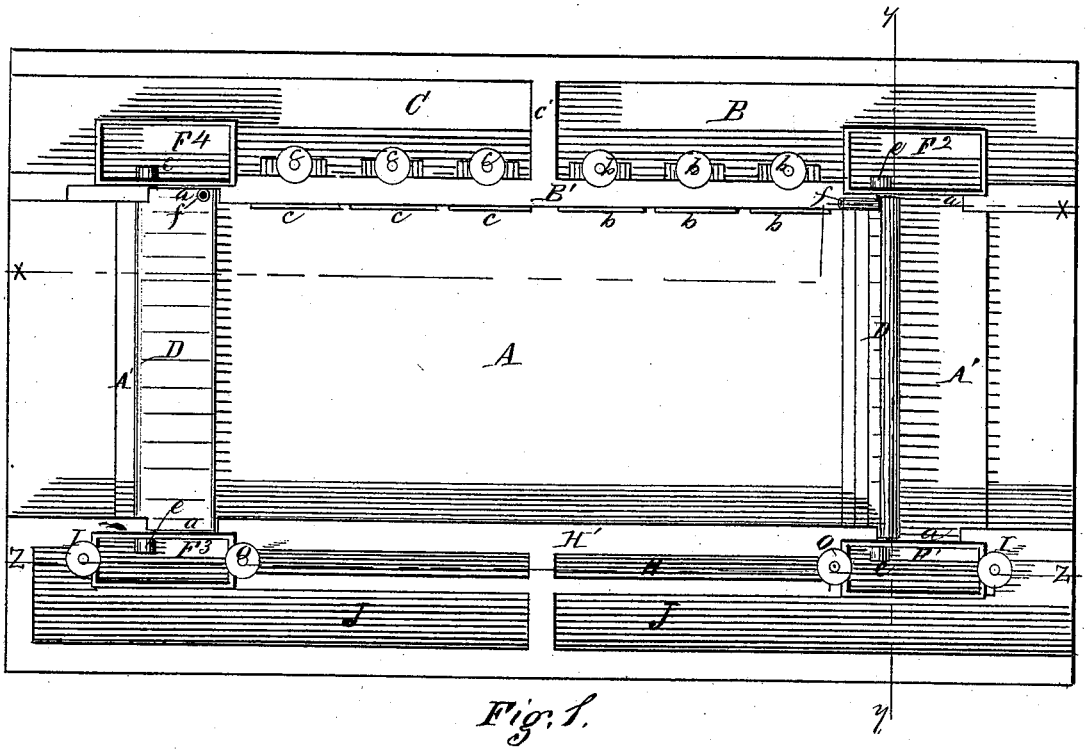

Fig. 1.

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Andrew Caster.
Francis L. Clark

Inventor Daniel Risher Jr.
By Attorney Wm. M. Cuthbert

2 Sheets—Sheet 2.

D. RISHER, Jr.

Lock-Gate.

No. 212,506. Patented Feb. 18, 1879.

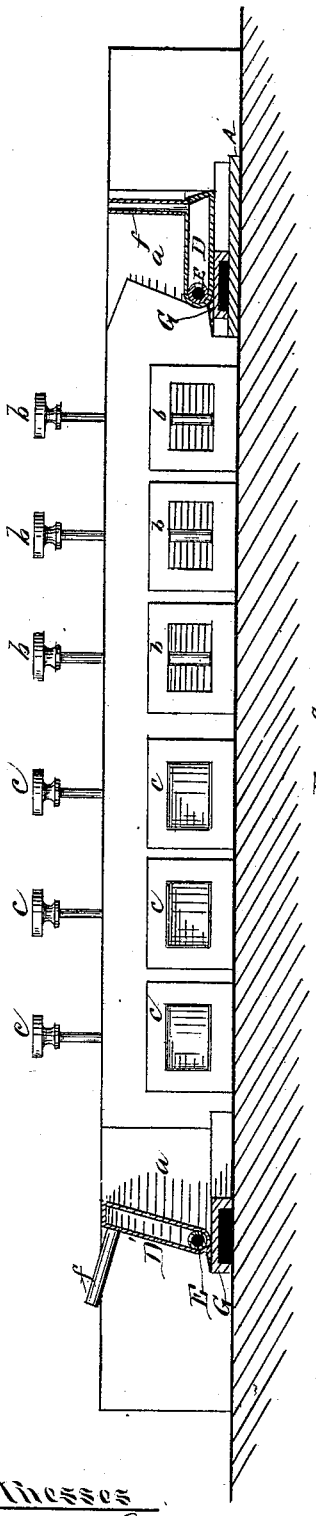

Fig. 3.

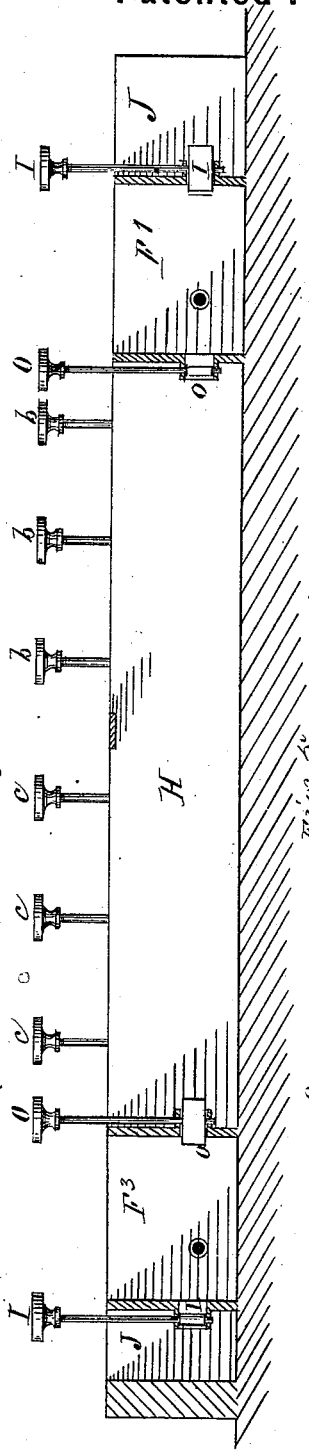

Fig. 5.

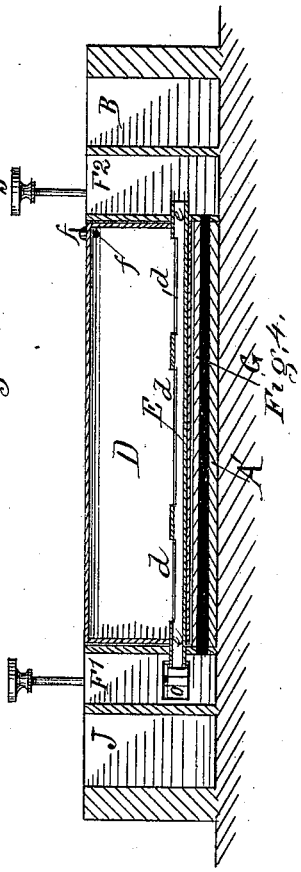

Fig. 4.

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UNITED STATES PATENT OFFICE.

DANIEL RISHER, JR., OF DRAVOSBURG, PENNSYLVANIA.

IMPROVEMENT IN LOCK-GATES.

Specification forming part of Letters Patent No. **212,506**, dated February 18, 1879; application filed December 9, 1878.

To all whom it may concern:

Be it known that I, DANIEL RISHER, Jr., of the town of Dravosburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Lock-Gates, which improvements are fully described in the following specification and accompanying drawings.

The object of my invention is simplicity and economy in the construction of lock-gates and the lock, ease, rapidity, and economy of labor in filling and emptying the lock, and in opening and closing the gates.

My invention consists in the lock-gates being hollow, hinged by hollow gudgeons at each lower corner, and opening into the interior of the gate, and also into a chamber at each end of the gate, and a sub-passage-way which connects said chambers, one of which is provided with an inlet and outlet wicket; and it further consists in a passage-way which supplies said chambers and gate with water through said inlet-wicket, and a receiving-chamber which receives the water from the gate and its chambers through said outlet-wicket, all of which is shown in detail in the drawings forming a part of this specification, in which similar letters of reference indicate like parts.

Figure 1 is a plan view of the invention. Fig. 2 is a perspective view of the same, the upper gate being closed. Fig. 3, Sheet 2, is a longitudinal vertical section of the lock, the lower gate being closed, and is taken at the line *x x* of Fig. 1. Fig. 4 is a cross-section at a line, *y y*, cutting through one of the gates, the gate being closed or up. Fig. 5 is a longitudinal vertical section of the two gate-chambers, which are provided with wickets, taken at line *z z*.

A is the main or lock chamber, one wall of which, B′, divides it from the inlet and outlet passage-ways, B C, and the other wall, H′, from the receiving-chamber H. At each end the chamber A is crossed by a mud or miter sill, A′, and at the points where said sills intersect or connect with said walls they (the walls) are recessed to such a degree as will admit and protect the air-tube *f* of the gate. The lower sides of these recesses, or that toward the pool below the dam, form stops for the gate when up or closed. Said recesses are of the form shown in the drawings, (see Fig. 3,) and receive the ends of the gates.

B is the inlet or supply passage-way. It is open at the upper end into the upper pool for the free admission of water through it and its wickets to the lock-chamber A, with which it is parallel, and from which it is separated by the partition-wall B′. It extends as far as the longitudinal center of said lock-chamber, and is provided with a series of wickets, *b b b*, in the wall B′, by which the water is admitted to and fills the lock-chamber. Said wickets are pivoted by central vertical shafts, which extend above the surface of the lock, and by which they are opened or closed.

C is the outlet passage-way, similar in size to the passage-way B, from which it is separated at its upper end by the wall or dam C′. It is parallel with the lower end of chamber A, and separated from it by the wall B′. It has also a series of wickets similar in construction to those above described, as shown by *c c c*. These wickets, when open, allow the water in the chamber A to pass out of it through passage-way C into the lower pool, into which it opens.

D and D′ are the lock-gates. They extend longitudinally across each end of the chamber A on the miter-sills A′, the ends entering the recesses *a a a a* in the wall B′ and H′, which limit their movement to a horizontal when down or open, and to an angle of about seventy-five degrees when up or closed, as shown in Fig. 3. Said gates are constructed of heavy boiler-iron, and are hollow and air-tight, their lower face, or "keel," as it may be termed, being formed of a large strong tube, E, to which the body of the gate is attached. The ends of this tube project beyond the ends of the gate, and form hollow gudgeons *e e e e*, on which the gate turns in opening or closing. Said gudgeons journal in the walls of the gate-chambers, hereinafter described, into which they penetrate and open. Inside the gate the tube E is perforated, *d d*, (see Fig. 4,) so that a free passage-way extends from the interior of the gate to its chambers. Projecting from the front side of the gate, at the upper corner of that end of the gate next passage-ways B C, and at a right

angle, is an air inlet or outlet tube, *f*. (See Fig. 3.) It is of such length that its mouth will be above the surface of the water when the gate is open, or in a horizontal position, and of such size as will allow the air to rapidly enter the interior of the gate as it is exhausted of its water, or to escape therefrom as the gate is filled. Said tube may be made like a narrow box across the end of the gate. It is protected from injury by being within the recess *a* in wall B′, which projects beyond it.

F^1 F^2 F^3 F^4 are narrow chambers or wells, of the same depth as chamber A, and are situated at the ends of the gates, F^1 F^2 being in connection with the upper gate, and F^3 F^4 with the lower gate, and receive the open ends of the gudgeons *e e e e*. Each pair of these chambers are connected by a subterraneous passage-way, G G, in the miter-sill under the gate, as will be seen by reference being had to Fig. 4.

The chambers F^1 and F^3 have inlet-wicket I and outlet-wickets O, which are similar in construction to wickets *b b*. H is the receiving-chamber. It is parallel with the lock-chamber A, from which it is separated by the wall H′. It extends from gate-chamber F^1 to gate-chamber F^3, with which it connects by means of the wickets O O. Said chamber is deeper than the gate-chambers, so as to drain them and the gate of the water contained in them when it is desired to raise or close the gate, said water being emptied in turn by means of one or more pumps, which may be driven by water-power derived from the dam, and by this means is kept constantly empty, and ready to receive the contents of the gates.

J is the gate-supply passage-way, open at its upper end for the free admission of water from the upper pool, and closed at its lower end. It is of the full length of the lock, and parallel with chambers H, from which it is divided by a suitable wall. It has connection with gate-chambers F^1 and F^3 by the inlet-wickets I I, and through them and the gate-chambers supplies or fills the gates with water when it is desired to lower or open them.

Operation: The lower gate, D′, being up or closed and all the wickets shut, and it is desired to lock or pass a boat from the upper to the lower pool, it is admitted into chamber A, the outlet-wicket O of gate-chamber F^1 is opened into the (empty) receiving-chamber H, whereupon the water contained in gate-chamber F^1 will be discharged, and with it that in chamber F^2, through the sub-passage-way G. When they are nearly empty, the gate discharges its water, through them and its hollow gudgeons *e e*, into said chamber H, which is large enough to completely drain it. The pump, being in operation, soon removes the water from it. As the water is drawn out of the gate, the air passes into it through the tube *f*, and as it unloads its weight of water and fills with air, it becomes buoyant and rises up, turning on its gudgeons *e e* until stopped by the lower face or side of the recesses *a a* in walls B and H, with which it forms a joint, thus closing, so that the current or pressure of water in the upper pool will be on and hold it shut. As soon as the gate is closed, wicket O of chamber F^1 is closed and outlet-wickets *c c c* are opened, and the water in chamber A is discharged, through them and passage-way C, into the lower pool, to the level of which the boat is lowered. These wickets are then closed and the inlet-wicket I of gate-chamber F^3 is opened, and the water of the upper pool at once rushes through passage-way J and the wicket, filling chamber F^3, and also chamber F^4, (through the sub-passage-way G of this gate,) which, in turn, fill or load the gate D′ through its hollow gudgeons *e e*, the air contained in it passing out, as it fills with water, through the air-outlet tube *f* of this gate. The gate, thus losing its buoyancy, sinks or opens by turning on its gudgeons to a horizontal position below the surface of the water in chamber A, and the boat passes out into the lower pool.

The process of raising a boat from the lower to the upper pool is the reverse of the operation as above stated, the lower gate, D′, being raised by exhausting its water through the wicket O of chamber F^3, and the chamber A being filled through the wickets *b b b* and passage-way B, and the upper gate lowered by filling or loading it through the wicket I′ of gate-chamber F^1.

I desire to say, further, that all the chambers and passage-ways are preferably constructed of stone, though in some cases it may be best to use iron; also, that it will be seen that my improved gate closes toward the lower end of the lock, so that the pressure of the water is always forcing to hold them shut; and, further, it will be understood that in a full-sized lock a much larger number of wickets, *b* and *c*, are used, and that the wickets I and O of the gate-chambers may also be increased in number, if required.

Having thus described my invention, what I claim, and desire Letters Patent for, is—

1. In a lock for purposes of navigation, a hollow gate provided with hollow gudgeons through which it is filled or emptied of water for the purpose of opening or closing, constructed and operating as and for the purpose set forth.

2. In a lock for navigation purposes, a hollow gate provided with a chamber at each end, and with which it is connected by hollow gudgeons, (on which it turns,) and from which it receives water, for the purpose of opening it, and into which it discharges the load of water for the purpose of closing, all constructed and operating as and for the object specified.

3. In a navigation-lock, the gate-chambers F^1 F^2 F^3 F^4, connected in pairs by a sub-passage-way, G, and to the gate by the hollow gudgeons on which the gate turns, all arranged and operating as and for the purpose specified.

4. The chambers F^1 and F^3, having the inlet

and outlet wickets I and O, and connected thereby with the supply passage-way J and receiving-vessel H, all arranged and operating as and for the object set forth.

5. In combination with a hollow lock-gate, the air outlet and inlet tube *f*, hollow gudgeons *e e*, gate-chambers F, wickets O and I, chamber H, and supply passage-way J, all arranged and operating to load or unload the gate with water, for the purpose of opening or closing the same, substantially as described.

6. The lock-chamber A, inlet passage-way B, outlet passage-way C, dam-wall C′, and series of wickets *c c c* and *b b b*, all combined, arranged, and operating as described, for the purpose of filling or emptying the chamber A of a lock.

DANIEL RISHER, JR.

In presence of—
ANDREW CASTER,
ALBERT J. HARNACK.