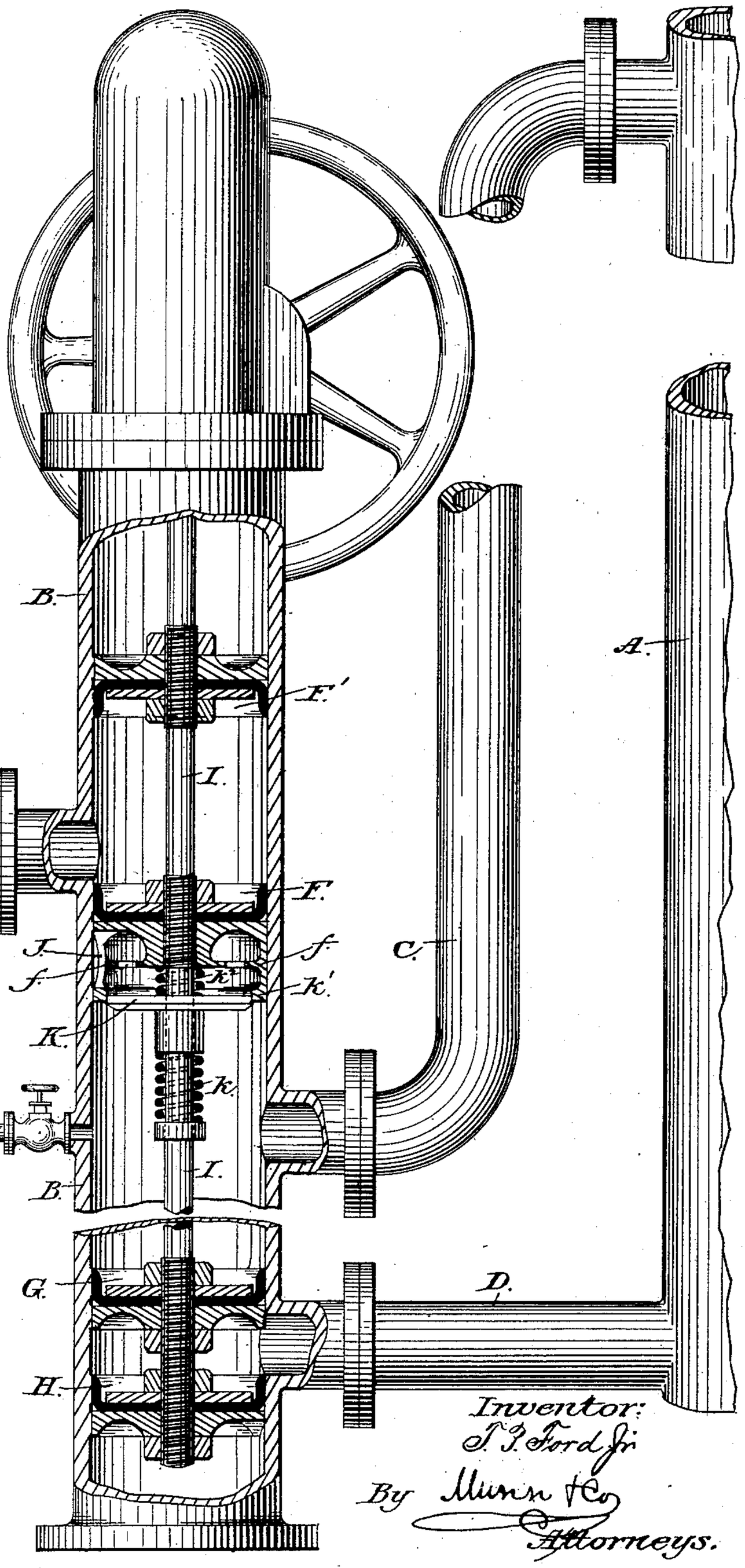
(No Model.)

T. P. FORD, Jr.

HYDRAULIC LIFT.

No. 367,612. Patented Aug. 2, 1887.



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UNITED STATES PATENT OFFICE.

THOMAS POWNALL FORD, JR., OF LONDON, ENGLAND.

HYDRAULIC LIFT.

SPECIFICATION forming part of Letters Patent No. 367,612, dated August 2, 1887.

Application filed December 29, 1886. Serial No. 222,867. (No model.)

To all whom it may concern:

Be it known that I, THOMAS POWNALL FORD, Jr., at present residing at 38 Old Jewry, in the city of London, England, engineer, have invented new and useful Improvements in Hydraulic Lifts, of which the following is a full, clear, and exact description.

My invention relates to improved means of controlling the working of that kind of hydraulic lift in which the cage is suspended by a chain or rope passing round an overhead sheave and is actuated and controlled by a piston working in a vertical cylinder with a column of water above and below it; and the invention has for its object to avoid the hissing noise usually caused by the water in passing through the valves, particularly through the outlet-valve, when the piston is descending. Attempts have heretofore been made to obviate this hissing noise at the outlet-valve, and to a certain extent successfully by automatically checking the discharge from the cylinder; but this gives rise to objectionable irregularity of motion of the piston.

This invention relates to means whereby the defect in question is cured without prejudicing the operation of the lift; and it consists in the employment of means of controlling the inlet and outlet of water to and from the two ends of the cylinder simultaneously and to the same extent, whereby the hissing noise which usually occurs at the outlet-valve is prevented; and to the employment, in combination with valves operated simultaneously and equally, as above described, of a column of water partially counteracting the pressure of the water entering through the inlet-valve, whereby the hissing noise is prevented from occurring at that valve.

It further relates to the employment, in combination with the inlet-valve, of a perforated diaphragm and of an automatic check-valve which is caused by a spring to close against the pressure of the water from the supply, and which is only intended to have any appreciable effect when the cage is being raised empty or with a very light load.

Reference is to be had to the accompanying drawing, forming part of this specification, wherein I have represented a vertical sectional elevation of the valve-cylinder and valves and as much of the main cylinder and pipe-connections as is necessary to explain the invention. In the drawing the valves are shown in the closed position.

A is part of the main cylinder, and B the valve-cylinder, connected with the top and bottom ends of the main cylinder by pipes C and D, respectively, these pipes both connecting with the valve-cylinder near the lower part thereof.

E is the inlet-pipe from the source of pressure connecting with the valve-cylinder near the upper part, as shown.

F is the inlet-valve, G the circulation-valve, and H the outlet-valve. In the example shown they are of the ordinary piston type (but they might be slides) and are all connected to the same valve-spindle I, or otherwise connected, so that all will be operated simultaneously and to the same extent by means of the same hand-gear.

Above the inlet-valve F is a second piston, F′, which serves to equilibrate the pressure on the upper face of valve F of the water from the main E when the inlet-valve is closed, as shown. The circulation-valve G performs the same function for the outlet-valve H with regard to the pressure from the lower end of the main cylinder when the outlet is closed.

K is the automatic valve, fitted to slide on the valve-rod I. It is closed by a spring, k, within a seat, k', carried at the under side of the inlet-valve F, a spring, k^2, being applied at the other side of the valve K to serve as a cushion for the valve. There is a space between these two valves F and K, in which is placed a perforated diaphragm, f, carried by the body of the valve F.

J is an inlet-aperture through which the water from the main E passes, part of the water passing through the perforations of diaphragm f, whereby the flow is checked. The pressure acting against valve K overcomes the spring and moves the valve K from its seat when the inlet-valve F is raised above the port of main E.

The port of pipe C is always between the inlet-valve and the circulation-valve, and by lowering the valves until the valve G is below the port of pipe D the pipe C is put into communication with the pipe D through the valve-cylinder B, for permitting the circulation of water from the upper to the lower end of the

main cylinder in the ordinary way when the cage is descending. The disposition of the valves and their ports is such that when the supply-main E is put into communication through the circulation-pipe C with the upper end of the main cylinder A the outlet D from the lower end of the said cylinder will be open to the exhaust to an extent corresponding to the supply through the valve F. The pressure of the column of water contained in the pipe C, which is nearly equal in height to the main cylinder, opposes the flow of water entering through the inlet-valve, and, together with the friction of the moving parts of the lift, partially counteracts the pressure from the main, the automatic auxiliary valve K assisting in the same way when the cage is light, thus preventing hissing at this valve.

When the cage is heavily loaded, the valves can be raised until valve K is entirely above the port of main E, so that the full pressure of the main is available. When the admission and exhaust are cut off and the valves are at the middle of their travel, as represented in the drawing, all the ports will be closed, and the piston in the main cylinder A will be held stationary. When communication between the two ends of the cylinder A is established through pipes C and D, the admission and exhaust will remain closed and water will be permitted to flow from one side of the piston in the main cylinder to the other, to allow of the motion of the piston and the descent of the cage under the control of the valve G, which governs the circulation of the water. A small by-pass pipe, L, from the main E is provided, in order that the water passing from one end of the main cylinder A to the other may be supplemented by the quantity necessary to compensate for the difference of area at the two sides of the piston, due to the displacement of the piston-rod. This by-pass puts the supply-main E in permanent communication with pipe C.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

In a valve-gear for hydraulic lifts, consisting of an equilibrated system of inlet, circulation, and exhaust valves connected together, the inlet and exhaust valves being equidistant from their respective ports, as herein described, the combination, with the inlet-valve, of a perforated diaphragm and a spring-actuated auxiliary valve acting against the pressure from the main to check the inflow through the inlet-valve when the cage is raised with a light load, substantially as specified.

The foregoing specification of my improvements in hydraulic lifts signed by me December, 1886.

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