

(No Model.)

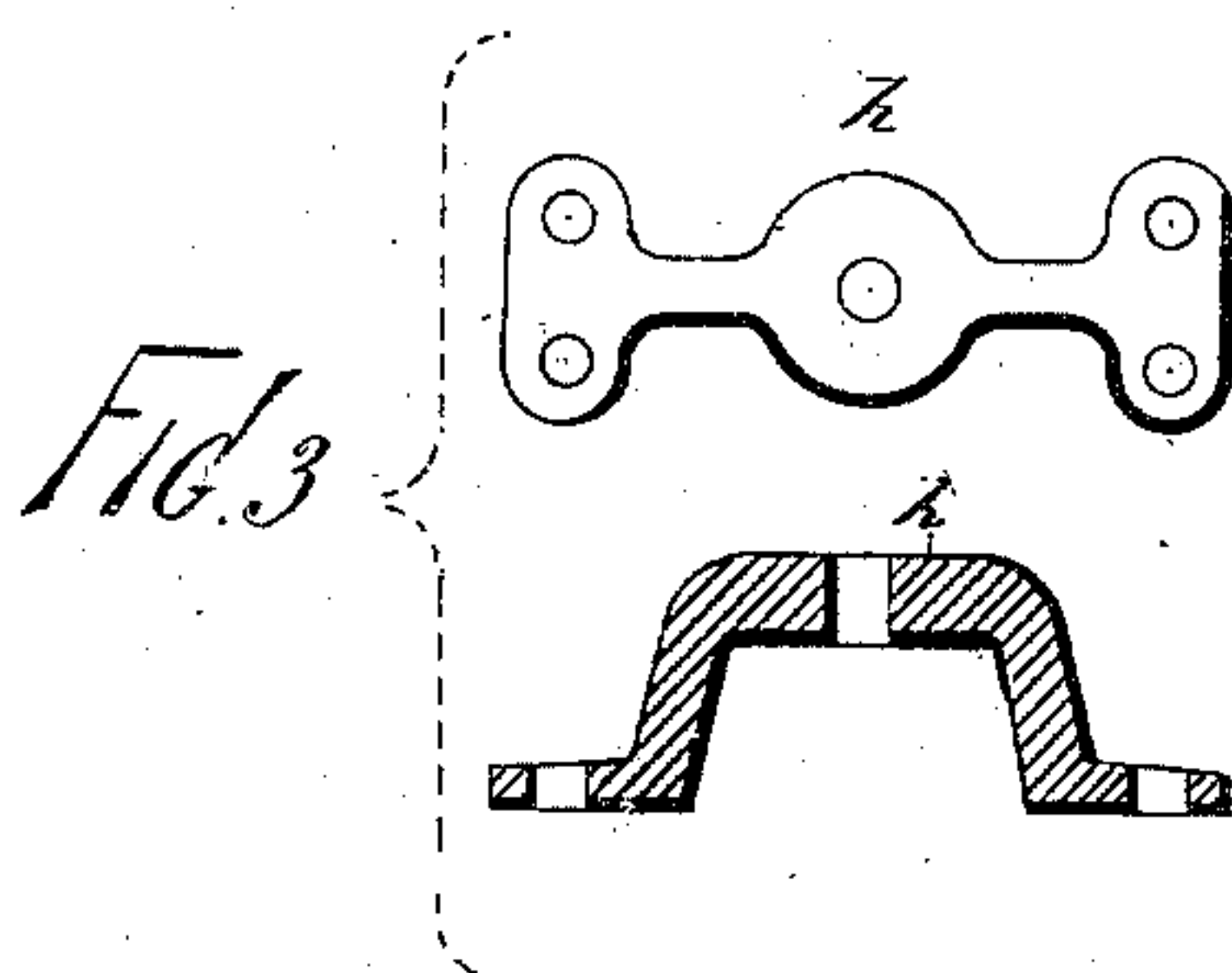
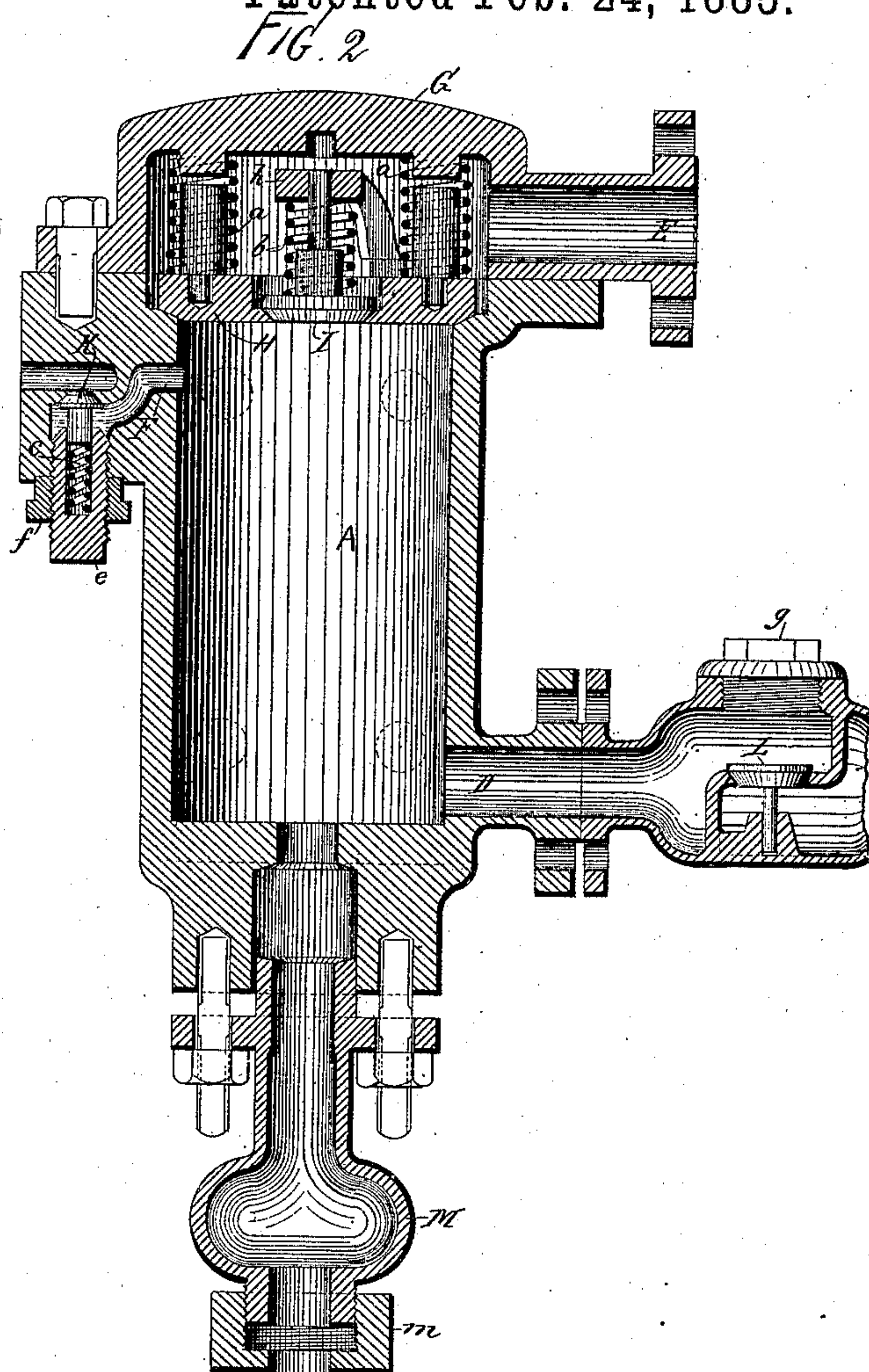
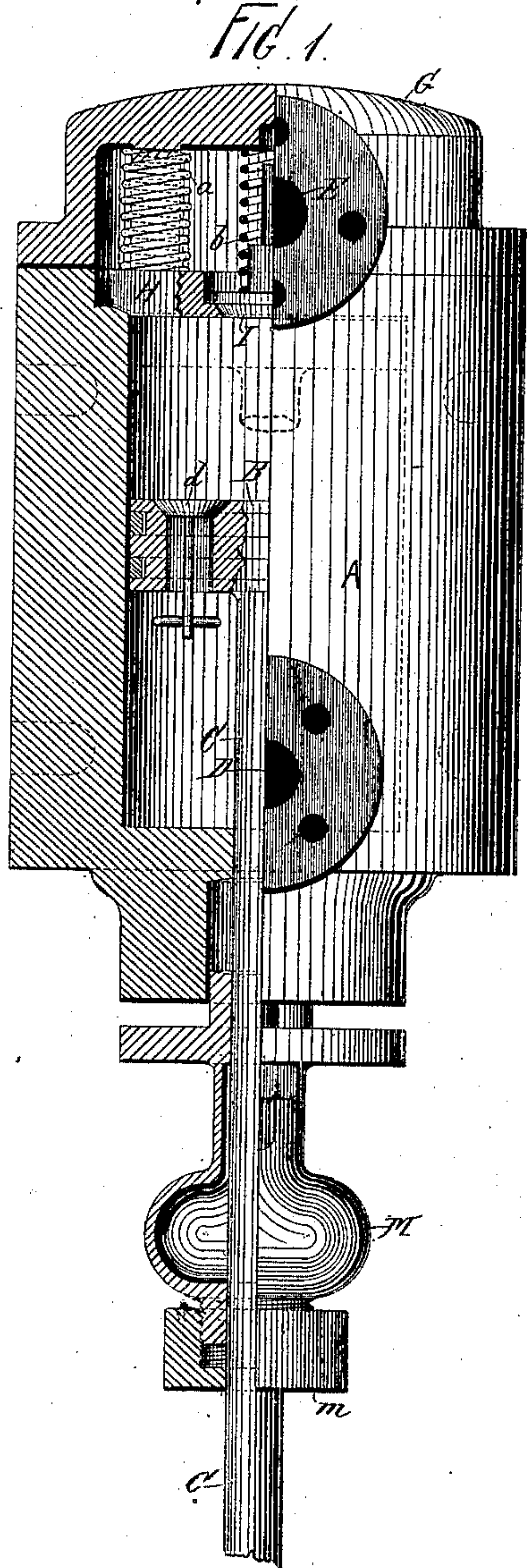
A. H. HUTCHINSON.

2 Sheets—Sheet 1.

PUMP.

No. 312,997.

Patented Feb. 24, 1885.



Witnesses:
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Henry Lieb.

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(No Model.)

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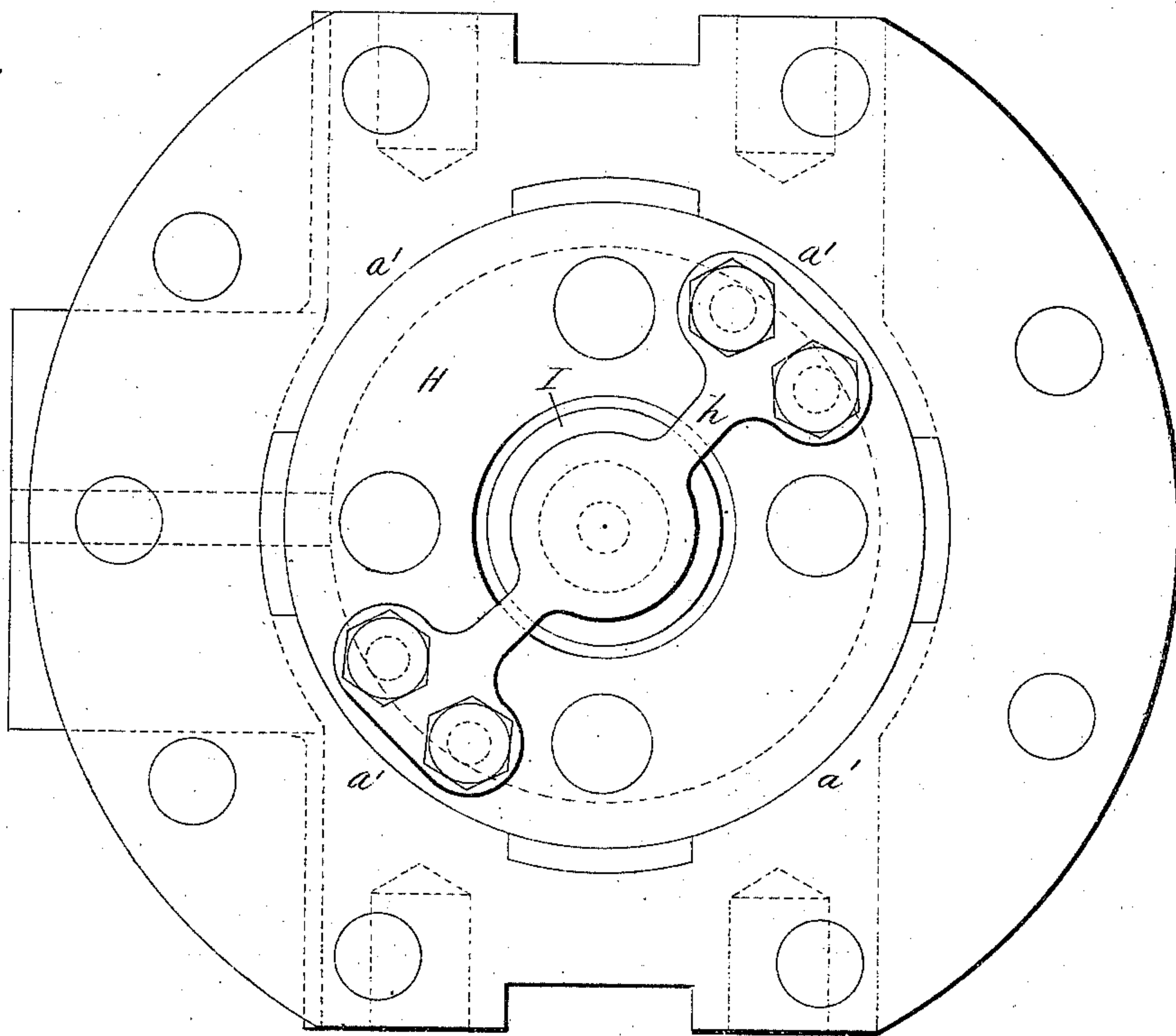
2 Sheets—Sheet 2.

PUMP.

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FIG. 4



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UNITED STATES PATENT OFFICE.

ARTHUR H. HUTCHINSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR
TO THE I. P. MORRIS COMPANY, OF SAME PLACE.

PUMP.

SPECIFICATION forming part of Letters Patent No. 312,997, dated February 24, 1885.

Application filed January 15, 1884. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR H. HUTCHINSON, of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Pumps for Ice-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention has relation to that class of pumps employed for forcing or compressing air and gases, and which are especially intended for use in connection with what are known as "compression ice-machines."

The object of my invention is to provide a pump simple, cheap, and durable in all its parts, and automatic in all its operations respecting the inflow and outflow of oil or liquid and air or gas, wherein the parts are readily accessible for inspection and repairs, wherein ample provision is made for the escape of the gas under pressure, and the same effectually sealed against returning to the piston-chamber, and wherein the gas or air is completely expelled from above the piston at each upstroke, and the piston permitted to return under a minimum of back-pressure, thus increasing the effective working capacity of the pump and reducing the power required to operate it.

To accomplish all of this, my improvements involve certain novel and useful peculiarities of construction, relative arrangements or combinations of parts, and principles of operation, all of which will be herein first fully described, and then pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a front elevation and partial section of a pump constructed and arranged for operation in accordance with my invention. Fig. 2 is a vertical axial section of the cylinder and its adjuncts, omitting the piston, the view being taken upon a plane at right angles to that of Fig. 1. Fig. 3 represents a plan and section of the bridge employed in connection with the auxiliary or ejection valve, the same being detached from the other parts. Fig. 4 is a plan view (enlarged beyond the other figures) omitting the dome, and showing the top of the displacement-

valve and the means of guiding it to its seat in the head of the cylinder.

In all these figures like letters of reference, wherever they occur, indicate corresponding parts.

It has not been deemed necessary to represent the frame which supports the pump, nor any mechanical means for driving the pump-piston, nor yet any tanks or piping leading from or to the pump, inasmuch as these appliances are well understood, and may be of any approved pattern.

A represents the pump-cylinder; B, the piston; C, the piston-rod; D, the inlet for gas or air; E, the outlet for the same, and F the inlet for oil or other liquid.

Upon the top of the cylinder A is secured, by bolts or otherwise, a dome or other shaped top, G, forming a chamber, into which the fluids and liquids are forced or compressed upon the upstroke of the piston. The lower mouth of this chamber is closed by a neatly-seated valve, H, the lower face of which valve is the same diameter as the piston, and which valve is normally seated and prevented from being disarranged by any number of light springs, as *aa*, suitably disposed about the central axis. This valve I call the "displacement-valve." In the center of this valve is another valve, I, which I call the "ejection-valve," the same being controlled by a suitable spring, as *b*. Upon the upstroke of the piston the central valve opens first, its spring *b* having less power or tension in proportion to its under surface than the combined power of the springs *a* in proportion to the under surface of valve H. As soon as the piston strikes the displacement-valve the ejection-valve closes, and all the fluid and liquid remaining above the piston (and which has not passed the ejection-valve) will be forced out through the opening controlled by the displacement-valve, thus entirely clearing the piston-chamber above the piston and leaving no fluid to expand therein when the piston starts upon its downstroke.

To permit the ready displacement of the last remnants of fluid and liquid as above explained, the displacement-valve is preferably so located as to leave a narrow and practically

unobstructed channel around the valve-seat, as plainly shown. Within this channel are rigid bearings or guides, placed at intervals about the circumference of the valve, (shown at *a' a'*, Fig. 4) by which the valve is properly guided in its up and down movements, the guides being so arranged as to permit the ready passage of fluid and liquid through the parts between them.

The channel above alluded to constitutes both the outlet for gas and air and the outlet for the oil.

K is the oil-valve or check-valve governing the flow of oil or lubricating-liquid. It is provided with a light spring, *c*, of tension sufficient to hold it up when the pressure upon both sides is equal. When the piston moves upwardly, the pressure upon the under side of valve K forces it firmly to its seat, and prevents further inlet of oil or liquid. The oil or liquid already admitted is forced out at top of the piston-chamber, and connections are made so as to return it to the oil-valve port, it being readily separable from the gas or air which moves out with it. Upon the down-stroke of the piston oil or liquid is injected through the oil-valve port, the pressure upon the exterior being then greater than upon the interior side. This liquid effectually seals the piston and the valves therein against passage of fluids upon the upstroke, and when it is forced through the valves at the top it also effectually seals them against any backflow of fluids. The liquid also lubricates the parts. Within the piston, and opening upwardly, are any number of valves *d*. Upon the down-stroke of the piston the gas or air opens these valves slightly, and passes through to the space above the piston.

At L is a check-valve intended to prevent escape of gas or air from the space beneath the piston, but readily opening to admit the gas or air as soon as the piston commences to rise.

Such being the general construction and operation of the pumps, it will be apparent that there is no time during its working when there is any appreciable quantity of gas left above the piston to expand, and therefore the pump always works up to its full capacity; and also the piston-valves, being made to open by the back-pressure, much power is saved over and above what would be required to force it back against a pressure of twenty to forty pounds, as occurs in such pumps as employ the solid piston. The oil-valve is accessible from the exterior by simply withdrawing the screw-plug *e*, and the tension of the spring may be adjusted or the valve securely closed, if desired, by simply turning this screw, and all this while the pump is working, thereby avoiding the necessity of stopping the same.

At *f* is a jam-nut by which the screw-plug *e* may be held in place. The valve at the inlet-port is also accessible from the exterior by simply removing the plug *g*. The ejection-valve is guided by a bridge, *h*, of suitable form, secured upon the top of the displacement-valve.

At M is an oil-box made to surround the piston and entering the stuffing-box to compress the packing therein. This box serves the double purpose of a follower for the stuffing-box and as a receptacle for oil, by which the escape of fluid is more effectually prevented and the piston-rod kept thoroughly lubricated. It has a screw-cap, *m*, by which it may be packed in any desired manner, and is otherwise preferably made in one piece to facilitate handling or adjustment and to reduce its cost.

The oil or liquid admitted to the pump-cylinder may be cooled in any suitable manner.

The improved pump, though primarily designed to effect the compression of air or gases, may obviously be used with marked advantage in situations wherein the chief object is to exhaust air or gases, as will be readily understood.

Being constructed and arranged for operation substantially as above described, the device has been found in practice to admirably answer the purposes or objects of the invention, as previously set forth.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a pump of the character herein set forth, the cylinder, the piston, displacement-valve, ejection-valve, oil-inlet, and oil-inlet valve, combined and arranged substantially as shown, and for the purposes set forth.

2. The combination, with the pump-cylinder, of the oil-inlet to said cylinder, the valve located therein, the spring operating in conjunction with the valve, and the pump-piston, combined and arranged to operate substantially as set forth.

3. In a pump of the character herein set forth, having an inlet for air or gas and inlet for oil, and a common outlet for both oil and air or gas, the combination, with the valve governing the oil-inlet and operating as explained, of the removable screw-plug and adjustable or regulating spring, substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of two witnesses.

ARTHUR H. HUTCHINSON.

Witnesses:

JOHN BUCKLER,
WORTH OSGOOD.