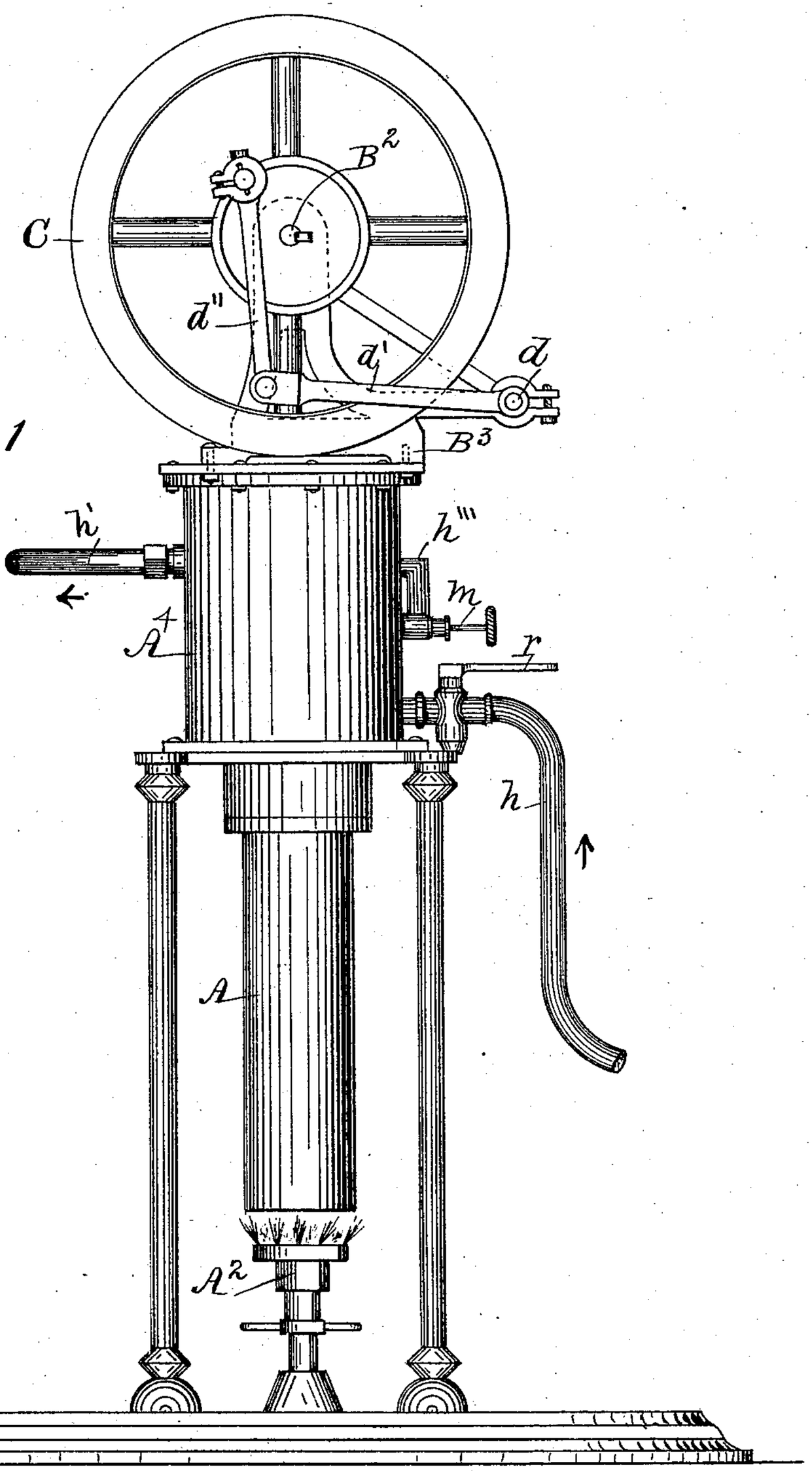
(No Model.) 3 Sheets—Sheet 1.

L. KESSLER.

HYDROPNEUMATIC ENGINE.

No. 368,952. Patented Aug. 30, 1887.

Fig. 1



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C. W. Stiles.

Inventor:
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(No Model.) 3 Sheets—Sheet 2.

L. KESSLER.

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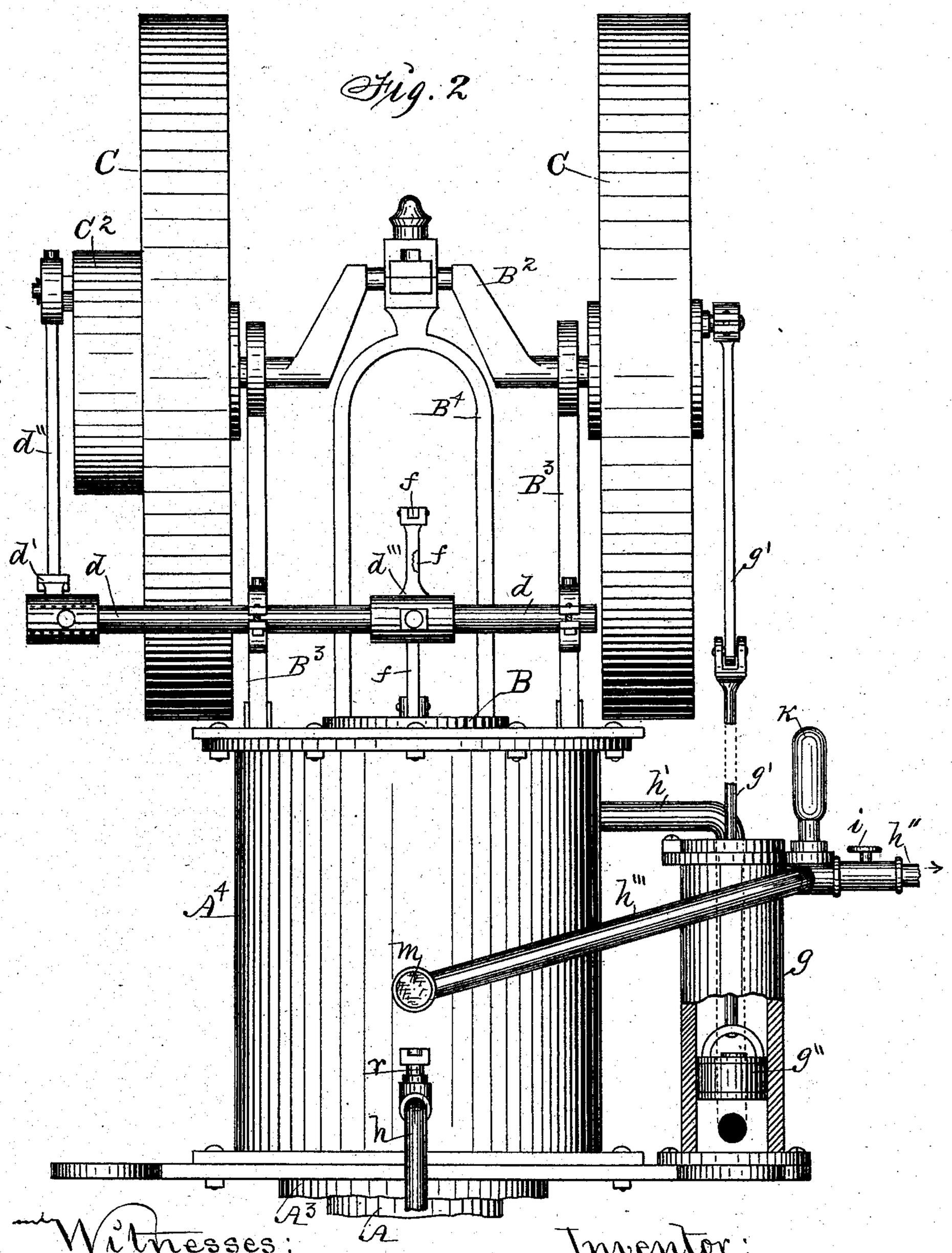
Fig. 2



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(No Model.) 3 Sheets—Sheet 3.

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Fig. 3

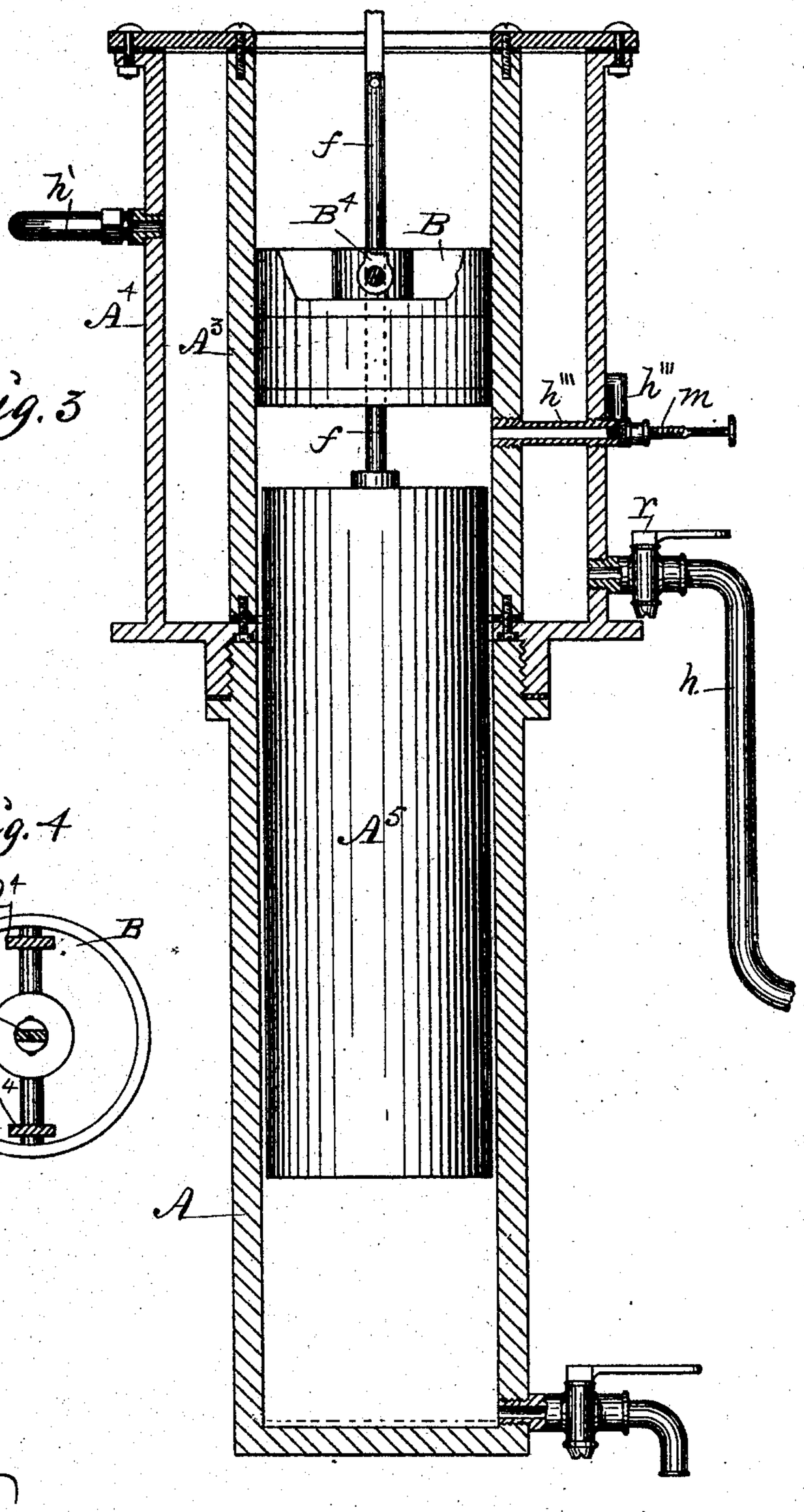

Fig. 4

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UNITED STATES PATENT OFFICE.

LOUI KESSLER, OF DES MOINES, IOWA, ASSIGNOR OF ONE-HALF TO F. HARBACH, OF SAME PLACE.

HYDROPNEUMATIC ENGINE.

SPECIFICATION forming part of Letters Patent No. 368,952, dated August 30, 1887.

Application filed December 13, 1886. Serial No. 221,462. (No model.)

To all whom it may concern:

Be it known that I, LOUI KESSLER, a citizen of Germany, and a resident of Des Moines, in the county of Polk and State of Iowa, have invented a Hydropneumatic Steam-Engine, of which the following is a specification.

My object is to produce an effective upward stroke of a piston by means of steam-pressure, an effective downward stroke by means of atmospheric pressure to overcome the dead-center of a crank-shaft, and to reduce the minimum of fuel and heat and increase the maximum of power in an engine of any given size, as required to reduce the cost of operating machines of different kinds for different purposes.

My invention consists in the construction and combination of a boiler, a furnace, a cylinder, a float, a piston, a driving-shaft, a condenser, and a pump, as hereinafter set forth, pointed out in my claim, and illustrated in the accompanying drawings, in which—

Figure 1 is a side view of the engine supported upon posts fixed to a portable base. Fig. 2 is an enlarged view of the top portion of the engine, taken from a point of view at right angles to the point from which Fig. 1 is taken. Fig. 3 is a vertical sectional view of the boiler and cylinder, showing the relative positions of the piston and the float. Fig. 4 is a top view of the piston, through which a rod connected with the float is extended and operated.

A is a vertical boiler, closed at its bottom and open at its top and provided with an eduction-tube and stop-cock near its bottom.

A^2 represents a furnace, preferably one adapted for burning gas, oil, or any kind of volatile fluid.

A^3 is an open-ended cylinder corresponding in diameter with the boiler, to the top of which it is fixed in concentric position.

A^4 is a condenser inclosing the cylinder A^3. The ends of the condenser have circular openings coinciding with the open ends of the boiler and cylinder.

A^5 is a float, preferably an air-tight sheet-metal cylinder not quite as large in diameter as the boiler, inclosed within the boiler in such a manner that steam generated in the bottom of the boiler will rise around the float and ascend into the cylinder A^3 to operate a piston, B, in that cylinder, and also in such a manner that it will elevate the float to make a supplementary stroke that will carry the crank of a driving-shaft past the dead-center of its orbit.

B^2 is a shaft that has a crank at its center supported upon bearers B^3, that are fixed on top of the condenser by means of bolts, or in any suitable way.

B^4 is a yoke hinged to the center of the crank at the center of the shaft B^2, at its closed end, and to the top of the piston B at the lower ends of its branches in such a manner that the yoke will perform the function of a rod or beam for transmitting power and motion from the piston to the crank of the driving-shaft.

C C are balance-wheels fixed to the ends of the driving-shaft B^2.

C^2 is a belt-wheel formed on or fixed to one of the balance-wheels to transmit power from the engine to operate machinery.

d is a rock-shaft in bearings formed in or fixed to the frames or bearers B^3, to extend horizontally and parallel with the driving-shaft B^2.

d' is an arm detachably fixed to the end of the rock-shaft and connected with the belt-wheel C^2 and the driving-shaft by means of a rod or bar, *d''*, as clearly shown in Fig. 1.

d''' is an arm detachably fixed to the central portion of the rock-shaft and connected with a jointed rod, *f*, that is fixed to the top and center of the float A^5, and extended up through the center of the piston B in such a manner that when the float rises it will impart force to the rock-shaft, to be transmitted therefrom to the driving-shaft at the instant that the piston B has completed its upward stroke and the crank of the shaft B^2 is at the dead-center of its orbit, so that the upward steam-pressure upon the float is applied at the proper time required to force the crank past the dead-center before a vacuum occurs in the cylinder and the piston is forced downward by atmospheric pressure.

g is a pump fixed on top of the base-plate that supports the condenser, as shown in Fig. 2. The jointed rod *g'*, that extends up from the plunger *g''* in the pump-cylinder, is connected with a wrist-pin on the end of the hub of the balance-wheel C^2 in such a manner that

the pump will be operated simultaneously with the driving-shaft B^2 to force water through the condenser A^4 continuously while the engine is in motion.

h is an induction-tube through which cold water is drawn from a reservoir into the annular chamber of the condenser A^4, that surrounds the steam-cylinder A^3.

h' is an induction tube at the opposite side and top portion of the condenser, through which the water is conveyed from the condenser into the lower end of the pump-cylinder, to be discharged from a tube, *h''*, at the top of the pump and returned to the well or reservoir from whence it was drawn or conveyed to any place desired. Cold water is thus circulated in the condenser by the automatic action of the pump to condense the steam in the cylinder A^3 at the instant the piston B has made its upward stroke, as required, to create a vacuum in the cylinder, so that the outside pressure of the atmosphere will be utilized in pressing the piston down and making an effective stroke and pull upon the crank of the driving-shaft B^2.

h''' is a tube connected with the top of the pump-cylinder *g* and the central portion of the steam-cylinder A^3 in such a manner that when the tube *h''* is closed by means of a valve, *i*, water can be drawn from the condenser and forced into the cylinder and under the piston to fall into the bottom of the boiler.

k is an air-chamber on top of the pump that facilitates the motion of the water.

m represents a valve by means of which communication is cut off between the pump and the boiler.

r is a valve by means of which the induction-tube *h* is opened and closed, as required, to regulate the flow of water into the condenser.

In the practical use of my engine thus constructed I open the stop-cock near the bottom of the boiler and then operate the pump by hand, or in any suitable way, to draw water into the condenser, and then force a small quantity from the condenser into the boiler until it begins to flow out of the open cock at the bottom of the boiler. The quantity of water admitted to the boiler is thus restricted. I then cease pumping and close the valve *m* and open the valve *i*. I next light the gas or other fuel used in the furnace, and heat the boiler and water therein to produce steam. The small quantity of water in the boiler is quickly converted into steam, that rises around the float in the boiler and presses the piston to the top of the cylinder, as required, to make an effective upward stroke to turn the crank of the driving-shaft with which the piston is connected, and as the volume of steam and its expansion increases at the bottom of the boiler the float therein is also pressed up into the cylinder to supplement the upward stroke of the piston and to force the crank of the driving-shaft past the dead-center of its orbit, which occurs when the crank is in a perpendicular position. The same upward motion of the float creates an annular chamber in the cylinder and retains the steam in the cylinder contiguous to the cold water in the condenser to facilitate condensation and the return of the water and the float to the bottom of the boiler. As condensation is thus effected, a vacuum is created in the cylinder and the piston is forced down by the atmospheric pressure on its top, as required, to produce an effective downward stroke to carry the crank of the driving-shaft downward to complete the revolution of the shaft and start a second revolution. At each revolution thus effected the plunger in the pump-cylinder is operated by means of the jointed rod that is connected with the wrist-pin on the end of the hub of one of the balance-wheels, as required, to keep cold water circulating through the condenser.

I am aware that a boiler surrounded at its upper portion by a condenser has had a piston operated in its top portion and a float or piston having closed ends in its lower portion in a similar manner; but my complete engine having a pump and pump operating mechanism to circulate water in the condenser and feed it into the boiler, in concert with the movements of the piston and float, is novel and advantageous.

I claim as my invention—

A hydropneumatic motor or engine composed of the following elements, to wit: a boiler having an open top and a closed bottom, a furnace under the boiler, an open-ended cylinder fixed on top of the boiler, a horizontal driving-shaft supported above the cylinder, a piston in the cylinder connected with the said driving-shaft by means of a rock-shaft that extends parallel with the driving-shaft and a jointed rod that extends from the top of the float through said piston, a condenser surrounding said cylinder, and a pump connected with said condenser, cylinder, and boiler by means of tubes and connected with said driving-shaft by means of a jointed rod and crank, to operate in the manner set forth.

LOUI KESSLER.

Witnesses:
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THOMAS G. ORWIG.