

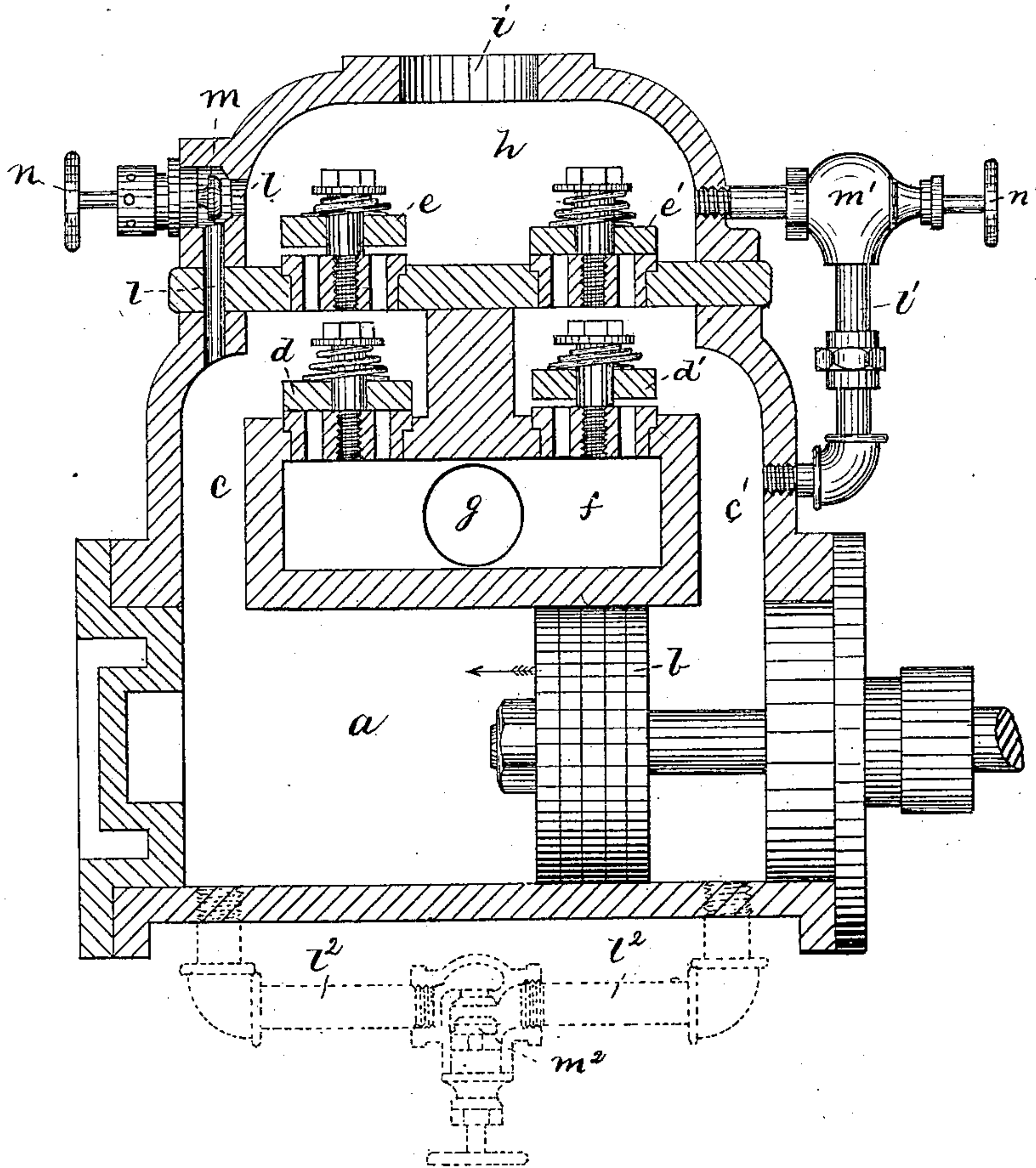
(No Model.)

L. J. KNOWLES.

AIR PUMP FOR CONDENSING ENGINES.

No. 246,857.

Patented Sept. 6, 1881.



Witnesses.

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UNITED STATES PATENT OFFICE.

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AIR-PUMP FOR CONDENSING-ENGINES.

SPECIFICATION forming part of Letters Patent No. 246,857, dated September 6, 1881.

Application filed July 5, 1881. (No model.)

To all whom it may concern:

Be it known that I, LUCIUS J. KNOWLES, of Worcester, county of Worcester, State of Massachusetts, have invented an Improvement in
5 Air-Pumps for Condensing-Engines, of which the following description, in connection with the accompanying drawing, is a specification.

My invention relates to an air-pump for condensing steam-engines; and it has for its object
10 to improve the action of the pump, in order to obtain thereby a more efficient and uniform vacuum in the condenser.

In air-pumps as now commonly constructed the pressure in the pump-cylinder is not always
15 sufficient to open the delivery-valves, especially when first starting the pump. When the pump is operating in this manner the piston compresses the air or vapor or other gaseous contents of the cylinder in front of it as it travels
20 through the cylinder, and if the pressure produced by this compression is not sufficiently great to open the delivery-valves, the gaseous contents will merely expand again when the piston makes its return-stroke, and if the pressure
25 in the condenser is not sufficiently great to open the suction-valves leading to the cylinder, nothing will be added to its contents, and the piston will merely travel back and forth, alternately compressing the contents of the cylinder
30 and permitting them to expand without accomplishing any beneficial result. This operation, which may occur periodically while the pump is running, is chiefly due to excessive clearance, and is obviated by this invention,
35 which consists in providing the cylinder with ports or passages leading to either end thereof and controlled by suitable valves operated by the attendant, through which any desired amount of water or other substantially inextensible fluid may be admitted to the cylinder,
40 preferably a trifle in excess of the clearance-space, so that, as the said liquid is substantially incompressible, the delivery-valves will be positively opened at the end of the stroke of the
45 piston, and in the return-stroke a perfect vacuum will be formed to insure that the contents of the cylinder shall open the suction-valves.

The drawing represents, in vertical longitudinal

section, an air-pump provided with my invention, illustrating several different arrangements of the water-supplying ports or
50 pipes and valves controlling them.

The pump-cylinder *a*, piston *b* therein, ports *c* *c'*, leading to the suction-valves *d* *d'*, and delivery-valves *e* *e'*, the former controlling passages leading to the inlet-chamber *f*, connected
55 by the inlet-pipe *g* with the condenser, and the latter controlling passages leading to the discharge-chamber *h*, provided with a discharge-passage, *i*, may be of any usual construction. 60

The piston *b* is shown as just beginning its stroke in the direction of the arrow, and if it were pumping dry air or gaseous material, and this were already considerably attenuated, it will be seen that in completing its stroke in the
65 direction of the arrow it merely compresses the said contents from the aggregate volume of the cylinder *a* and port *c* to the volume of the latter alone, and this compression may not produce a sufficient pressure to open the valve *e*,
70 acted upon by the pressure of the atmosphere, together with that of its closing-spring and the liquid that remains in the chamber *h* and pipe or passage leading therefrom. If this were the case, the piston, in making its return-
75 stroke, would merely allow the contents of the cylinder to expand again, and their pressure would be no less than at the end of the preceding stroke, so that the suction-valve *d* would not again be opened, and the pump would continue operating in this manner without producing any useful effect until the pressure in the
80 chamber *f* were increased sufficiently to open the valve *d*. In order to obviate this, the cylinder *a* is provided with a passage, preferably
85 made as a port, *l*, connecting the said cylinder or the port *c* therefrom with a suitable supply of water or other liquid, preferably that in the chamber *h*, the said port being provided with a valve, *m*, operated in any usual manner, as
90 by the hand-wheel *n*, to properly control the passage of the liquid, so that an amount a trifle in excess of what is necessary to fill the clearance-space when the piston has completed its stroke may be admitted, thus insuring the
95 positive opening of the delivery-valves and an

almost perfect vacuum in the cylinder and port *c* when the piston makes its return-stroke, thereby insuring the opening of the suction-valves and an efficient vacuum in the chamber *f*' and condenser.

When this improvement is to be added to an air-pump already constructed on the common plan, the passage may consist, as shown at *l*', of pipes properly connected with the chamber *h* and cylinder or port *c*', as by screw-threads, the said pipes being controlled by a valve, *m*' *n*', of any usual or suitable construction.

When convenient and desirable, any other source of water than the chamber *h* may be employed, suitable passages, *l*², controlled by the valve *m*², being shown in dotted lines as connected at either end of the cylinder *a* with a suitable supply of water or other liquid.

I claim—

1. In an air-pump for condensing-engines, the combination, with the pump-cylinder, of

ports or passages connecting either end thereof with a supply of water or other liquid, and controlling-valves therefor, whereby an amount of water sufficient to fill the clearance-space may be admitted to the cylinder, to cause the pump-valves to be positively opened, substantially as and for the purpose described.

2. The pump-cylinder and piston therein, combined with the delivery-chamber and small ports connecting the said chamber with each end of the cylinder, and adapted to remain open independently of the operation of the piston and pump-valves, substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LUCIUS J. KNOWLES.

Witnesses:

GEO. F. BLAKE,
E. C. TURNER.