

(No Model)

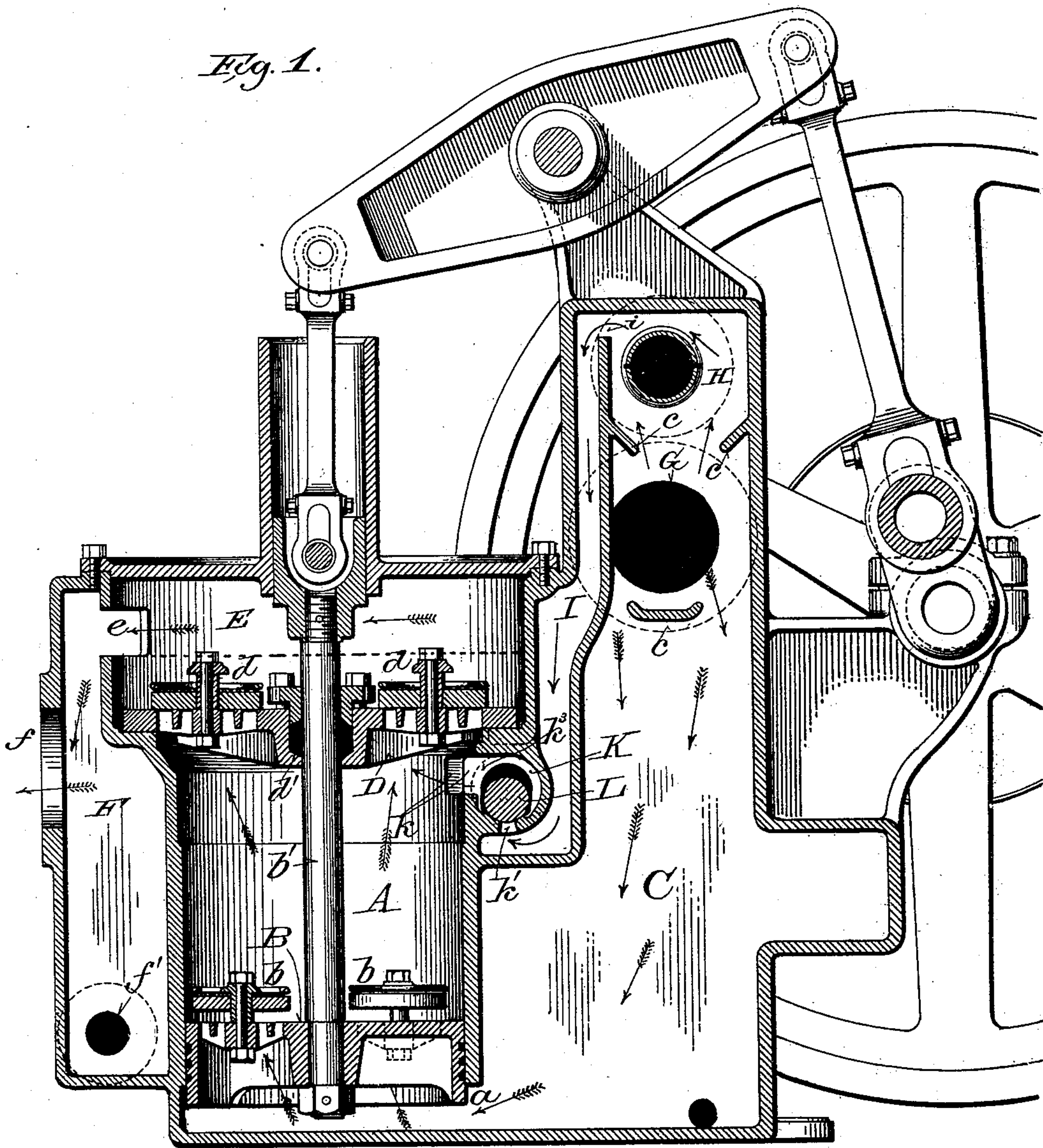
2 Sheets—Sheet 1.

B. V. NORDBERG.
AIR PUMP FOR CONDENSERS.

No. 482,315.

Patented Sept. 6, 1892.

Fig. 1.



Witnesses:

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Inventor:

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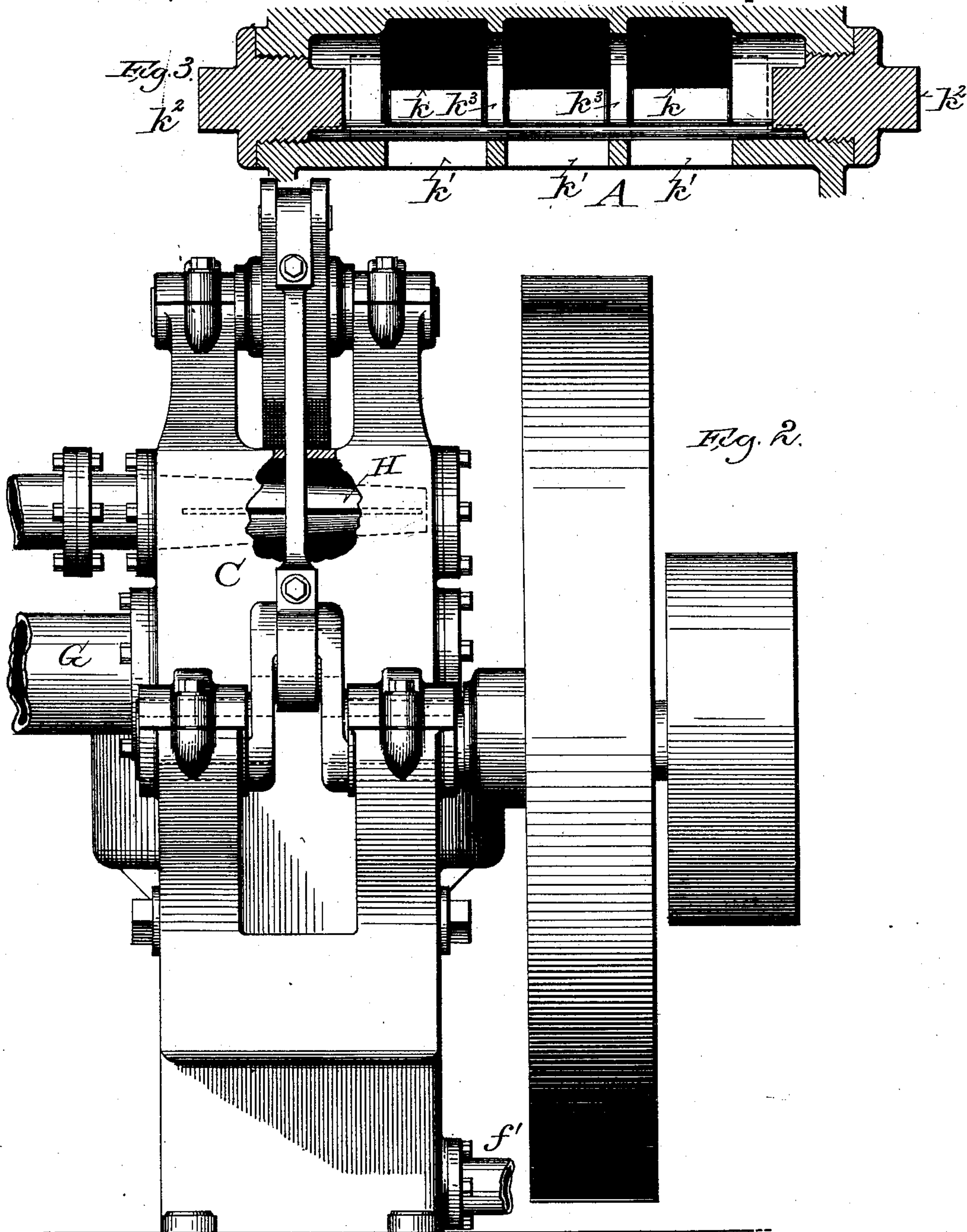
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AIR PUMP FOR CONDENSERS.

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UNITED STATES PATENT OFFICE.

BRUNO V. NORDBERG, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO THE
BRUNO NORDBERG COMPANY, OF SAME PLACE.

AIR-PUMP FOR CONDENSERS.

SPECIFICATION forming part of Letters Patent No. 482,315, dated September 6, 1892.

Application filed November 17, 1891. Serial No. 412,147. (No model.)

To all whom it may concern:

Be it known that I, BRUNO V. NORDBERG, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain
5 new and useful Improvements in Air-Pumps for Condensers; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make
10 and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to that class of pumps
15 which is designed to be employed in connection with condensers, vacuum-driers or other apparatus in which a vacuum is to be produced and maintained in connection with the condensation of steam or vapor.

20 Its main object is to produce and maintain a more perfect vacuum than has been heretofore attainable in apparatus of this class.

It consists, essentially, of a valve-controlled opening or passage from the suction or condensing chamber into the pump-cylinder between the suction and discharge valves, whereby air or other gas is discharged by the
25 pump without being forced through and encountering the resistance of the liquid in the pump-cylinder, and of certain other minor details of construction and arrangement hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters
35 designate the same parts in the several figures.

Figure 1 is a vertical medial section of a pump and condenser embodying my improvements. Fig. 2 is an end elevation of the same
40 as viewed from the right with reference to Fig. 1, and Fig. 3 is a vertical section, on an enlarged scale, through the air-valve case in the pump-cylinder.

A represents the cylinder of the pump, communicating through its open lower end *a* with the suction and condensing chamber C.

B is the pump-piston provided with upwardly-opening suction-valves *bb* and mounted upon a piston-rod *b'*, which passes upwardly through a stuffing-box in the upper
50

head D of the pump-cylinder. The head D is provided with discharge-valves *d d*, opening upwardly into a chamber E, which holds a water-seal over the valves *d d* and communicates through an overflow-opening *e* with a
55 well F at one side of the pump-cylinder, having an overflow opening or connection *f* in the side and a pump connection *f'* at or near the lower end for drawing off a portion of the water or liquid, the greater portion of the water or liquid and the air or gas being discharged through the opening *f* above.

G is the exhaust connection of the engine, vacuum-drier, or other apparatus in which a vacuum is to be maintained with the upper
60 portion of the condensing-chamber C.

H is a laterally slotted or perforated pipe or nozzle located above the exhaust connection G and arranged to introduce sheets or sprays of cool injection-water for condensing the
65 steam or vapors entering the chamber C through the connection G.

c c are spreading-plates arranged to direct the inflowing injection-water, so as to act most efficiently upon the inflowing steam or vapor.
70 Heretofore in machines of this class the air or other gas has been drawn, together with the water or liquid and any uncondensed vapor, by the pump through the suction valve or valves in the piston into the pump-cylinder, no provision being made for discharging it otherwise. The air or gas being lighter than the water or other liquid to be discharged by the pump in the manner last mentioned must displace a considerable amount of water
75 retained in the pump-cylinder for the purpose of sealing the suction-valves *bb*, and the force required to thus displace the water or other liquid in discharging the air or gas correspondingly impairs or diminishes the strength of the vacuum produced and maintained by the pump, because the pressure in the condensing-chamber C must exceed the pressure in the pump-cylinder A between the suction and discharge valves plus the weight
80 of the column of water above the piston, to force air or gas from said condensing-chamber through the valves in the piston and the water resting thereon into the pump-cylinder.

To obviate the necessity of discharging the
85 90 100

air or gas through the water or liquid in the lower portion of the condenser and pump, I provide a valve-chamber K in one side of the pump-cylinder A, which chamber communicates with the condenser C through ports or openings k' and with said cylinder through similar ports or openings k . The valve-chamber K, for convenience of construction is preferably made cylindrical in form and applied in a horizontal position to the pump-cylinder. The ends, which are made open for the purpose of boring or finishing the interior of the valve-chamber, particularly the valve-seat, are closed by screw caps or plugs k^2 , as shown in Fig. 3. The openings or ports k' are made in the bottom of the valve-chamber and are normally closed by the gravity of a cylindrical valve L, which may be made of rubber or any other suitable material. The valve L is guided upon its seat and retained in place by inwardly-projecting ribs k^3 . The ports k' preferably open from a passage I, which communicates through an opening i with the upper end of the condensing-chamber C. By this means condensed steam and liquid passing through the condenser is excluded from the air-valve K.

In operation liquid entering and vapor condensed in chamber C are drawn therefrom in the usual way through the opening a into the pump-cylinder with each upward stroke of the piston, and as the piston descends the valves $b b$, opening upwardly, allow the liquid to pass above it. With each upward stroke of the piston a portion of the contents of the cylinder A between the piston and head D is expelled through the valves d into the chamber E, whence it passes through opening e into the chamber F, the air or gases, with a part of the liquid, being discharged therefrom through the opening f and the remainder of the water or liquid being drawn off through the connection f' . When a sufficient amount of water or liquid has accumulated above the pump-piston B to afford a seal for the valves $b b$ and to impede the passage of air or gas, the latter will be drawn through the passage I and valve-chamber K into the upper portion of the pump-cylinder whenever the pressure in the chamber C exceeds the pressure in the pump-cylinder; or, in other words, whenever a more perfect vacuum occurs in the pump-cylinder than in the chamber C. The valve L is easily displaced by any excess of pressure in chamber C; but when the conditions are reversed it immediately closes the ports k' , preventing any backflow from the pump-cylinder into said chamber C. By this means and in the manner above stated a more perfect vacuum can be produced and maintained than has been possible with pumps as heretofore constructed for the purpose. It will be observed that the condensing-chamber C and the well F are cast integrally with cylinder A.

Various changes in the details of construc-

tion and arrangement of my improvement may be made within the intended scope of my invention, which consists, essentially, of the auxiliary air-valve hereinbefore described.

The pump proper and condenser, in connection with which I have shown my improvement, are in the main of a well-known construction; but the device may be adapted to pumps of various other forms for like or similar purposes.

I claim—

1. In a pump for condensers, the combination, with the cylinder, piston, and suction and discharge valves, of a condensing-chamber having an opening into the space between the suction and discharge valves of the pump and an air-valve placed in said opening and closing toward said condensing-chamber, substantially as and for the purposes set forth.

2. In a pump for condensers, the combination, with an upright cylinder, an outwardly-opening discharge-valve, and a piston provided with an inwardly-opening valve, of a condensing-chamber communicating with the pump-cylinder through an opening into the space between the piston and discharge-valve and an air-valve placed in said opening and closing toward said condensing-chamber, substantially as and for the purposes set forth.

3. In a pump for condensers, the combination, with an upright cylinder, a condensing-chamber communicating therewith, a piston provided with one or more upwardly-opening valves, and an upper head also provided with one or more upwardly-opening valves, of a cylindrical valve-chamber formed in the side of the pump-cylinder, with open ends, which are closed by caps or plugs, said valve-chamber communicating through a port in its under side with the condensing-chamber and through a lateral port with the cylinder above said piston, and a cylindrical valve seated in the lower side of said valve-chamber and normally closing the port from said condensing-chamber, substantially as and for the purposes set forth.

4. In a pump for condensers, the combination, with the cylinder, piston, suction and discharge valves, and a condensing-chamber communicating with the lower end of the pump-cylinder, of a passage leading from the upper part of the condensing-chamber in a space between the suction and discharge valves of the pump and an air-valve placed in said passage and opening toward said space, substantially as and for the purposes set forth.

5. In a pump for condensers, the combination of a piston provided with one or more upwardly-opening valves, an upright cylinder provided with one or more outwardly-opening valves in its upper end and with a horizontal cylindrical valve-case opening into said cylinder between the valve or valves in its upper end and said piston, and a condensing-cham-

ber communicating with the lower end of said
cylinder and with said valve-chamber through
a port in the bottom thereof, and a cylindri-
cal valve seated by gravity over said port,
5 opening toward said cylinder and closing to-
ward said condensing-chamber, substantially
as and for the purposes set forth.

In testimony that I claim the foregoing as
my own I affix my signature in presence of 10
two witnesses.

BRUNO V. NORDBERG.

Witnesses:

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E. G. ASMUS.