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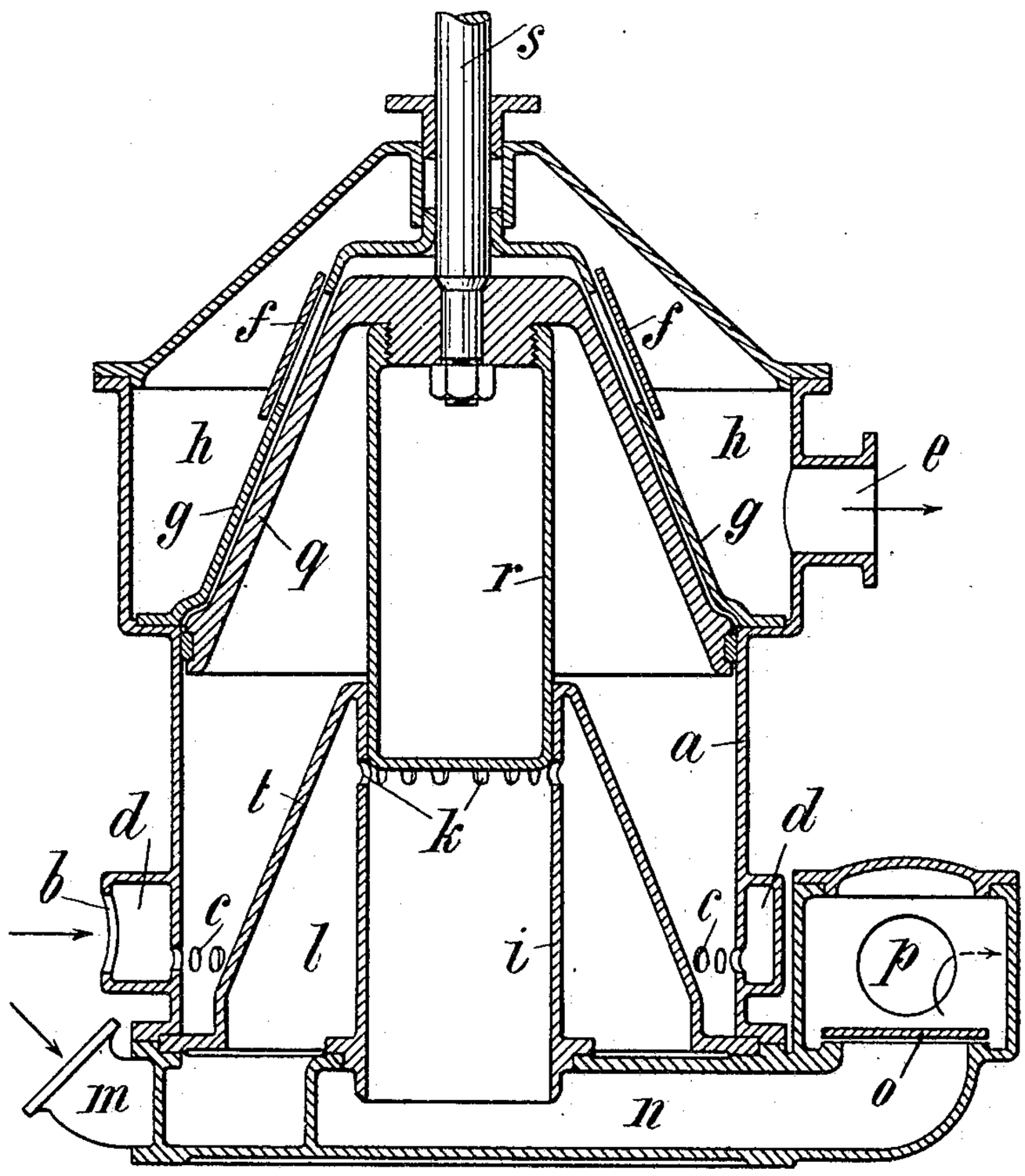
J. WILHELMI.

CONDENSING AIR PUMP.

APPLICATION FILED MAY 2, 1903.

NO MODEL.



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No. 758,801. Patented May 3, 1904.

UNITED STATES PATENT OFFICE.

JOHANNES WILHELMI, OF HAMBURG, GERMANY.

CONDENSING AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 758,801, dated May 3, 1904.

Application filed May 2, 1903. Serial No. 155,432. (No model.)

To all whom it may concern:

Be it known that I, JOHANNES WILHELMI, a resident of Hamburg, in the German Empire, have invented certain new and useful Improvements in Condensation Air-Pumps, of which the following is a specification.

The present invention relates to improvements in condensation air-pumps.

In surface condensation it is advantageous to suck water and air from the condenser separately.

With this end in view my invention consists in combining in a pump an air-piston presenting a large cross-section and a water-plunger piston presenting a small cross-section, both pistons being operated by one single piston-rod and arranged in such a manner that the space which is formed in the large cylinder between the large and the small piston causes by its vacuum action a compensation or balance of work between the two halves of a double stroke (up and down stroke) and acts as a buffer on the termination of the downstroke.

In order that my invention may be more fully understood by one skilled in the art to which it appertains, I shall now proceed to describe the same in detail, reference being taken for that purpose to the accompanying sheet of drawing, whereon I have shown a central vertical section of a condensation air-pump constructed in accordance with and embodying my invention.

The improved pump is provided with an air-cylinder *a*, which is in communication with the air-inlet *b* by means of openings *c* and an annular channel *d*, surrounding the latter, and with the air-outlet *e* by means of suitable pressure-valves *f*, provided in the cylinder cover or top wall *g*, and of a chamber or casing *h*, mounted at the top of the pump and surrounding the said pressure-valves. At the lower part of the pump or cylinder *a* there is arranged a water-cylinder *i*, which is in communication, by means of openings *k* and a chamber *l*, surrounding the said openings, with the water-inlet *m*, and by means of a channel *n* and a suitable pressure-valve *o* with the water-outlet *p*. The air-inlet *b* and the water-inlet *m* are suitably connected to the condenser.

The cylinder *a* contains a piston *q* and the cylinder *i* a piston *r*, preferably a plunger-piston. Both pistons are attached to and operated by a single piston-rod *s*. In order to construct a pump of this kind of small dimensions, the air-piston and the cylinder end walls *g* and *t* are made conical in form and the water-piston and water-cylinder arranged in the hollow of the conical piston *q* and conical bottom wall *t*, respectively, as clearly shown in the drawing.

By means of the described arrangement of the condensation air-pump an almost uniform efficiency is obtained. During the upstroke the air above the piston *q*, which air opposes a comparatively small resistance, is expelled through the valves *f*, chamber *h*, and outlet *e* against atmospheric pressure, whereas fresh air is sucked into the space underneath the piston *q* from the condenser through the openings *c*. At the end of the upstroke of the piston *q* the same vacuum will exist in the cylinder *a* as in the condenser. As the piston *r* moves simultaneously with the piston *q* a vacuum is produced at the same time in the water-cylinder *i*. When at the end of the upstroke of the pistons *q* and *r* the bottom of the piston *r* has cleared the openings *k*, water will rush in from the condenser through the inlet *m*, chamber *l*, and openings *k* and fill up the water-cylinder *i*. During the subsequent downstroke of the pistons *q* and *r* the openings *k* are immediately closed by the down movement of the piston *r*, and the water below the piston *r*, which water opposes a comparatively great resistance, is forced out through the channel *n*, pressure-valve *o*, and outlet *p*, a vacuum being produced at the same time in the air-cylinder *a* above the piston *q* by the down movement of this piston. Upon the termination of the downstroke the lower part of the air-cylinder is completely closed by the piston *q* sliding over the openings *c*, and the air contained in the said lower part compressed, so that an extremely advantageous cushioning effect for compensating or absorbing the action of the weight of the moving parts is obtained. After the piston *q* on its downstroke has passed the openings *c* the

vacuum above the piston *q* causes the air to rush from the condenser through the cleared openings *c* into the air-cylinder, from where it will be expelled by the next or following upstroke of the air-piston.

By the described combination of two pistons of different sizes the following results are attained: Almost all the air is exhausted by the sucking action of the large piston and little or no air enters the small water-cylinder, and, secondly, a vacuum is formed or produced on each stroke in the air-cylinder which demands an expenditure of energy on the upstroke of the piston which is, however, recuperated on the downstroke.

In the example shown the pistons operate with pressure-valves only, the suction-valves being replaced by the openings *c* and *k* and the slide action of the pistons themselves. The pump may, however, also be provided with suction-valves, if desired. When the pump is provided with suction-valves, the conical chamber *l* serves as suction air-chamber.

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

1. A pump having a water-cylinder and an air-cylinder larger than the water-cylinder, pistons therein, a piston-rod connected to both pistons and means to produce an air-cushion at the termination of the downstroke, whereby the space between the large and small pistons in the air-cylinder causes by its vacuum action a compensation or balance of work between the two halves of a double stroke (up and down stroke), substantially as described.

2. A pump having a water-cylinder and a concentric air-cylinder, each having inlet-ports, concentric pistons in said cylinders, a piston-rod operating both of the pistons, the ports in the air-cylinder closed before the end of the air-piston stroke to form an air-cushion and admit air into the partial vacuum above the piston, and the ports in the water-cylinder opened at the end of the suction-stroke of the water-pistons to admit water to the partial vacuum formed in the water-cylinder, substantially as described.

3. A pump having a water-cylinder provided with peripheral ports at one end and a concentric air-cylinder provided with peripheral ports at its opposite end, concentric pistons in said cylinders to control the ports and a piston-rod connected to both of the pistons, substantially as described.

4. A pump having a water-cylinder provided with peripheral ports, a concentric air-cylinder also provided with peripheral ports, a conical piston in the air-cylinder and a piston in the water-cylinder each controlling the respective ports, and a piston-rod connected to both of the pistons, substantially as described.

5. A pump having a water-cylinder provided with peripheral ports, a concentric air-cylinder having peripheral ports and conical ends, a piston in each of said cylinders controlling the respective ports and an annular conical chamber surrounding the water-cylinder and communicating therewith through the ports in said cylinder, substantially as described.

6. A pump having a water-cylinder provided with peripheral ports at its upper end and having its lower end opening into a valve-controlled discharge-channel, a larger concentric air-cylinder having conical ends and peripheral ports near its lower end, an air-chamber surrounding the upper end of said cylinder, valves to control the exhaust of air from the cylinder to the chamber, a conical piston in the air-cylinder, a cylindrical piston in the water-cylinder, each controlling admission through their respective ports and a conical chamber surrounding the water-cylinder and communicating therewith through the ports in said cylinder, substantially as described.

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Witnesses:
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