No. 697,666.

Patented Apr. 15, 1902.

F. SARGENT.

CONDENSER.

(Application filed Feb. 9, 1901.)

(No Model.)

2 Sheets—Sheet 1.

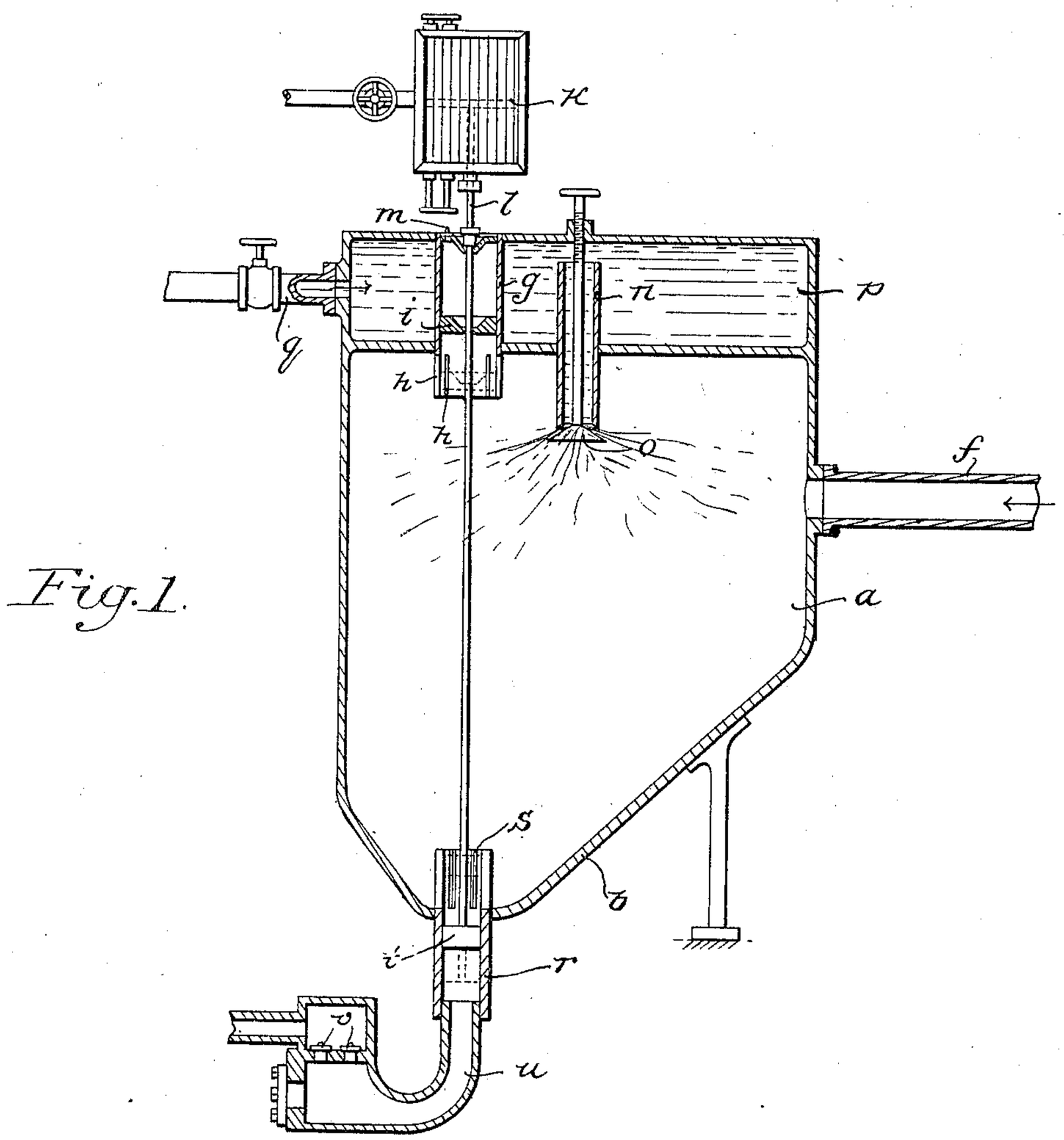

Fig. 1.

Witnesses:
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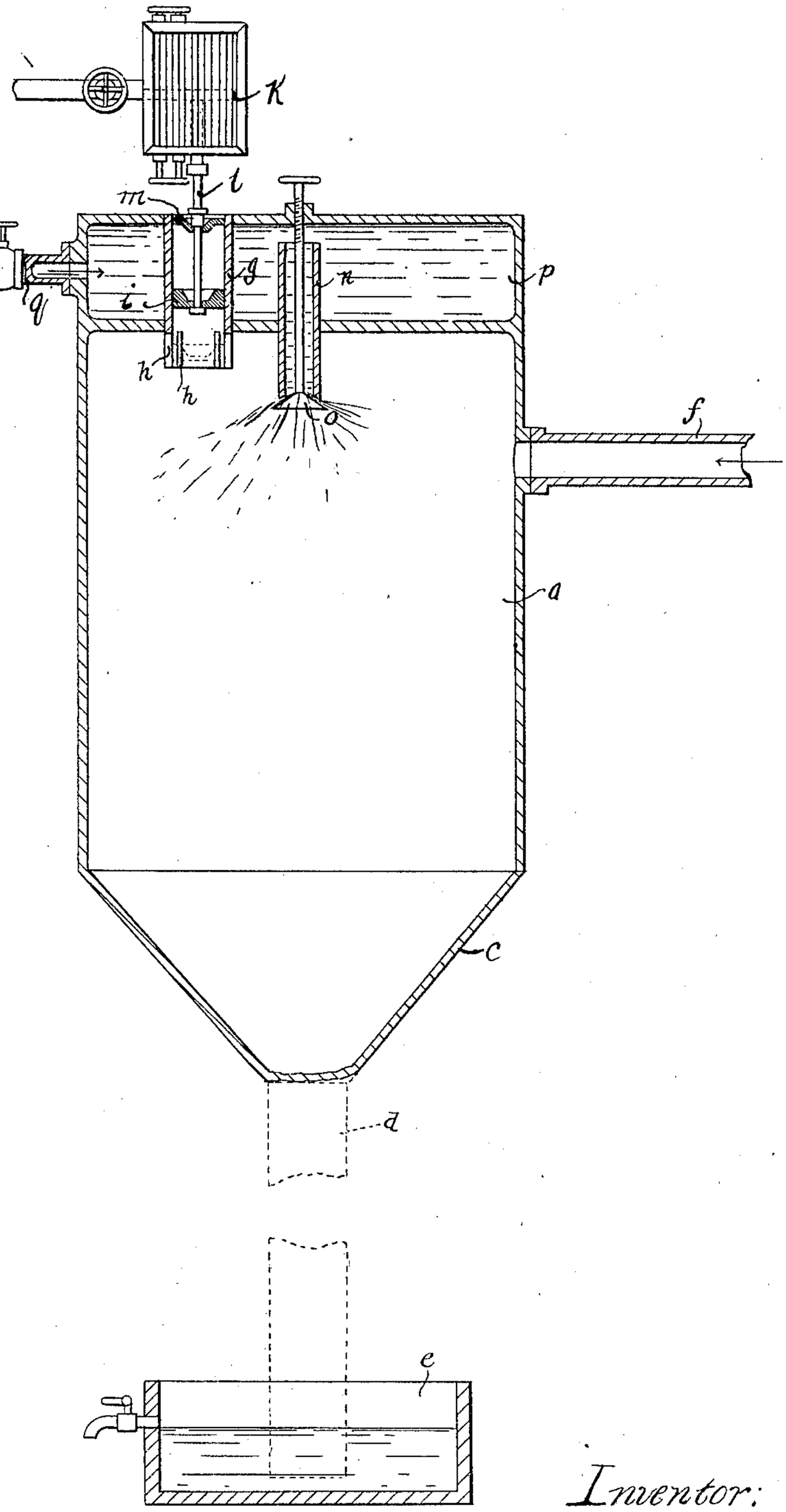

Fig. 2.

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UNITED STATES PATENT OFFICE.

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CONDENSER.

SPECIFICATION forming part of Letters Patent No. 697,666, dated April 15, 1902.

Application filed February 9, 1901. Serial No. 46,667. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK SARGENT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Condensers, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to condensers employed for reducing exhaust-steam to water, and has for its object the provision of improved means whereby air may be exhausted from the condenser from time to time. As is well known, condensers of this class employ sprays or jets for distributing cold water within the interior of the condenser either in a finely-subdivided state throughout the steam or against deflecting-plates to afford cooling-surfaces against which the exhaust-steam may impinge.

In the process of condensing steam it is advantageous to have a vacuum or partial vacuum in the condenser, which is restored from time to time as the steam and water import a quantity of air as the entry into the condenser is effected.

My invention has for its object the provision of very simple means for effecting the withdrawal of the air, which means may be applied to a condenser having a barometric column or to one wherein a pump is employed for the purpose of passing over the condensing fluid.

Generally speaking, my invention may be described as consisting in its preferred embodiment of a hollow vessel to the interior of which the exhausted steam is conveyed and to which interior is also passing the cooling fluid, that is thereafter distributed within the chamber in the manner desired, either in the form of a spray or against cooling-plates or otherwise. The chamber in the preferred embodiment of the invention is provided with one or more cylinders that project through the top or other suitable portion of the chamber, the cylinder being provided with apertures or slots in its lower end and being also provided with a piston that is adapted for reciprocation within the cylinder. The apertures, slots, or other means for establishing communication between the interior of the cylinder and the chamber are so located with relation to the piston that the piston will travel below the same, thereby affording a vent for the air contained within the condensing-chamber, which air is thereafter forced out by the piston when it ascends. A similar device is preferably provided at the lower end of the condensing-chamber through which the condensing fluid may be forced from time to time, the pistons of these devices being preferably actuated by a common prime mover.

I will explain my invention more fully by reference to the accompanying drawings, illustrating the preferred embodiments thereof, in which—

Figure 1 shows a condensing apparatus constructed in accordance with my invention, and Fig. 2 illustrates a modification of the condensing apparatus shown in Fig. 1.

In Fig. 1 I have illustrated a condensing-chamber *a*, which may be of any suitable form, preferably cylindrical, and provided with a bottom *b*, preferably of conical form, as shown. The exhaust-steam may be admitted to the condensing-chamber at any suitable point, an exhaust-pipe *f* being illustrated in the present instance communicating to the side of the chamber. One or more cylinders *g* may project through the top of the condensing-chamber, the cylinder being preferably provided with a series of apertures *h* or other means for establishing communication between the interior of the cylinder and the interior of the condensing-chamber. A reciprocating piston *i* is provided in the cylinder, above which the slots *h* extend when the said piston is at the lower limit of its excursion, as indicated in dotted lines. A suitable form of prime mover *k* may be employed to actuate the piston-rod *l*, carrying the piston at the required speed to maintain the desired vacuum. The piston is provided with a conical central recess that conforms substantially to a similar inward projection provided upon the upper head of the cylinder. The cylinder-head is provided with a suitable form of poppet-valve *m*, that serves to permit of the egress of the exhausted air to the extraneous atmosphere without permitting the admission of air. The particular means for reducing the steam to liquid shown herein is in the form of a tube *n*, that projects through the

upper wall of the condensing-chamber, a deflecting agency *o* being provided for spreading the water throughout the interior of the chamber. The water is preferably supplied to a reservoir *p*, carried upon the upper end of the condensing-chamber, and through which reservoir a cylinder *g* extends, the water within said reservoir circulating about said cylinder and through tube *n* into the condensing-chamber. The pipe *q* serves to convey water from a suitable source of supply to the reservoir *p*.

Where the type of condenser illustrated in Fig. 1 is employed, I provide an improvement consisting of a pump-cylinder *r*, having apertures *s* or other means for establishing communication between the condensing-chamber and the interior of the cylinder *r*. This cylinder is provided with a piston *t*, which when at the upper limit of its excursion extends above the portions of the slots *s*, so that condensed fluid may pass beneath the piston into the elbow *u*, from which the fluid may be forced through the passages of check-valves *v* as the piston *t* descends. The bottoms of the slots *s* are preferably located near the bottom of the chamber *b*, so that the fluid need not accumulate within the chamber before it is extracted. The pistons *i* and *t* are preferably mounted upon the same shaft, to be actuated by the same prime mover.

I have illustrated in Fig. 2 a modification of my improved condensing apparatus, which may be employed in place of the pump-cylinder *r* to effect egress of the condensed fluid from the condensing-chamber. The modification consists of a stand-pipe *d* for the liquid, which communicates with the lower and preferably triangular base portion *c* of the condensing-chamber *a*. The lower portion of the stand-pipe *d* is immersed in liquid contained in a receptacle *e*, a suitable overflow being provided in said receptacle, so that the condensing and condensed liquid may be withdrawn therefrom and only a sufficient amount of liquid allowed to remain therein so that the lower portion of the stand-pipe *d* may always be under water. It is apparent that with a vacuum in the condensing-chamber *a* the water in the stand-pipe *d* will remain at a constant level, depending upon the degree of vacuum in the said chamber *a*, irrespective of the amount of condensing liquid or condensed fluid admitted into said chamber, so that no pumping mechanism need be employed to withdraw the liquid from said condensing-chamber.

The construction which I have described possesses numerous advantages. For instance, by locating the air-pump in direct communication with the condensing-chamber instead of at some distance from that chamber I am able to produce a much more complete vacuum than can be produced with the pump at a distance. The air-pump cylinder also being located in the coolest part of the condenser takes the air in its least rarefied condition, and thus assists in securing and maintaining the vacuum within the condenser. This result is further aided by the location of the pump-cylinder in the path of the inflowing cool medium, which passes around the cylinder.

Heretofore in all condensers in which a pump has been used for withdrawing the water of condensation the air-pump and the water-pump have been united. This has made it necessary to sacrifice the efficiency which is secured by the construction which I have shown herein. The water-pump being necessarily located at a low point in order to operate most effectively has prevented the location of the air-pump, when the two are thus combined, at the point where its operation is most efficient. By means of my invention as herein set forth, in which the two pumps are separated, although when used in the same condenser they can be operated by the same prime mover, I am able to secure the important results which I have above set forth.

It is obvious that changes may be made from the embodiment of my invention herein shown and particularly described, and I do not, therefore, wish to be limited to the precise construction shown; but,

Having thus described my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. A condensing apparatus provided with a vacuum-pump with the open end of its cylinder projecting into the condensing-chamber, means being provided for establishing communication between the interior of the condensing-chamber and the cylinder when the piston within the cylinder is at one end of its stroke, whereby as the piston is returned the air admitted to the cylinder may be forced out, substantially as described.

2. A condensing apparatus provided with a vacuum-pump with the open end of its cylinder projecting into the condensing-chamber, means being provided for establishing communication between the interior of the condensing-chamber and the cylinder when the piston within the cylinder is at one end of its stroke, whereby as the piston is returned the air admitted to the cylinder may be forced out, the head of the cylinder being provided with valve mechanism for permitting the egress of the air that is to be exhausted and preventing the ingress of atmospheric air, substantially as described.

3. In a condensing apparatus, the combination with a condensing-chamber, of a pump-cylinder through which the condensed fluid may be forced, the pump-cylinder being provided with communicating means affording communication between the interior of the condensing-chamber and the cylinder when the piston within the cylinder is at the corresponding end of its stroke, whereby fluid may pass from the condensing-chamber into the cylinder, whereupon said fluid may be forced

away upon the reverse reciprocation of the piston, a vacuum-pump in direct communication with the condensing-chamber, and a common actuating device for effecting the operation of the vacuum and fluid pumps, substantially as described.

4. In a condensing apparatus, the combination with a condensing-chamber, of a pump-cylinder through which the condensed fluid may be forced, the pump-cylinder being provided with communicating means affording communication between the interior of the condensing-chamber and the cylinder when the piston within the cylinder is at the corresponding end of its stroke, whereby fluid may pass from the condensing-chamber into the cylinder, whereupon the said fluid may be forced away upon the reverse reciprocation of the piston, a vacuum-pump having its cylinder communicating directly with the interior of the condensing-chamber, and a common actuating device for effecting the operation of the vacuum and fluid pumps, substantially as described.

5. In a condensing apparatus, the combination with a condensing-chamber, of a pump-cylinder through which the condensed fluid may be forced, the pump-cylinder being provided with communicating means affording communication between the interior of the condensing-chamber and the cylinder when the piston within the cylinder is at the corresponding end of its stroke, whereby fluid may pass from the condensing-chamber into the cylinder, whereupon the said fluid may be forced away upon the reverse reciprocation of the piston, a vacuum-pump with its cylinder projecting into the condensing-chamber, means being provided for establishing communication between the interior of the condensing-chamber and the cylinder when the piston within the cylinder is at one end of its stroke, whereby as the piston is returned the air admitted to the cylinder may be forced out, and a common actuating device for effecting the operation of the vacuum and fluid pumps, substantially as described.

6. In a condensing apparatus, the combination with a condensing-chamber, of a pump located in communication with the bottom of said condensing-chamber for withdrawing the water of condensation, and a separate vacuum-pump located at the top of said condensing-chamber for exhausting the air, and means whereby both of said pumps may be operated by the same prime mover, substantially as described.

7. A condensing apparatus provided with a condensing-chamber, a vacuum-pump having the open end of its cylinder in direct communication with the condensing-chamber, and means independent of said vacuum-pump for withdrawing condensed fluid from said condensing-chamber, substantially as described.

8. A condensing apparatus provided with a condensing-chamber, a vacuum-pump having the open end of its cylinder communicating directly with the interior of the condensing-chamber, and means independent of said vacuum-pump for withdrawing the liquid of condensation from said condensing-chamber, substantially as described.

9. A condensing apparatus provided with a condensing-chamber, a vacuum-pump in direct communication with the condensing-chamber, means independent of said vacuum-pump for effecting a withdrawal of fluid of condensation from said condensing-chamber, and a reservoir partially inclosing said vacuum-pump through which condensing liquid is adapted to pass, substantially as described.

10. A condensing apparatus provided with a condensing-chamber, a vacuum-pump having its cylinder communicating directly with the interior of the condensing-chamber, means independent of said vacuum-pump for effecting a withdrawal of fluid of condensation from said condensing-chamber, and a reservoir partially inclosing said vacuum-pump through which condensing liquid is adapted to pass, substantially as described.

11. A condensing apparatus provided with a condensing-chamber, a vacuum-pump in direct communication with the condensing-chamber, means independent of said vacuum-pump for effecting a withdrawal of fluid of condensation from said condensing-chamber, a reservoir partially inclosing said vacuum-pump through which condensing liquid is adapted to pass, and means in communication with said reservoir for spraying condensing liquid into said condensing-chamber, substantially as described.

12. A condensing apparatus provided with a condensing-chamber, a vacuum-pump having its cylinder communicating directly with the interior of the condensing-chamber, means independent of said vacuum-pump for effecting a withdrawal of fluid of condensation from said condensing-chamber, a reservoir partially inclosing said vacuum-pump through which condensing liquid is adapted to pass, and means in communication with said reservoir for spraying condensing liquid into said condensing-chamber, substantially as described.

13. In a condensing apparatus, the combination with a condensing-chamber, of pumping means located at the top of and in communication with said condensing-chamber into which air is adapted to enter which is thereafter removed therefrom through the agency of said pumping means, a pump into which liquid of condensation is adapted to enter to be thereafter removed therefrom through the agency of said pumping mechanism, and means for simultaneously operating both pumps, substantially as described.

14. In a condensing apparatus, the combination with a condensing-chamber, of a pump located at the top of and projecting into said condensing-chamber, and a piston for said pump one end of said pump-cylinder being in constant communication with the said con-

densing-chamber, the remaining end of said cylinder being adapted for periodic communication with the said condensing-chamber, substantially as described.

15. In a condensing apparatus, the combination with a condensing-chamber, of a pump located at the top of and projecting into said condensing-chamber, a piston for said pump, one end of said pump-cylinder being in constant communication with the said condensing-chamber, the remaining end of said cylinder being adapted for periodic communication with the said condensing-chamber, and pumping means for removing condensed liquid from said condensing-chamber, substantially as described.

16. The combination with a condensing-chamber, of a vacuum-pump having its cylinder projecting within the condensing-chamber, a reservoir for condensing liquid, inclosing the said vacuum-pump, means for spraying the condensing liquid into the condensing-chamber, and a pump for effecting the egress of liquid of condensation from the said condensing-chamber, substantially as described.

17. The combination with a condensing-chamber, of a vacuum-pump having its cylinder projecting within the condensing-chamber, a reservoir for condensing liquid, inclosing the said vacuum-pump, means for spraying the condensing liquid into the condensing-chamber, a pump for effecting the egress of liquid of condensation from the said condensing-chamber, and means for effecting a simultaneous operation of both pumping means, substantially as described.

In witness whereof I hereunto subscribe my name this 2d day of February, A. D. 1901.

FREDERICK SARGENT.

Witnesses:

GEORGE L. CRAGG,

HERBERT F. OBERGFELL.