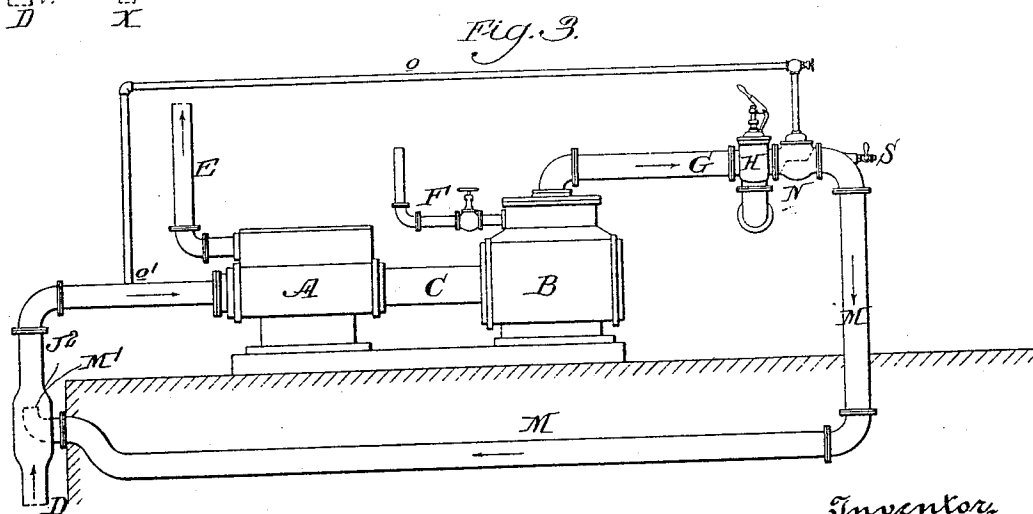
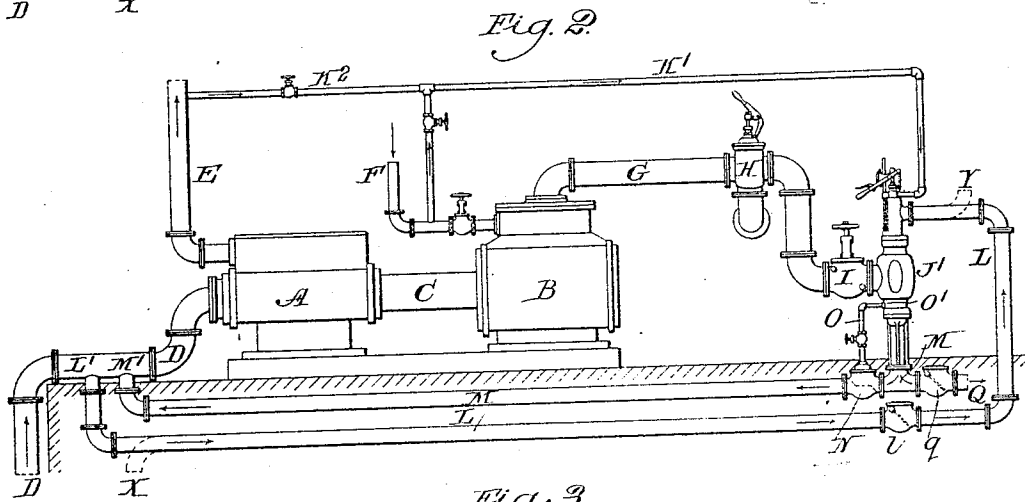
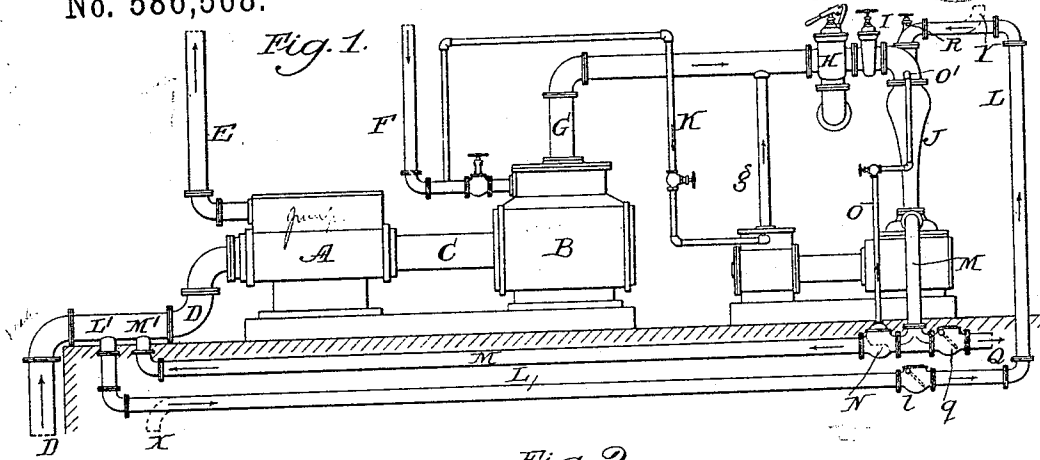


(No Model.)

L. SCHUTTE.
CONDENSER FOR PUMPS.

No. 586,568.

Patented July 20, 1897.



7684
x 7607

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33 PUMPS

DRAFTSMAN.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 6.

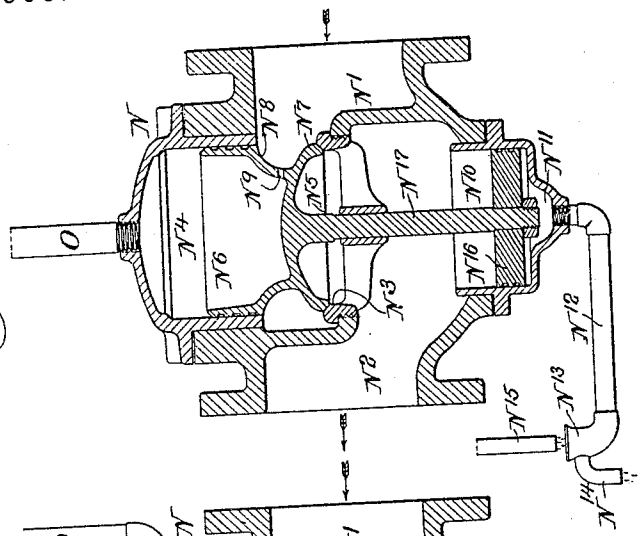


Fig. 5.

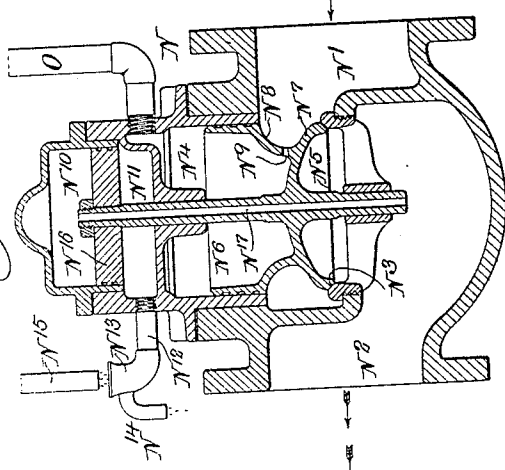
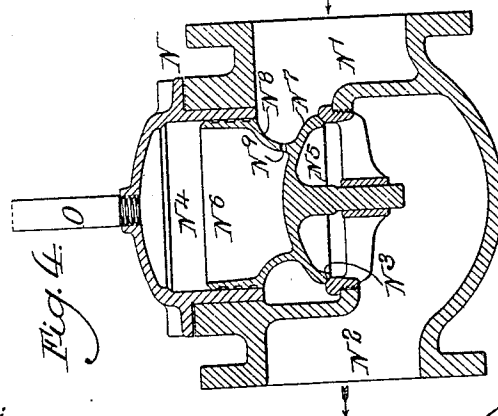


Fig. 4.



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UNITED STATES PATENT OFFICE.

LOUIS SCHUTTE, OF PHILADELPHIA, PENNSYLVANIA.

CONDENSER FOR PUMPS.

SPECIFICATION forming part of Letters Patent No. 586,568, dated July 20, 1897.

Application filed April 7, 1897. Serial No. 631,069. (No model.)

To all whom it may concern:

Be it known that I, LOUIS SCHUTTE, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Condensers for Pumps, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to the operation and construction of steam-actuated pumps, having for its object the delivery of water used in condensing the steam of the engine into the suction-pipe of the pump, and preferably also the utilization of the water passing through the suction-pump as a means for condensing the steam. The only serious difficulty met with in attempting to utilize the water passing to the pump for condensing the steam or feeding the condensing-water into the suction-pipe is the danger of permitting uncondensed steam to enter the pump, an occurrence which would not only in most cases stop the entry of water through the suction-pipe, but would also injuriously act upon the piston-packing and be apt to seriously injure the pump. Accordingly, the principal feature of my invention consists in the provision of means whereby the conduit leading from the exhaust to the suction-pipe of the pump is automatically closed upon the failure of the condensing device, whatever it may be, to condense the steam; and this, as well as the other more detailed features of my invention, will be best understood as described in connection with the drawings, in which they are illustrated, and in which—

Figure 1 is a side elevation of a pump provided with an ordinary air-pump condenser and adapted for utilizing the water in the suction-pipe of the pump for condensing purposes. Fig. 2 is a similar side elevation of a pump equipped with a jet condenser, but with other appliances substantially the same as in Fig. 1. Fig. 3 is a side elevation of a pump in which the exhaust-conduit leading from the steam-engine leads the exhaust-steam directly to the suction-pipe of the pump, a portion of which is made to serve as a condenser. Fig. 4 is a sectional view of an automatic valve adapted for use in closing the

connection between the exhaust and the suction-pipe of the pump. Fig. 5 is a view of a similar valve provided with some additional appliances which it is advisable to use under certain conditions to be explained; and Fig. 6 is a view of a valve of the same character as that shown in Fig. 5, modified somewhat in its structure, but not its principles of operation.

A is a pump-cylinder, B the steam-cylinder, and C the plunger of the pump.

D indicates the suction-conduit through which the water enters the pump-chamber A. E is the delivery-pipe of the pump.

F is the steam-conduit leading live steam to the engine-cylinder B.

G is the exhaust-steam pipe leading from the engine-cylinder B. In Figs. 1 and 2 this exhaust-steam pipe leads into the condensers, (indicated at J and J'), and through these condensers into a conduit M, which in turn leads into the suction-pipe D, as indicated at M'. In Fig. 3 the exhaust-steam conduit G connects directly with the conduit M, leading into the suction-pipe D.

H in Figs. 1, 2, and 3 indicates a valve-closed outlet leading from the exhaust-steam pipe G to the outer air or to some convenient point, said outlet being in each case situated between the engine-cylinder B and the valve-casing N, to be hereinafter described.

I, Figs. 1 and 2, indicate valves whereby the exhaust-steam conduit can be cut off from connection with the condensers.

J, Fig. 1, indicates an ordinary air-pump condenser which, as shown, is actuated by live steam drawn from the steam-pipe F through a pipe K, g indicating the exhaust-steam conduit leading from the condenser-cylinder into the exhaust-steam conduit G of the pump-engine cylinder, K' being a steam-pipe leading from the steam-pipe F to the condenser, and K² being a branch pipe connecting with the delivery-pipe E of the pump, whereby water under pressure can be delivered directly to the condenser through the pipe K'. This arrangement, it will be obvious, is a convenient one for starting the injector-condenser before its normal and intended supply of water through the pipe L is available.

L, Figs. 1 and 2, is a pipe leading from the suction-pipe D of the pump at the point L' and serving as the water-supply pipe of the condensers J and J', and M is a pipe leading, as shown in Figs. 1 and 2, from the condensers J or J' back to the suction-pipe D, as indicated at M'. As shown in Fig. 3, M connects directly with the exhaust-steam pipe G and leads to the suction-pipe D and into a portion J² of the said suction-pipe which, for reasons to be explained, must be below the actual level of the top of the suction-pipe.

In Figs. 1 and 2 I have indicated at Y that in place of connecting the pipe L with the suction-pipe it may be connected with a head of water, which causes the condensing-water to flow into the condensers by gravity, and I have also indicated in dotted lines at X that instead of being connected with the suction-pipe the pipe L may lead to the same source of supply that the suction-pipe leads from, but without connecting with the suction-pipe. This latter arrangement would be most available when the height to which the water is raised through the pipe D is comparatively small.

N indicates the valve-casing of my automatic valve for closing the connection between the exhaust of the pump-engine and the suction-pipe of the pump, O in Figs. 1 and 2 indicating a pipe leading from a point O' in the condenser to the said casing and serving to maintain within a portion of the same, to be hereinafter described, the steam-vacuum that exists in the condenser. In Fig. 3 a pipe o serves the same purpose, leading, as shown, from a point in the suction-pipe D at a higher level than the point M', where the conduit M enters the suction-pipe.

Q indicates a branch or by-pass extending out from the pipe M and through which water or steam can flow when the automatic valve at N is closed, q indicating the valve situated in the said branch.

R, Fig. 1, indicates a regulating device for controlling the flow of water to the condenser.

S, Fig. 3, is an air-cock by which air can be admitted to the pipe M when desired.

My preferred construction of the automatic valve is illustrated in Figs. 4, 5, and 6, in which N indicates the valve-casing having an inlet-passage N', outlet-passage N², and valve-seat N³, situated between these passages. There is also formed above the valve-seat N³ a piston-chamber N⁴, which communicates by a pipe O or, as shown in Fig. 3, o, with the condenser. N⁵ is the valve which, when seated at N³, closes the conduit. Attached to this valve is a piston N⁶, fitting and working in the cylinder N⁴, and by means of shoulders N⁷ and N⁸ the balance of the valve, with regard to pressure entering the valve-chamber N, is adjusted to the desired extent, which, as those skilled in the art will understand, will vary somewhat under different conditions. The fit between the piston N⁶ and the cylinder N⁴

is preferably not a tight one, but loose enough to permit some escape of water or steam between the piston and cylinder, and to further facilitate the entry of water or steam into the piston-chamber N⁴, I prefer to form a small orifice, as indicated at N⁹, through the piston N⁶ or its extension.

Without further describing for the present the additional appliances shown in Figs. 5 and 6 of the drawings, it will be obvious that the opening and closing of the valve N⁵ will, in each of the arrangements shown in Figs. 1, 2, and 3, be dependent upon the vacuum communicated to the chamber N⁴ through the pipe O or o. Thus when the condensers J or J' are working efficiently and with their normal vacuum the valve N⁵ will be drawn up and the water will pass into the pipe M, which constitutes what is in ordinary condensers called the "waste-water" pipe, though by my arrangement the water no longer goes to waste, but is fed into the suction-pipe of the pump. When, on the other hand, the condensers J or J' cease to work properly and the vacuum within them falls, the valve N⁵ will close, preventing the escape of steam into the pipe M and through it into the suction-pipe of the pump. In this case the waste water and steam may open the valve q and escape through the pipe Q, or the exhaust-steam may escape through the pipe indicated at H.

In the construction shown in Fig. 3 the normal vacuum communicated through the pipe o to the cylinder N⁴ will be that due to the difference in elevation of the point o' with which the vacuum-pipe o communicates with the suction-pipe and the point M' at which the pipe M communicates with the suction-pipe, the part J² of the suction-pipe serving as a condenser. The apparatus will obviously work efficiently so long as the steam is properly condensed on entering the suction-pipe. If, however, the condensation of the steam is not perfect, there will immediately be a drop of the water in the suction-pipe D below the point M', whereupon the pressure transmitted through pipe o and that existing in pipe M will be equal and the valve N⁵ will immediately close.

While referring to the construction shown in Fig. 3 it will be seen that when the pump is stopped the condensation of the steam in the pipe M may very well result in the said pipe being filled with water up to the level of the valve-casing N, which, the pump being again started, would result in an abnormal downward pull tending to hold the valve N⁵ to its seat. To avoid this, I provide the air-cock S, by which under the conditions mentioned air may be admitted to the pipe M, permitting the water-level to fall to the level of the point M'.

The construction of the automatic valve, as illustrated in Fig. 4 and above described, will in most cases be entirely efficient. Where, however, the pump-suction is very high, it may sometimes exceed the vacuum in the con-

denser, a difficulty which could be provided against by a special balance of the valve, but which, as it is desirable that these valves should be made in quantity and for use on pumps differently situated, I prefer to obviate in the manner shown in Figs. 5 and 6—that is to say, by providing in or in connection with the casing N an additional piston-chamber N¹⁰, having a portion N¹¹ open to the atmosphere preferably through a water-trap pipe N¹². The turned-up end N¹³ of this pipe I prefer to make open at the top and to lead into a water-pipe N¹⁵, a spout N¹⁴ being provided for the water to run out of. In the cylinder N¹⁰, I place a piston N¹⁶, which by a rod or stem N¹⁷ is connected with the valve N⁵. It is immaterial in what physical position with reference to the valve N⁵ the cylinder N¹⁰ may be placed. It may be above the valve, as shown in Fig. 5, or below it, as shown in Fig. 6, but in all cases provision must be made for a connection between the delivery side N² of the valve-casing N and the cylinder N¹⁰ and in such a way that the suction exerted by the column of water in the suction-pipe of the pump shall act upon the piston N¹⁶ in the opposite direction to that in which it acts upon the valve N⁵. It will be obvious that by such a balancing piston as N¹⁶ the net result or effect of the suction in the suction-pipe of the pump upon the valve N⁵ may be made as little as desired.

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

1. In combination with a pump actuated by a steam-engine and having a suction-pipe, a conduit leading from the steam-exhaust of the steam-engine to the suction-pipe, a valve situated in said conduit, a condenser arranged to utilize the water passing through the suction-pipe and means for actuating the valve aforesaid controlled by the vacuum in said condenser, all substantially as specified, and so as to close the valve when the vacuum in the condenser falls below a determined point.

2. In combination with a pump actuated by a steam-engine and having a suction-pipe, a condenser connected to the exhaust of the steam-engine, a waste-water conduit leading from the condenser to the suction-pipe of the pump, a valve situated in said waste-water conduit and means for actuating said valve controlled by the vacuum in the condenser, substantially as specified.

3. In combination with a pump actuated by a steam-engine and having a suction-pipe, a condenser connected to the exhaust of the steam-engine, a water-supply pipe leading from the suction-pipe to the condenser, a waste-water conduit leading from the condenser to the suction-pipe of the pump, a valve situated in said waste-water conduit

and means for actuating said valve controlled by the vacuum in the condenser substantially as specified.

4. In combination with a pump actuated by a steam-engine and having a suction-pipe, a condenser connected to the exhaust of the steam-engine, a waste-water conduit leading from the condenser to the suction-pipe of the pump and having a branch as Q, a valve situated in said waste-water conduit, means for actuating said valve controlled by the vacuum in the condenser and a valve as q situated in branch Q, substantially as specified.

5. In combination with a pump actuated by a steam-engine and having a suction-pipe, a conduit leading from the steam-exhaust of said engine to the suction-pipe, a condenser arranged to utilize the water passing through the suction-pipe, a valve-casing N interposed in the conduit leading from the exhaust and embracing the valve-seat N³ and cylinder N⁴, a valve N⁵ situated in casing N and having attached to it a piston N⁶ working in cylinder N⁴ and a pipe connecting cylinder N⁴ and the condenser whereby the vacuum in the condenser will be maintained in said cylinder.

6. In combination with a pump actuated by a steam-engine and having a suction-pipe, a conduit leading from the steam-exhaust of said engine to the suction-pipe, a condenser arranged to utilize the water passing through the suction-pipe, a valve-casing N interposed in the conduit leading from the exhaust and embracing the valve-seat N³, cylinder N⁴ and cylinder N¹⁰, a valve N⁵ situated in casing N and having attached to it a piston N⁶ working in cylinder N⁴ and a piston N¹⁶, a pipe connecting cylinder N⁴ and the condenser whereby the vacuum in the condenser will be maintained in said cylinder and a pipe N¹² connecting cylinder N¹⁰ with the outer air.

7. In combination with a pump actuated by a steam-engine and having a suction-pipe, a conduit leading from the steam-exhaust of said engine to the suction-pipe, a condenser arranged to utilize the water passing through the suction-pipe, a valve-casing N interposed in the conduit leading from the exhaust and embracing the valve-seat N³, cylinder N⁴, and cylinder N¹⁰, a valve N⁵ situated in casing N and having attached to it a piston N⁶ working in cylinder N⁴, and a piston N¹⁶ working in cylinder N¹⁰, a pipe connecting cylinder N⁴ and the condenser whereby the vacuum in the condenser will be maintained in said cylinder and a pipe N¹² connecting cylinder N¹⁰ with the outer air and having a water seal.

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