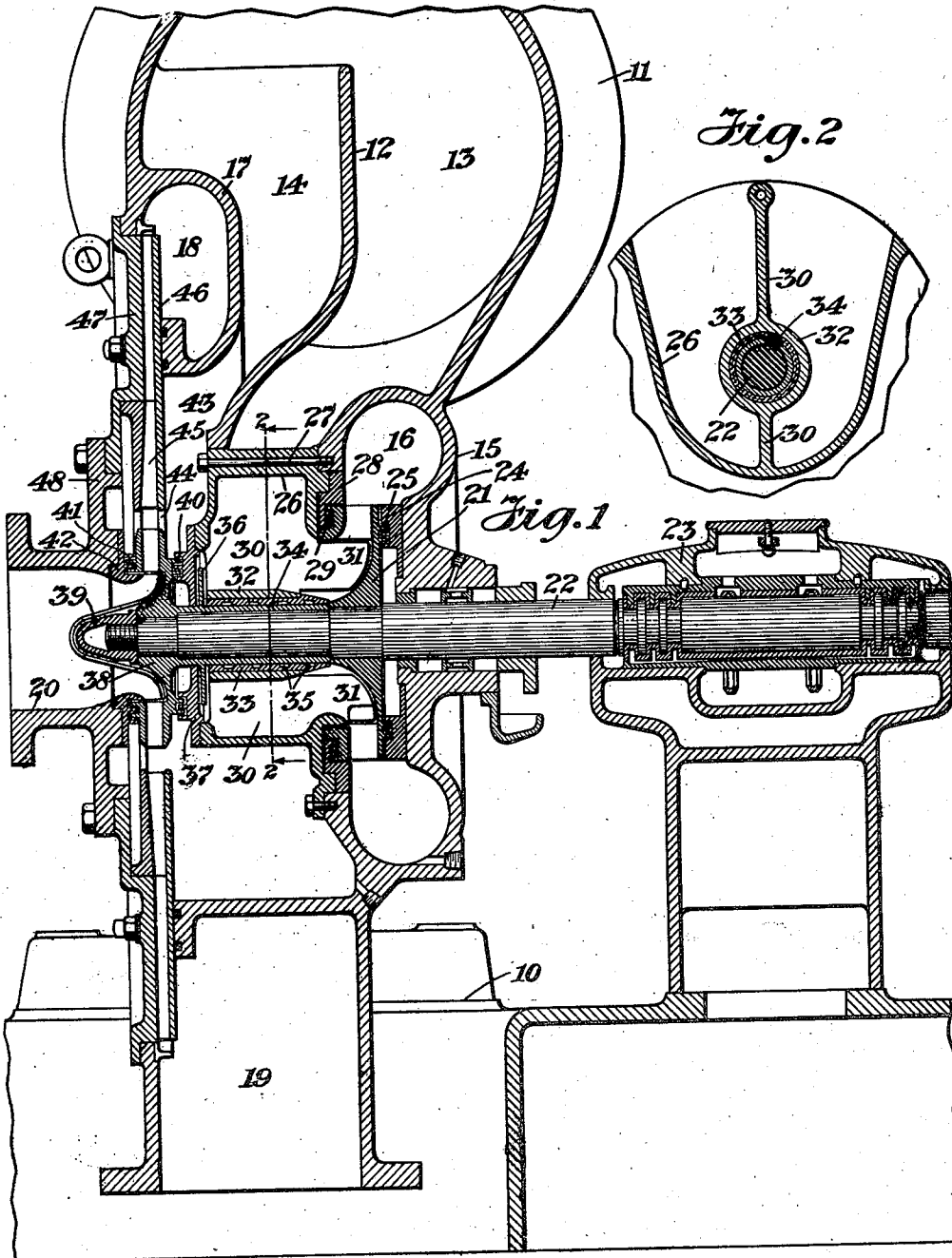


J. J. BROWN.
AIR PUMP.
APPLICATION FILED MAY 22, 1915.

Patented May 30, 1916.
2 SHEETS—SHEET 1.

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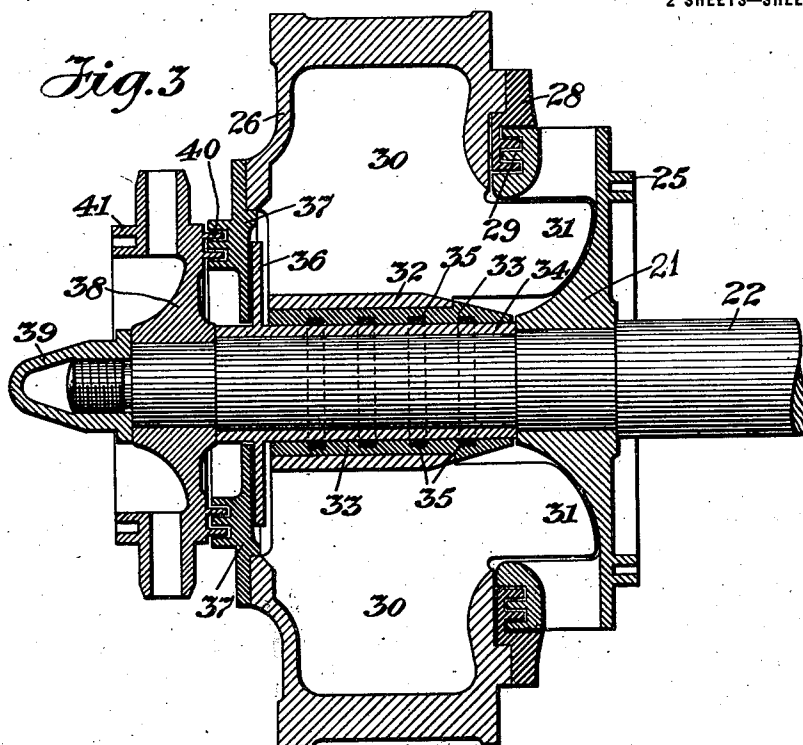
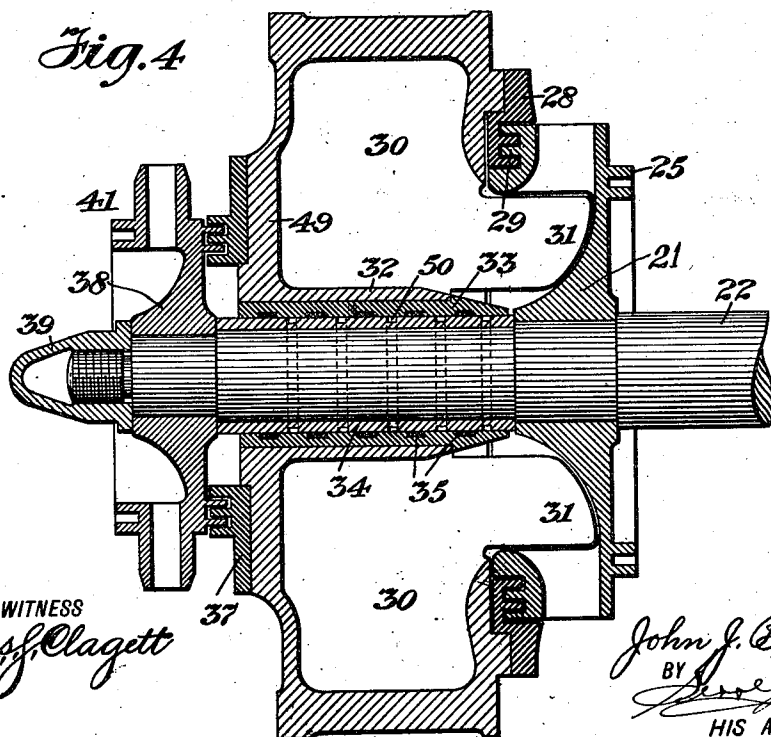


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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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AIR-PUMP.

1,185,286.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN J. BROWN, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Air-Pumps, of which the following is a specification.

My present invention relates to combined air and condensate pumps, and particularly to that class of this type of pump in which the condensate and air or non-condensable vapors from a steam engine, or elsewhere, are delivered together to the pump, being separated therein and the condensate discharged by one means and the non-condensable vapors by another.

So far as I am aware, in pumps of this type, as heretofore constructed, no adequate means have been provided for preventing the condensate from leaking from the receptacle in which it is received in the pump into the chamber provided for the non-condensable vapors. These conditions, it has been found, result in considerable loss of the condensate, that portion of the same which leaks to the non-condensable vapor chamber, being discharged therefrom with the non-condensable vapors and the hurling water, which, as will be understood, is undesirable.

The object of my present invention, therefore, is the provision in a pump of this type of a suitable means for preventing the leakage of the condensate to the non-condensable vapor chamber, as well as to provide a means for suitably journaling the end of the pump shaft within the same, and the pump constructed in accordance with my present invention will be hereinafter more particularly described.

In the drawing, Figure 1 is a central vertical cross section of a pump embodying my present invention. Fig. 2 is a transverse section on line 2—2, Fig. 1, of the hot-well employed in this pump. Fig. 3 is a central vertical cross section on an enlarged scale illustrating the construction of this hot-well and the parts which more particularly comprise my present invention, and Fig. 4 is a view similar to Fig. 3, illustrating a modified form of the invention.

Referring to the drawing, and particularly to Figs. 1, 2, and 3, my improved pump comprises a base 10 and a pump casing 11 mounted thereon, which preferably com-

prises an inlet connection 11 interiorly provided with a baffle or partition wall 12 dividing the interior of the connection into a chamber 13 for the condensate and a chamber 14 for the non-condensable vapors; and also a wall 15 inclosing the condensate discharge chamber 16; a wall 17 inclosing the discharge chamber 18 for the non-condensable vapors and hurling water, which chamber is connected to a discharge 19; and a hurling water inlet, which is represented at 20. As is usual, the pump also includes a condensate impeller 21, fixed on a shaft 22, and adapted to revolve by the turning thereof, to discharge the condensate into the chamber 16.

Exteriorly of the pump, the shaft 22 is journaled in a suitable bearing 23, and within the pump the otherwise free end of the shaft is also journaled in a bearing, as will be hereinafter described, to prevent the otherwise lateral thrust or whip action thereof.

Within the pump casing, and adjacent the right-hand side of the impeller 21, as shown in Fig. 1, I employ a ring member 24 provided with circular grooves adapted to receive the circular ribs 25 provided on the face of the impeller to form a suitable water-sealed joint.

26 represents a hot-well casing, which interiorly thereof is secured to the pump casing by bolts 27, or otherwise, and suitably secured to the right-hand face of the hot-well casing, as indicated in Fig. 1, there is a ring member 28, also provided with circular recesses to receive the circular ribs 29 on the opposite face of the impeller 21, to provide a suitable water-sealed joint on this side thereof. Interiorly, the hot-well casing 26, as indicated in these figures, is preferably provided with a vertical partition wall, indicated at 30, provided on one side with projections 31, extending into the open side of the impeller 21, thereby assisting in directing the condensate to the passages of the impeller.

Made integral with the vertical partition wall 30 is a hub 32 adapted to act as a journal for the free end of the shaft 22, the shaft within the hot-well being provided with a spacer or bushing 34 and a sleeve 33. The sleeve 33 is made fast to the hub 32 by a set screw not shown, or otherwise, and the bushing or spacer 34 is keyed or other-

wise made fast to the shaft 22, so that the bushing turns within the sleeve 33, which latter, as indicated in Figs. 1 and 3, may be provided with recesses 35 to receive
5 graphite or other suitable lubricating material.

Suitably connected to the spacer or bushing 34 I employ a disk 36. As shown in the drawing, this disk is made integral with
10 the bushing, although, as will be understood, it may be made separate and suitably secured thereto.

The disk 36 lies immediately within the hot-well or cover 37 on the side opposite
15 the condensate impeller 21, and as will be readily appreciated, this disk revolves with the shaft and spacer or bushing, and in so doing creates a head within the hot-well, depending of course upon the diameter of
20 the disk and the velocity of its revolution, but in all events, in practice, the diameter and the speed of the disk are such that the head created thereby will cause a pressure greater than that due to the static head of
25 the water in the hot-well, and this prevents the water or condensate in the hot-well from leaking therefrom to the space or chamber for the non-condensable vapors and being discharged therefrom by the hurling
30 water. Also as will be understood, the bearing comprising the hub 32 and sleeve 33 within the hot-well maintain the otherwise free end of the shaft in alinement, thereby preventing any lateral thrust or whip action thereof when revolving at high speeds.
35

On the free end of the shaft is the hydraulic impeller 38. This is secured in place by a nut 39, or otherwise, and as is indicated in Fig. 1, the outer surface of the
40 hot-well cover 37 is provided with series of circular recesses to receive circular ribs 40 on the adjacent side of the hydraulic impeller 38 to form a water-sealed joint between the same, and similarly and for the
45 same purpose the corresponding ribs 41, on the other side of the hydraulic impeller, revolve in recesses provided therefor in the ring member 42.

The air or condensate chamber 14 communicates with a chamber 43 adjacent the central portion of the pump and this communicates with the annular space 44, between the periphery of the hydraulic impeller 38 and the adjacent inlet portion of the diffuser 46, in which, as is customary, there are
55 passages 45 in which the air from the annular space 44 is entrapped by the hurling water, as the same is discharged from the hydraulic impeller into the passages in the
60 diffuser.

47 designates the pump cover and 48 the cap in which, as illustrated, the inlet 20 for the hurling water is connected.

In the use of this pump, the combined
65 condensate and non-condensable vapors are

discharged from an engine exhaust or elsewhere, to the connection 11, in which they are separated by the baffle or partition wall 12, and the condensate passed to the hot-well, from which it is delivered by the condensate impeller 21, while the non-condensable vapors pass from the chamber 14 to the annular space 44 and are carried through the passages in the diffuser, together with the hurling water and delivered
75 to the chamber 18, from which they are discharged by way of the discharge connection 19, it being apparent that due to the head created by the revolution of the disk 36, it will be impossible in the operation of the
80 pump for the condensate to pass from the hot-well to the chamber 43, and from thence to be discharged with the non-condensable vapors and the hurling water.

By reference to Fig. 4, it will be seen that
85 instead of employing the disk 36, as hereinbefore described, in connection with the preferred form of the invention, the wall of the hot-well opposite the condensate impeller may be made solid, as indicated at 49
90 and the hub 32 made integral therewith, which of course will accomplish the same purpose as the use of the disk 36.

In this construction, as is also indicated in Fig. 4, the spacer or bushing 34, which
95 extends between the condensate impeller 21 and the hydraulic impeller 38 may be provided in its outer surface with suitable circumferential recesses 50, which make a water-sealed joint between the spacer and
100 bushing and the sleeve. Furthermore, it will be understood that this spacer or bushing may be dispensed with, in which event, to obtain the water-sealed joint, the circumferential grooves may be provided in the
105 shaft itself.

I claim as my invention.

1. In a hydraulic air pump, a casing, an intake for the condensate and non-condensable vapors, a chamber for the non-condensable vapors, means for discharging the non-condensable vapors, a receptacle for the condensate, means for discharging the condensate from one end of the receptacle therefor, and means separate and distinct from the
115 last aforesaid means at the other end of the condensate receptacle for preventing the condensate therein from leaking to the chamber for the non-condensable vapors.

2. In a hydraulic air pump, a casing, an intake for the combined condensate and non-condensable vapors, a partition wall in the said intake for separating the condensate from the non-condensable vapors, means whereby the non-condensable vapors are discharged, a receptacle for the condensate, means for discharging the condensate at one end of the receptacle, and means separate and distinct from the last aforesaid means
125 at the other end of the condensate receptacle

for preventing the condensate from leaking into the chamber for the non-condensable vapors.

3. In a hydraulic air pump, a casing, an intake for the combined condensate and non-condensable vapors, means within the intake for separating the condensate from the non-condensable vapors, a chamber for the non-condensable vapors, means whereby the non-condensable vapors are discharged, a hot well for receiving the condensate, an impeller at one end of the said hot well for discharging the condensate therefrom, and means separate and distinct from the said impeller at the other end of the said hot well for preventing the condensate from leaking from said hot well into the chamber for the non-condensable vapors.

4. In a hydraulic air pump, a casing, an intake for combined condensate and non-condensable vapors, means within the intake for separating the condensate from the non-condensable vapors, a chamber for the non-condensable vapors, means whereby the non-condensable vapors are discharged, a hot well for receiving the condensate, a wall dividing the hot well into two compartments, a bearing in the said wall, a shaft journaled in said bearing, means mounted on the shaft at one side of the said wall for discharging the condensate from the hot well, and means mounted on the said shaft at the other side of the said wall for preventing the condensate in the hot well from leaking into the chamber for the non-condensable vapors.

5. In a hydraulic air pump, a casing, an intake for the combined condensate and non-condensable vapors, a baffle within the intake for separating the condensate from the non-condensable vapors, a hot-well, a shaft, means operated by the shaft for discharging the condensate from the hot-well, a chamber for the non-condensable vapors, means actuated by the shaft for hurling water to withdraw the non-condensable vapors from the said chamber, a spacer bushing on the said shaft, a cover for the said hot-well, and a disk revoluble with the said shaft and bushing and lying adjacent the said cover within

the hot-well for preventing the condensate from leaking from the hot-well to the chamber for the non-condensable vapors.

6. In a hydraulic air pump, a casing, an intake for the combined condensate and non-condensable vapors, a baffle within the intake for separating the condensate from the non-condensable vapors, a hot-well in which the condensate is received from the said intake, a shaft, an impeller thereon for discharging the condensate from the hot-well, a chamber for the non-condensable vapors, a diffuser having passages therein, a hydraulic impeller on the said shaft for hurling water through the space between its periphery and the said diffuser, a cover for the said hot-well, a spacer bushing on the said shaft extending between the said impellers, and a disk revoluble with the said spacer bushing and lying adjacent the inner surface of the said hot-well cover to prevent the condensate in the hot-well from leaking therefrom to the chamber for the non-condensable vapors.

7. In a hydraulic air pump, a casing, an intake for the combined condensate and non-condensable vapors, a baffle within the intake for separating the condensate from the non-condensable vapors, a hot-well, in which the condensate is received from the said intake, a shaft, an impeller thereon for discharging the condensate from the hot-well, a chamber for the non-condensable vapors, a diffuser having passages therein, a hydraulic impeller on the said shaft for hurling water through the space between its periphery and the said diffuser, a cover for the said hot-well, a spacer bushing on the said shaft extending between the said impellers, a disk revoluble with the said spacer bushing and lying adjacent the inner surface of the said hot-well cover to prevent the condensate in the hot-well from leaking therefrom to the chamber for the non-condensable vapors, and a bearing associated with the said hot-well and in which the end of the said shaft is journaled.

Signed by me this 20th day of May, 1915.
JNO. J. BROWN.