O. S. SLEEPER.

DISCHARGE VALVE.

APPLICATION FILED JULY 20, 1907.

919,787.

Patented Apr. 27, 1909.

3 SHEETS—SHEET 1.

Fig. 1.

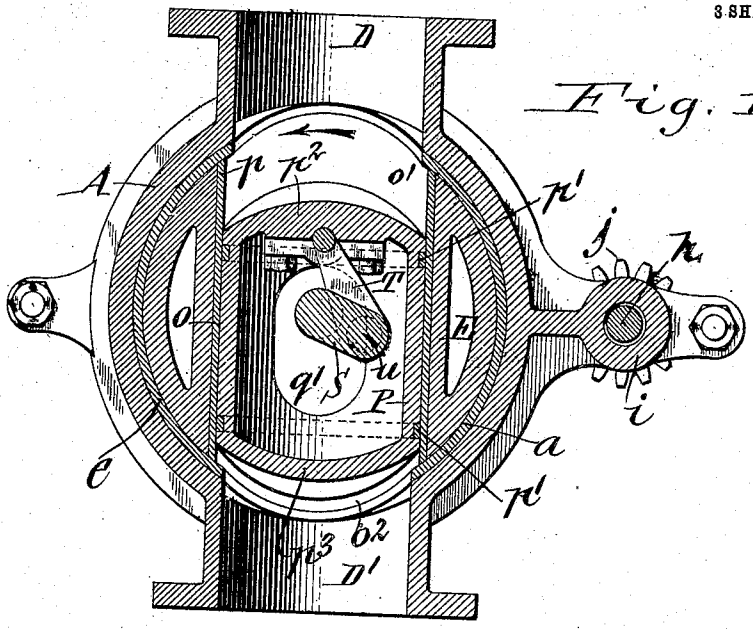
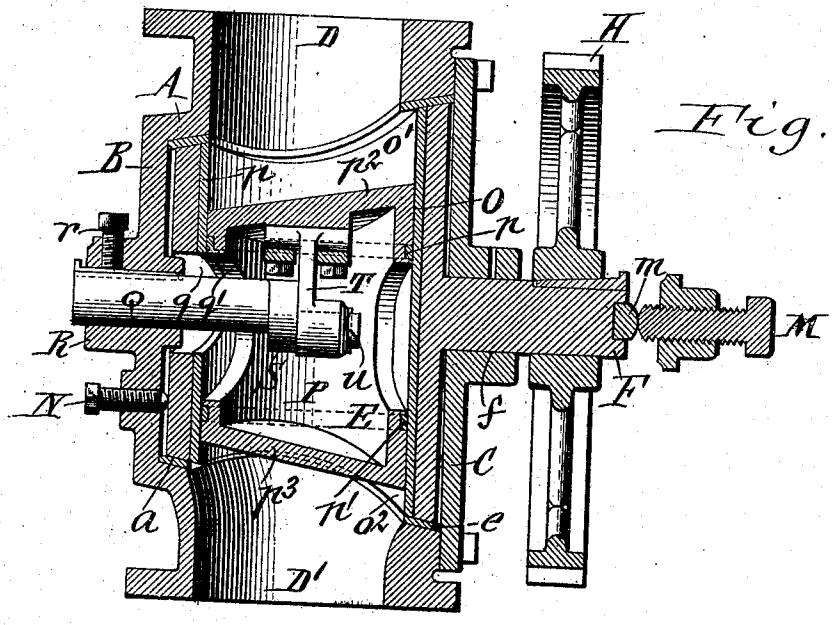


Fig. 2.



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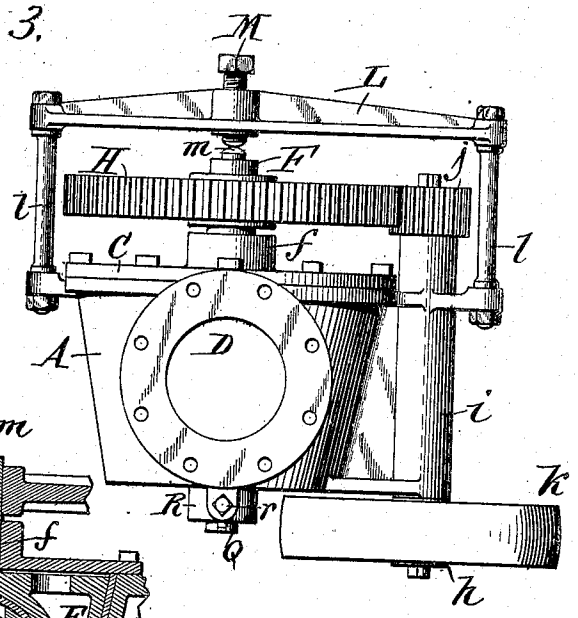
3 SHEETS—SHEET 2.

Fig. 3.



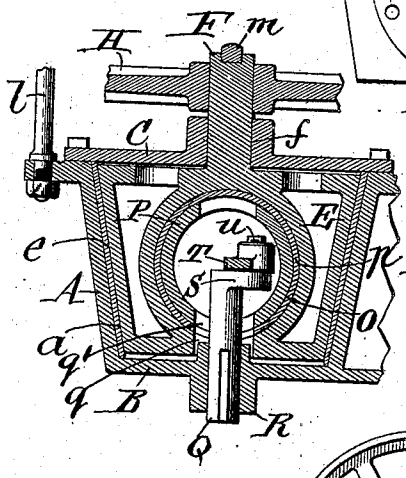
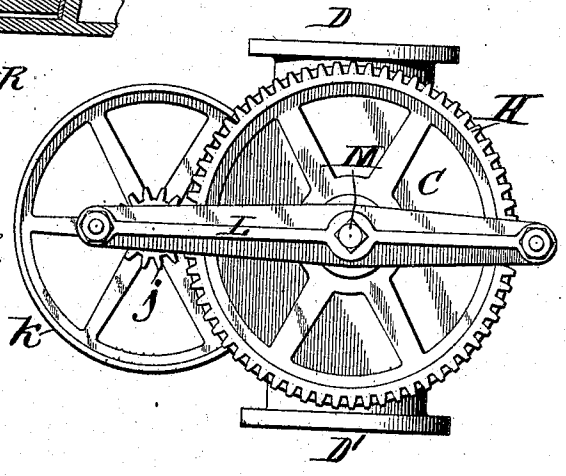


Fig. 4.

Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 6.

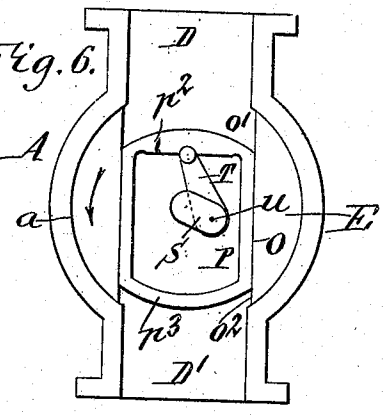


Fig. 9.

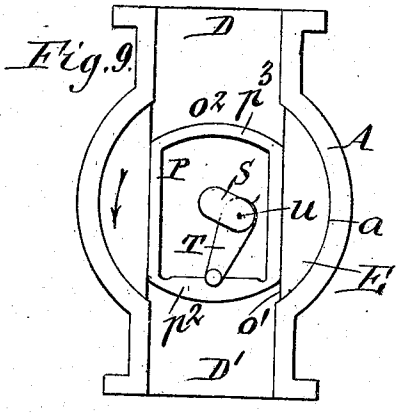


Fig. 7.

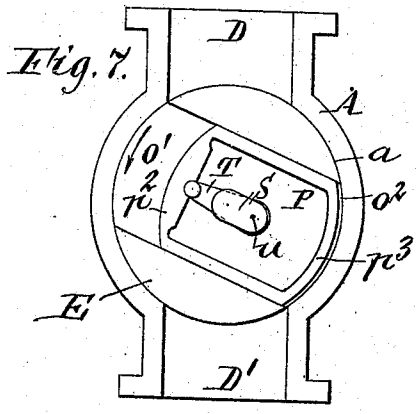


Fig. 10.

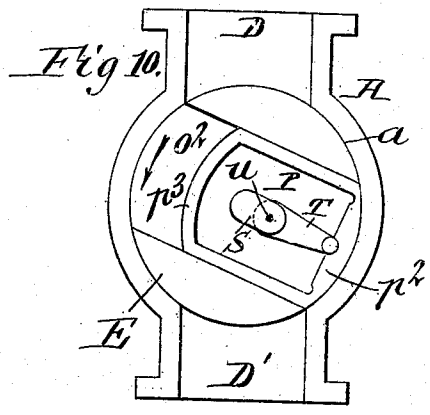


Fig. 8.

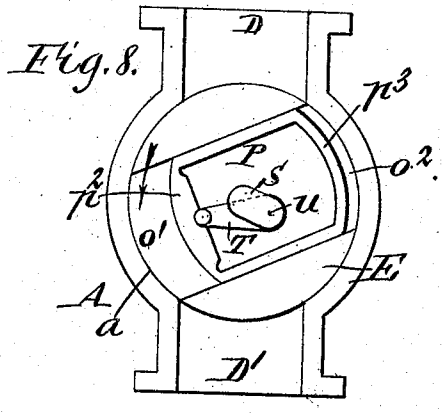
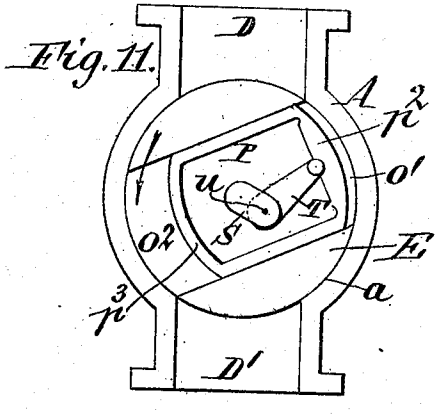


Fig. 11.



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UNITED STATES PATENT OFFICE.

OLIVER S. SLEEPER, OF BUFFALO, NEW YORK, ASSIGNOR TO BUFFALO FOUNDRY COMPANY, OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

DISCHARGE-VALVE.

No. 919,787. Specification of Letters Patent. Patented April 27, 1909.

Application filed July 20, 1907. Serial No. 384,744.

To all whom it may concern:

Be it known that I, OLIVER S. SLEEPER, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Discharge-Valves, of which the following is a specification.

This invention relates to a discharge valve which is more particularly designed for use on the outlet of vacuum apparatus in which it is necessary to prevent the admission of air into the vacuum space while the vapors are being removed from the substance under treatment and the dried material is being removed from the vacuum space against atmospheric pressure.

The object of this invention is the provision of a valve of this character which is positive and reliable in its action, simple and durable in construction and not liable to leak or get out of order.

In the accompanying drawings consisting of 3 sheets: Figure 1 is a vertical section of my improved vacuum discharge valve. Fig. 2 is a similar section taken at right angles to Fig. 1. Fig. 3 is a top plan view of the valve, on a reduced scale. Fig. 4 is a fragmentary horizontal section, on a reduced scale, taken in line 4—4, Fig. 1. Fig. 5 is an end elevation of the valve. Figs. 6, 7, 8, 9, 10 and 11 are diagrammatic views showing different positions of the plug and piston of the valve when in operation.

Similar letters of reference indicate corresponding parts throughout the several views.

A represents the body or casing of the valve the seat *a* of which is preferably conical and arranged with its axis horizontal. At the small end of the valve seat the casing is closed by a fixed head B and at the large end thereof the same is closed by a removable head C. At its top and bottom the casing is provided with inlet and outlet nipples or branches D, D^1 respectively which communicate with diametrically opposite sides of the valve seat.

E represents a conical valve plug which is rotatable in a vertical position about a horizontal axis within the seat of the valve casing, a self lubricating bushing *e* being preferably interposed between these parts, as shown in the drawings. At its large end the plug is provided with an outwardly projecting stem or shank F which is journaled in a bearing *f* formed on the adjacent removable head of the valve casing. This stem together with the valve plug attached thereto may be rotated by any suitable means, that shown in the drawings being suitable for this purpose and consisting of a gear wheel H secured to the outer end of the valve stem, a driving shaft *h* journaled parallel with the axis of the plug in a bearing *i* on the outer side of the casing, a pinion *j* arranged on one end of the driving shaft and meshing with the gear wheel H, and a pulley *k* arranged on the opposite end of the driving shaft and adapted to receive a driving belt.

The plug of the valve is held with its periphery in proper engagement with the bore of the valve seat so as to form an air tight joint between the same by means of a cross bar, or bridge L arranged transversely at the outer end of the valve stem, longitudinal stay or tie bars *l*, *l* connecting opposite ends of the cross bar with the valve casing and an end bearing screw M arranged in the cross bar and bearing against a wearing piece *m* at the outer end of the valve stem. The screw M should be tightened only so much as will produce a reliable contact.

The inward movement of the valve plug toward the small end of the valve seat under the action of the screw M is preferably limited by an adjustable abutment screw N arranged in the fixed head of the casing parallel with the axis of the valve plug and adapted to be engaged at its inner end by the small end of the plug. By turning this screw forwardly or backwardly the same serves as an adjustable stop which limits the extent of the inward movement of the plug thereby enabling the frictional contact between the plug and its seat to be regulated so as to prevent these parts from binding on each other. The screw N is also utilized for removing the plug from its seat when it is desired to dismember the valve for repairs or inspection. When thus used the detachable head of the casing is first removed and then the screw N is turned forwardly, causing the valve plug to be drifted or ejected axially out of its seat.

In the central part of the valve plug and extending diametrically therethrough in line with the inlet and outlet nipples of the casing is a cylindrical chamber or opening O of substantially the same diameter as said nipples.

Reciprocating within said chamber transversely to the axis of rotation is a hollow

cylindrical piston P. The latter is of less length than the chamber and has its opposite ends rounded and tapered so that when the same is moved to its extreme position in either direction the respective end of the piston will be flush with and practically forms a continuation of the peripheral surface of the plug. As the piston reciprocates it retracts from opposite sides of the plug and forms pockets or cavities o^1, o^2 at opposite ends of the chamber. The bore of the chamber preferably has a self lubricating lining or bushing p and the piston is provided on its periphery with packing rings p^1. Various means may be employed for effecting the reciprocating movement of the piston within the chamber that shown in the drawings, as an example, being constructed as follows:

Q represents an arbor arranged axially in line with the valve plug and stem and with its central part in coinciding openings q, q^1 formed in the small end of the plug and the adjacent part of the piston while its inner end is arranged within the piston and its outer end is secured in a socket R on the adjacent fixed head of the casing by a set screw r. At its inner end the arbor is provided with a laterally projecting crank or arm S.

T represents a link or connecting rod arranged within the piston and pivotally connected at one end with the head p^2 of the piston while its opposite end is connected with the crank arm S. The axis u of the pivotal connection between the crank arm and link is arranged on one side of or eccentrically relatively to the arbor and the axis of rotation of the valve plug.

The arrangement of the pivotal connection u relatively to the direction of rotation of the valve plug is such that a line drawn from this pivot to the axis of the plug forms an obtuse angle with a line drawn from the axis of the plug through the inlet nipple of the casing. Owing to this eccentric connection between the piston and the valve plug the piston is caused to be reciprocated in the pocket of the plug during the rotary movement of the latter and alternately moved into each end of the pocket and withdrawn therefrom, thereby permitting material to alternately enter each pocket of the chamber upon passing the inlet or supply nipple and then to be ejected therefrom upon passing the outlet nipple.

Assuming that the inlet nipple of the casing is connected with the outlet of a vacuum drying apparatus and that the plug rotates in the direction of the arrow the operation of the valve is as follows: In the position of the parts shown in Figs. 1, 2 and 6, the pocket o^1 adjacent to the attached end p^2 of the piston is uppermost and communicates fully with the inlet of the valve casing. The link T at this time is partly folded and stands at an acute angle relatively to the crank, whereby the attached end of the piston is drawn partly into the respective end of the chamber and forms a pocket cavity therein. The material which is being dried in the vacuum apparatus drops from the outlet thereof through the inlet nipple of the casing into the pocket o^1. As the plug turns forward until the rear or trailing edge of the pocket o^1 meets the left wall of the inlet nipple as shown in Fig. 7, the link is in line with and in a fully folded position relatively to the crank, thereby retracting the piston to its fullest extent and at the same time cutting off the further admission of material into the respective pocket o^1. This pocket remains closed until the front or advancing edge of the same reaches the left wall of the outlet nipple, as shown in Fig. 8, during which time the link unfolds partly and moves the piston toward the side of the plug through which the pocket o^1 opens. As the plug continues to turn in this direction the pocket o^1 is gradually uncovered until it reaches its central position relatively to the outlet nipple of the casing at which time it is fully uncovered, as shown in Fig. 9. During the continued movement of the plug the rear edge of the pocket o^1 meets the right side wall of the outlet nipple, thereby cutting off this pocket from the outlet nipple, as shown in Fig. 10. The material in the pocket o^1 is discharged through the outlet nipple of the casing while these spaces are in communication in the manner described. From the time the rear edge of the pocket o^1 meets the left side of the inlet nipple, as shown in Fig. 6 to the time this edge of said pocket meets the right side wall of the outlet nipple, as shown in Fig. 10, the link T moves from its completely folded position to its completely unfolded position, causing the piston to move outwardly in the pocket o^1 and eject such material therefrom into the outlet nipple which has not already been discharged by gravity. After communication between the pocket o^1 and the outlet nipple has been thus cut off this pocket remains closed until the plug has turned forward sufficiently to bring the front edge of this pocket to the right wall of the inlet nipple, as shown in Fig. 11. This pocket thereafter is placed in communication with the inlet nipple until the rear edge of the same reaches the left wall of the inlet nipple, as shown in Fig. 7, thereby permitting the material from the vacuum apparatus to enter the respective end of the pocket o^1 in the manner previously described. As the plug turns from the position in which the pocket o^1 is cut off from the outlet, to the position in which the same is placed in communication with the inlet nipple, and then cut off again from the latter, the link is moved from its fully straightened or unfolded position to its fully folded position, thereby fully retracting the piston from that side

of the plug through which the pocket o^1 opens and permitting the same to receive material from the inlet nipple. The other pocket o^2 of the plug is in like manner presented alternately to the inlet and outlet of the valve case to admit the material and discharge the same therefrom and during the reciprocating of the piston its opposite head p^3 is retracted in the pocket o^2 while the latter is opposite the inlet nipple and projected while the same is opposite the outlet nipple so that the material is alternately admitted into the pocket o^2 and ejected therefrom.

While each pocket is closed by the valve seat and the respective end of the piston is retracting a vacuum is produced in the respective pocket which causes the same to become filled quickly with material the instant this pocket reaches the inlet nipple and while each pocket is closed by the valve seat during the projecting movement of the respective end of the piston the contents of this pocket is compressed and caused to be quickly ejected therefrom the instant this pocket reaches the outlet nipples.

It will be noted that during the operation of the valve the material is delivered from the vacuum apparatus without permitting any external air to enter the apparatus through the valves, thereby enabling the maximum efficiency of the vacuum apparatus to be obtained.

I claim as my invention:

1. A valve comprising a casing having an inlet and an outlet, a plug rotatable in said casing and having a chamber extending through the same, means for rotating said plug a piston reciprocating in said chamber, a support and a link pivotally connected at one end with the piston while its opposite end is pivoted on said support on one side of the axis of the plug, substantially as set forth.

2. A discharge valve comprising a casing having an inlet and an outlet, a plug rotatable in said casing and having a chamber extending diametrically through the same and having an opening in one of its ends leading to said chamber, means for rotating said plug a reciprocating piston arranged in said chamber, an arbor arranged in the opening in the end of the plug and supported at its outer end on said casing, and a link connected at one end with said piston and connected at its opposite end with said arbor on one side of the axis of the plug, substantially as set forth.

3. A discharge valve comprising a casing having an inlet and an outlet, a plug rotatable in said casing and having a chamber extending diametrically through the same and having an opening in one of its ends leading to said chamber, means for rotating said plug a hollow reciprocating piston having an opening in its side in line with the end opening of the plug, an arbor arranged in said openings and mounted at its outer end on the said casing, a crank arm arranged on the inner end of said arbor within the piston, and a link connected at one end with the piston and connected at its opposite end with said arm eccentrically to the axis of the plug, substantially as set forth.

4. A discharge valve comprising a casing having an inlet an outlet and a conical seat, a conical plug rotatable in said seat, a stop screw arranged on said casing and engaged by the small end of the plug, and an adjusting device operating on the opposite end of the plug, substantially as set forth.

5. A discharge valve comprising a casing having a conical seat, inlet and outlet nipples on opposite sides of the bore of said seat, a fixed head at the small end of said seat and a detachable head at the large end of the seat, a bearing on the detachable head a conical plug rotatable in said seat, an abutment screw arranged on the casing and adapted to be engaged by the small end of said plug, a stem arranged on the large end of said plug and journaled in said bearing, a driving mechanism connected with said stem, a cross bar, and an adjusting screw arranged on said cross bar and engaging with said stem, substantially as set forth.

Witness my hand this 18th day of July, 1907.

OLIVER S. SLEEPER.

Witnesses:
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ANNA HEIGIS.