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R. C. BROMLEY.

ROTARY PUMP.

APPLICATION FILED DEC. 7, 1907.

Fig. 1.

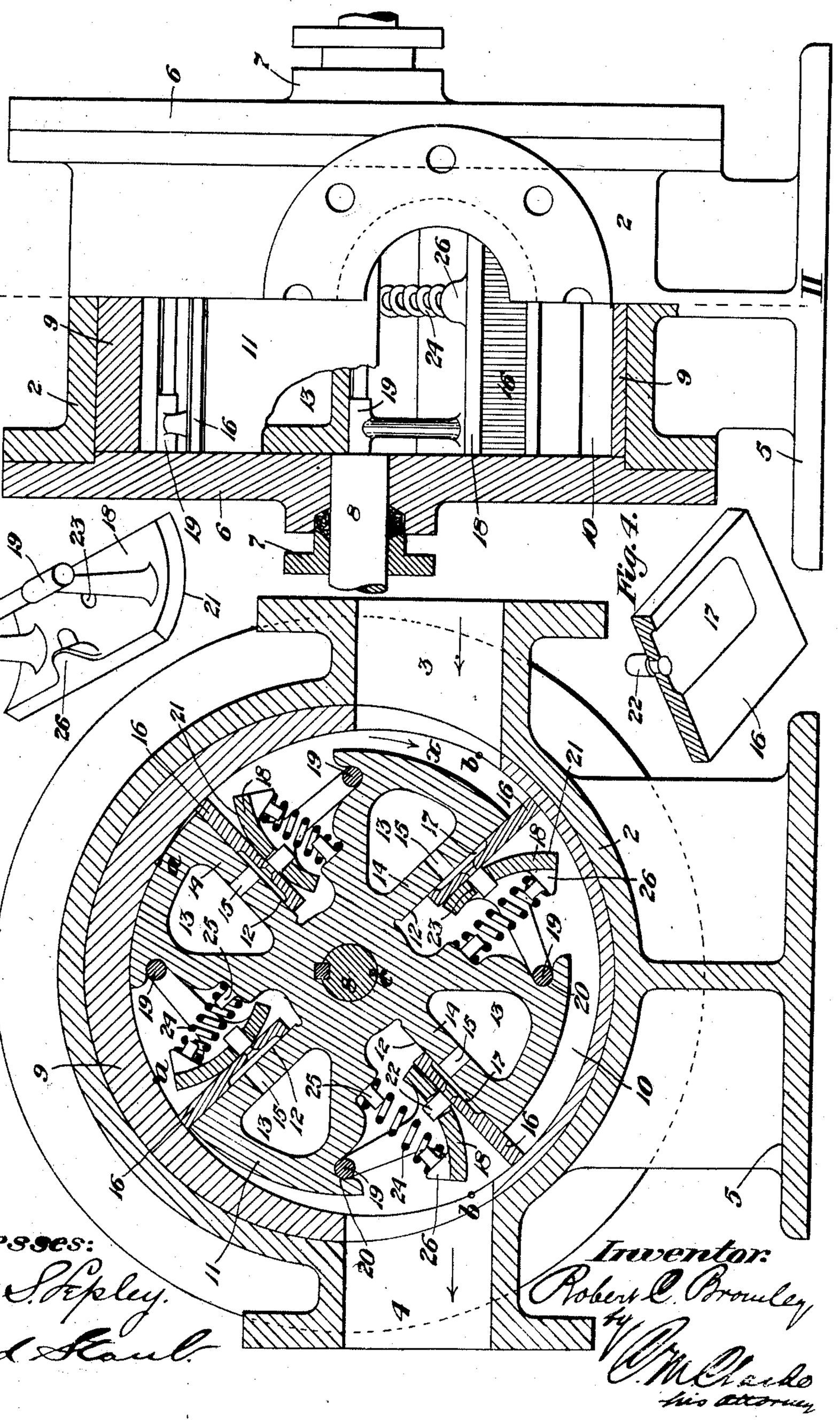

Fig. 3.

Fig. 4.

Fig. 2.

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UNITED STATES PATENT OFFICE

ROBERT CAMPBELL BROMLEY, OF BEN AVON, PENNSYLVANIA.

ROTARY PUMP.

No. 886,110. Specification of Letters Patent. Patented April 28, 1908.

Application filed December 7, 1907. Serial No. 405,503.

To all whom it may concern:

Be it known that I, ROBERT CAMPBELL BROMLEY, a citizen of the United States, residing at Ben Avon, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Rotary Pumps, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention refers to improvements in pumps, particularly to the class of rotary pumps, and consists of an improvement in pumps of this type adapted for use alternately as a pump or motor, the improvements particularly consisting in the construction of the rotating head and its parts.

Generally stated, the pump comprises an outer casing or cylinder having an internal chamber, one portion of which is eccentric to the shaft center, provided with inlet and outlet openings, and a rotating drum or head therein having vanes adapted to travel radially with relation to the head and to provide abutments for forcing the fluid through the pump when used as such, or for providing pressure areas when the device is used as a motor, said vanes being arranged to occupy the eccentrically arranged space within the chamber by outward travel and to recede therefrom by inward travel.

A feature of improvement and advantage is in the construction of the vanes and their mounting on the head whereby to secure positive action independent of centrifugal force, and to overcome the back pressure of the water by providing a sliding seat upon which the vanes will always bear in all positions.

Referring to the drawings: Figure 1 is a side view, half in elevation and half in vertical section through the casing, showing the drum and its parts in elevation, partly broken away. Fig. 2 is a central vertical sectional view indicated by the line II, II, of Fig. 1. Fig. 3 is a perspective detail view of one of the vane frames. Fig. 4 is a similar sectional view of one of the vanes.

2 represents the main body portion of the casing, of cylindrical form, having an inlet opening 3 and an outlet opening 4, which openings are used alternately when the device is used as a motor; that is to say, in such case 3 would be the outlet opening and 4 the inlet. The casing 2 is provided with a suitable base 5 whereby it may be set on a foundation as shown or suspended from any supporting framework, if desired, and is closed at each end by cylinder heads 6, 6, having the usual glands and stuffing boxes 7, 7, in which is mounted shaft 8. The center of said shaft and its bearing preferably corresponds with the center of cylinder 2, which may be bored out to provide the eccentric enlargement referred to, but which is preferably bored to provide a seat for an internal lining or bushing 9, in which is formed the eccentrically enlarged chamber 10. The walls of said eccentric chamber may be developed from a center offset from the center of shaft 8 for the entire circumference, but are preferably in the form of an eccentrically arranged enlargement of the interior drum cavity and provided with a minor circumferential wall *a*, *a*, of say one-sixth of the complete circumference and a major circumferential wall *b*, *b*, of say one-third the circumference, and of radii defined from the center of shaft 8. The intervening walls at each side of the center, *a*, *b*, and *a*, *b*, respectively, are defined from a center *c* eccentric to the center of shaft 8.

The advantage of the above described bushing 9 within the casing, is that while the vanes are under the load between the points *b* and *b* of the major circumferential wall there is no movement, while the vanes are free of any load pressure while traversing the path of the eccentric walls from *a* to *b* and *b* to *a* respectively. Also when the vanes are entirely receded they will be at rest from *a* to *a* before being again extended.

A particular advantage of incorporating the entire interior wall against which the vanes bear in making an entire revolution in one completely embracing bushing is that the bushing can not only be made of a different metal from the casing 2, as of bronze, but that all wear is thus confined to the bushing alone without in any way affecting the casing. When worn, a new bushing may be easily substituted, thus rendering the casing practically indestructible.

A further advantage is that the bushing may be shifted or adjusted annularly with relation to varying positions of the inlet and outlet openings of standard base pumps, or to locate the bushing with relation to the casing for any desired purpose, as in case of inaccurate turning on the lathe, etc.

While the foregoing proportions and arrangement of the interior wall of the cas-

ing, or of its bushing 9, will give good results in practice, I do not wish to be specifically confined thereto, inasmuch as my improved construction of vanes and their mounting on the head is applicable to any of the well-known forms of rotary pumps or motors of this type.

11 is the rotatable piston head of generally cylindrical form surrounding the shaft 8 which passes through it and is keyed or otherwise secured therein, said head having a plurality of radially arranged vane seats 12, four in number or of any other number desired, according to the size and conditions of service for which the pump is intended. The vane seats 12 are located on one side of hollow segmental-shaped portions of the piston head intervening between the vanes, each vane seat having adjacent to it a generally segmental-shaped clearance opening within which are mounted the vane, its frame, and the several features of construction, said space being suitably designed to receive such parts. Each segmental-shaped portion of the head, upon one side of which is provided the vane seat 12, is provided with an interior cavity 13, connecting through the radial vane-bearing wall 14 by one or more ports 15 with the vane-bearing face to the chamber 13. The object of this construction is that ample provision is thus made for leakage backwardly from underneath the vanes so that when they are under pressure they may solidly seat upon faces 12, thereby obviating any tendency of the pressure of the fluid to become effective underneath the vane tending to raise it from its seat.

16 is the vane, generally rectangular in fprm, of flat blade-shaped construction, slidably mounted on face 12 and preferably having at its under side a clearance cavity 17 within its surrounding smooth under bearing face, so as to insure perfect seating, and likewise providing ample opportunity for backward travel through port 15 of any excess pressure.

18 is the vane frame mounted by a bearing cross-bar 19 in suitable bearings 20 in the side of each segmental extension of head 11 opposite face 12, the frame having a smooth curved bearing face 21 concentric with the center of bearing bar 19 and adapted to bear upon the outer face of the vane at all positions. Each vane is provided with one or more abutments or pins 22, projecting outwardly from its upper face into a receiving socket 23 of frame 18. Said frame is normally pressed outwardly by means of compression spring 24 mounted at its inner end against a suitable bearing in the piston head, as by a stud 25, and bearing at its outer end against a similar abutment or bearing 26 on frame 18. By this construction vanes 16 will always be projected outwardly independent of the centrifugal force so as to fill the eccentric working space, the vanes being receded by their contact with the receding inner wall *b* to *a* of bushing 9. It will be understood, however, that if desired, springs 24 may be dispensed with, as in large sizes or with pumps of high velocity, and that the vanes will ordinarily travel outwardly by centrifugal action and will be held to their seats by the frames entirely independent of the springs.

The operation of the device is as follows. Upon the piston head 11 being rotated by its shaft 8 in the direction of arrow *x*, water passing inwardly through inlet 3 will be carried by each vane successively around through the eccentric cavity 10 and discharged outwardly through opening 4 and its connections, at a rate of travel depending on the speed of the pump. Backward pressure of the water against the vanes due to the weight of the column beyond the outlet 4, will bear equally against the entire outer area of each vane and will solidly seat it upon face 12 so that any tipping thereon or tendency to displace that portion of the vane extending beyond its supporting bearing, will be prevented, while the bracing effect of frame 18 will also serve to positively hold each vane to its seat. The same result is secured when the pump is used as a motor and the pressure is directed against the vanes inwardly through opening 4.

The advantages of the invention result from the positive seating of the vanes; the positive laterally-directed motion imparted to them by their spring-actuated frames, and the provision made for the prevention of back pressure underneath them.

The invention may be changed or varied by the skilled mechanic in various features or details, but all such changes are to be considered as within the scope of the following claims:

What I claim is:

1. A pump having an interior chamber and an inlet and an outlet opening, a rotatable piston head eccentrically mounted in said chamber and provided with radially arranged vanes, and co-acting vane frames bearing against the faces of the vanes to hold them to their seats, substantially as set forth.

2. A pump having an interior chamber and an inlet and an outlet opening, a rotatable piston head eccentrically mounted in said chamber and provided with radially arranged vane-bearing seats having sliding vanes, and pivoted vane frames having curved bearing faces operatively engaging the faces of the vanes at one side to hold their other sides against their seats, substantially as set forth.

3. A pump having an interior chamber and an inlet and an outlet opening, a rota-

table piston head eccentrically mounted in said chamber and provided with radially arranged vane-bearing seats having sliding vanes, pivoted vane frames having curved bearing faces operatively engaging the faces of the vanes at one side to hold their other sides against their seats, and means for projecting the vanes outwardly, substantially as set forth.

4. A pump having an interior chamber and an inlet and an outlet opening, a rotatable piston head eccentrically mounted in said chamber and provided with radially arranged vane-bearing seats having sliding vanes, pivoted vane frames having curved bearing faces operatively engaging the faces of the vanes at one side to hold their other sides against their seats, and springs arranged to press the vane frames outwardly, substantially as set forth.

5. A pump having an interior chamber and an inlet and an outlet opening, a rotatable piston head eccentrically mounted in said chamber and provided with radially arranged vane seats having exhaust ports, and vanes slidingly mounted thereon, substantially as set forth.

6. A pump having an interior chamber and an inlet and an outlet opening, a rotatable piston head eccentrically mounted in said chamber and provided with radially arranged vane seats having exhaust ports, and vanes slidingly mounted thereon provided with cavities on their under sides, substantially as set forth.

7. A pump having an interior chamber and an inlet and an outlet opening, a rotatable piston head eccentrically mounted in said chamber and provided with radially arranged vane seats, vanes slidingly mounted on said seats, pivotally mounted vane frames having curved bearing faces operatively engaging the faces of the vanes at one side thereof, and means providing shifting engagement between the vanes and frames, substantially as set forth.

8. A pump having an interior chamber and an inlet and an outlet opening, a rotatable piston head eccentrically mounted in said chamber and provided with radially arranged vane seats, vanes slidingly mounted on said seats, and pivotally mounted vane frames operatively engaging the vanes and having curved bearing faces adapted to hold the vanes to their seats, substantially as set forth.

9. In a rotary pump, the combination with the rotatable piston head having radially arranged vane seats, of vanes mounted thereon by their under sides, and pivotally mounted vane frames operatively engaging against the other side of the vanes, substantially as set forth

10. In a rotary pump, the combination with the rotatable piston head having radially arranged ported vane seats, of vanes mounted thereon by their under sides, and pivotally mounted vane frames operatively engaging against the other side of the vanes, substantially as set forth.

11. In a rotary pump, the combination with the rotatable piston head having radially arranged vane seats, of vanes mounted thereon by their under sides, pivotally mounted vane frames in operative engagement with the other side of the vanes, and springs arranged to press the frames and vanes outwardly, substantially as set forth.

12. In a rotary pump, the combination with the rotatable piston head having radially arranged vane seats, of vanes mounted thereon provided with studs, and pivotally mounted vane frames engaging said studs, substantially as set forth.

13. In a rotary pump, the combination with the rotatable piston head having radially arranged vane seats, of vanes mounted thereon provided with studs, and pivotally mounted vane frames engaging said studs and having curved faces arranged to bear against said vanes to hold them to their seats, substantially as set forth.

14. The combination of the casing having a cylindrical chamber, a bushing therein having an annular eccentrically arranged interior wall, inlet and outlet openings communicating through the casing with the bushing interior, a rotatable head and its shaft mounted in the casing concentric therewith, radially arranged vanes mounted in the rotatable head, and swinging frames having bearing faces operatively engaging against the faces of the vanes, substantially as set forth.

15. The combination of the casing having a cylindrical chamber, a bushing therein having an annular eccentrically arranged interior wall, inlet and outlet openings communicating through the casing with the bushing interior, a rotatable head and its shaft mounted in the casing concentric therewith, radially arranged vanes mounted in the rotatable head, swinging frames having bearing faces operatively engaging against the faces of the vanes, and springs arranged to press the frames and vanes outwardly, substantially as set forth.

16. In a rotary pump, the combination with the cylindrical casing having concentric shaft bearings, of an annular bushing mounted within the casing having major and minor inner circumferential walls concentric with the bearing centers and intervening walls described from a center eccentric thereto, a rotatable piston head having a shaft mounted in said bearings and provided with radially arranged vanes, and co-acting vane frames bearing against the faces of the vanes to hold them to their seats, substantially as set forth.

17. In a rotary pump, the combination with the cylindrical casing having concentric shaft bearings, of an annular bushing mounted within the casing having major and minor inner circumferential walls concentric with the bearing centers and intervening walls described from a center eccentric thereto, a rotatable piston head having a shaft mounted in said bearings and provided with radially arranged vanes, and co-acting vane frames bearing against the faces of the vanes to hold them to their seats, the pump having means providing an inlet and outlet to the interior of the bushing, substantially as set forth.

18. In a rotary pump, the combination of a casing having shaft bearings at each end, an annular bushing within the casing having a major and a minor inner circumferential wall concentric with said bearings and intervening connecting walls described from a center eccentric thereto, and having an inlet and outlet opening extending through the casing and bushing; and a rotatable piston head provided with a shaft mounted in said bearings and provided with radially arranged vane bearing seats having sliding vanes and pivoted vane frames having curved bearing faces operatively engaging the faces of the vanes at one side to hold their other faces against their seats, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT CAMPBELL BROMLEY.

Witnesses:
C. M. CLARKE,
CHAS. S. LEPLEY.