(No Model.)

J. BOWNS.

DISK PUMP.

No. 410,308. Patented Sept. 3, 1889.

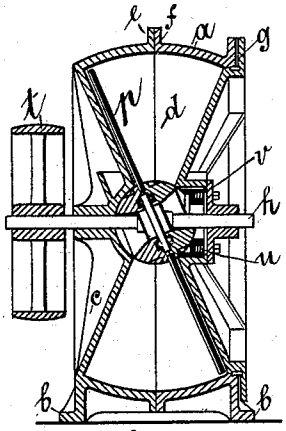

Fig. 1.

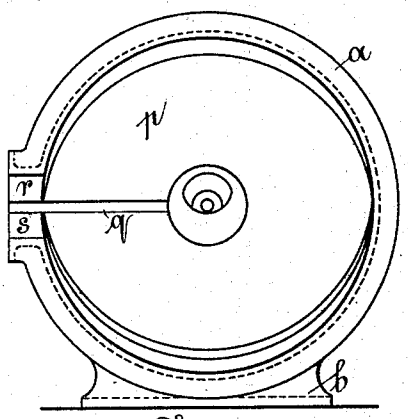

Fig. 2.

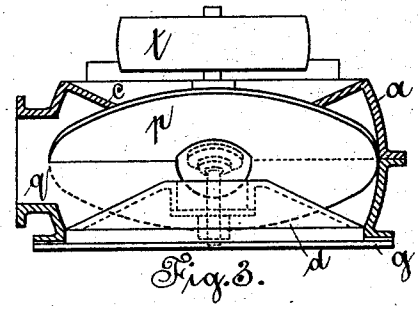

Fig. 3.

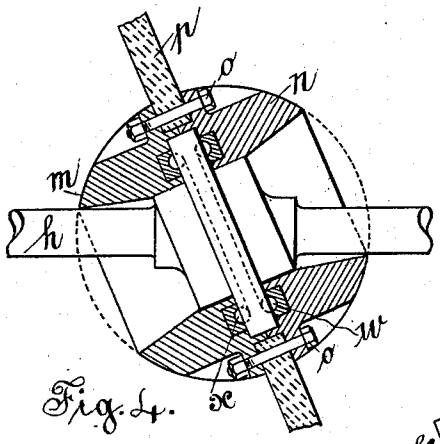

Fig. 4.

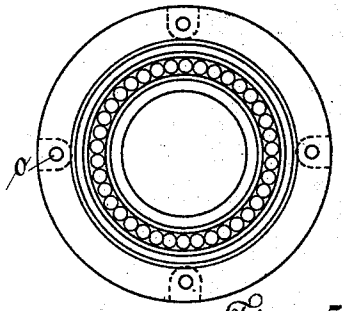

Fig. 5.

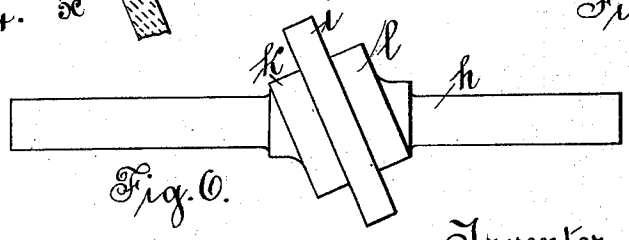

Fig. 6.

Witnesses:
Carl Bollé
Samuel Scroza.

Inventor
John Bowns
by W. T. Sumner
Attorney.

UNITED STATES PATENT OFFICE.

JOHN BOWNS, OF SHEFFIELD, COUNTY OF YORK, ENGLAND.

DISK PUMP.

SPECIFICATION forming part of Letters Patent No. 410,308, dated September 3, 1889.

Application filed March 29, 1888. Serial No. 268,907. (No model.) Patented in England April 21, 1887, No. 5,794; in Belgium February 18, 1888, No. 6,000; in France February 24, 1888, No. 188,943, and in Germany May 12, 1888, No. 44,217.

To all whom it may concern:

Be it known that I, JOHN BOWNS, a subject of the Queen of Great Britain, residing at Talbot Street, Sheffield, in the county of York, in the Kingdom of Great Britain and Ireland, have invented certain new and useful Improvements in Disk Pumps, Blowers, Motors, and Such Like Machines, (for which Letters Patent dated the 21st April, 1887, and numbered 5,794, have been granted to me in Great Britain, and in Germany, No. 44,217, dated May 12, 1888; in France, No. 188,943, dated February 24, 1888, and in Belgium, No. 6,000, dated February 18, 1888,) of which the following is a specification.

My invention relates to that class of pumps, blowers, motors, and such like machines in which a flat disk works in a spherical casing between two cones having the same axis and a distance equal to the thickness of the disk between their apices, on which cones the disk has a rolling motion. Ordinarily a shaft perpendicular to the disk is passed through the spherical boss of the disk, or a similar shaft is formed on the said boss and connected to a crank on a shaft, the axis of which coincides with that of the cones, so that when this shaft rotates the shaft fitted to or formed on the disk has a gyrating motion and describes a cone having its apex in the center of the disk. This arrangement has the drawback that the two shafts are not rigidly connected to one another and each shaft has only one bearing. In some cases the two shafts with the crank connecting them have been formed in one piece, and the shaft perpendicular to the disk has also been prolonged on the opposite side and formed with a second crank and shaft end coaxial with the two cones, the two cranks being opposite to one another. These arrangements have the disadvantage that the bearings of the coaxial shaft ends are at a great distance from the center of the disk, and that the shaft between the two cranks which carries the disk is liable to be bent and subject to vibrations, causing a noisy and irregular working of the machine.

The object of my improvements is to obviate these drawbacks and to make a steadier machine capable of running at a high speed without vibration.

On the sheet of drawings appended hereunto, Figure 1 shows a vertical cross-section through my improved machine; Fig. 2, a vertical longitudinal section; Fig. 3, a horizontal section through the casing, with the disk and conical cover in outside view. Figs. 4, 5, and 6 show details on an enlarged scale.

The machine consists, similarly to those hereinbefore referred to, of a spherical casing or cylinder *a*, provided with suitable feet *b b* for fixing it to a foundation and having conical ends *c* and *d*. The cylinder *a* is shown made in two parts divided vertically and bolted together through the flanges *e f*, and the cone *c* cast in one piece with one-half of the cylinder, while the other cone *d* is separate and bolted to the cylinder *a* by means of the flange *g*. Both cones, however, may be cast solid each with one-half of the cylinder, or both cones may be separate and bolted to the cylinder *a*. The latter may be made in two parts divided horizontally and bolted together instead, as shown, both ends being made separate in this case.

My improvements consist in placing a straight shaft *h* (shown on an enlarged scale by Fig. 6,) coaxially with the two cones, which shaft is supported in bushes by bearings formed on or attached to the conical ends of the cylinder and has formed on or fixed upon it a flat disk or collar *i*, inclined to the axis of the shaft *h* at the same angle as that formed by the sides of the cones with their axis. By preference I forge the disk *i* solid with the shaft, as shown on the drawings, and turn it with the requisite inclination to the shaft by chucking the latter eccentrically in a lathe, the bosses *k l* at the sides of the disk being turned at the same setting. On the disk *i* and bosses *k l*, I place two hemispherical bosses *m* and *n*. (Shown on an enlarged scale by Fig. 4 in section and by Fig. 5 in a view of the joint.) These bosses are recessed, so as to inclose and fit the disk *i* when bolted together by the bolts *o o*, and bored to fit the bosses *k l*, with the ends of the hole bored conically to clear the shaft *h*.

On the edges of the two hemispheres a

groove is turned, in which the large disk or piston *p* of the machine is clipped and secured by the bolts *o o*. In some cases I form the piston *p* solid with one of the hemispherical bosses instead, as described. The central parts of the conical ends or bushes inserted into them are turned spherically on the inside to fit the bosses *m n*. The piston *p* is slotted, as usual, along one radius from the spherical boss to the circumference and a partition-plate *q* inserted into the slot, which divides the inlet and outlet ports *r* and *s* from one another, and can conveniently be secured in its place by being fitted into recesses of the conical cylinder ends. This partition-plate *q* holds the disk and prevents it from rotating, and when the shaft *h* is rotated by the pulley *t* the piston *p* rolls on the cones and draws the air or liquid in on one side of the partition-plate *q* and expels it on the other side in the usual manner.

The machine may also be used as a motor. The fluid under pressure, being admitted through the port at one side of the partition-plate and exhausted through the port on the other side, will cause the piston to roll on the cones and drive the shaft, the disk or roller *i* being in that case made larger in proportion to the piston *p* than shown on the drawings. The bearings or bushes for the shaft may both be cast solid with the cylinder ends, as shown on the left-hand side of Fig. 1, or they may be separate and attached by bolts, as shown on the right-hand side. An adjustable cylindrical bush *n*, turned spherically at the end to fit the boss of the piston, is by preference inserted into one cylinder end, as shown, and pressed by springs *v* against the spherical boss to take up the wear and prevent shaking. Balls may be inserted between the disk *i* and the bosses *m* and *n*, so as to form ball-bearings for the purpose of reducing the friction. This arrangement is shown on the drawings. Hard-metal rings *w* and *x* are inserted into grooves turned in the bosses *m* and *n* and have grooves turned into them, the disk *i* having corresponding grooves turned into it, so that the balls are half-way, or nearly so, in each of them. In some cases I place balls in grooves turned on the outer circumference of the disk half-way into the disk *i* and half-way into the bosses *m* and *n* at their joint.

The cylinder and piston may be made of cast-iron, gun-metal, vulcanite, or other material suitable for the purpose for which the machine is intended. In some cases I cover the piston or disk *p* with leather, india-rubber, or other elastic material not injured by the fluid in the machine, for the purpose of insuring a perfect fit of the piston *p* against the conical cylinder ends and preventing leakages and vibrations.

Elastic packings may be arranged on the circumference of the disk or piston *p* and on the edges of the slot bearing upon the partition-plate *q*.

Having now particularly described and ascertained the nature of my invention and in what manner the same is to be performed, I declare that what I claim is—

1. In disk blowers, pumps, motors, and such like machines, the collar *i*, rigidly attached to the shaft *h*, rotating in bearings coaxial with the conical cylinder ends *c* and *d* and inclined to said shaft at the angle the side of the cones form with their axis, in combination with the disk *p*, attached to hemispherical bosses *m n*, with cylindrical recesses turned into them coaxially with the disk *p*, in which recesses the collar *i* works, the spherical cylinder *a*, and partition-plate *q*.

2. In disk blowers, pumps, motors, and such like machines operated by means of a straight shaft with an inclined collar rigidly attached thereto and rotating in recesses of the bosses of the disk, ball-bearings for reducing the friction between said collar and bosses.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 23d day of January, 1888.

JOHN BOWNS.

Witnesses:
JOSEPH HALLAM,
WILLIAM TASKER.