

Dec. 13, 1932.

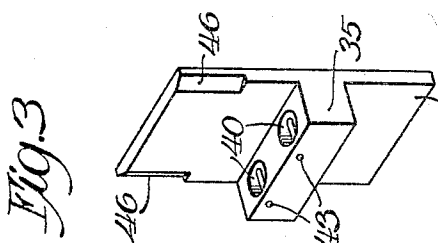
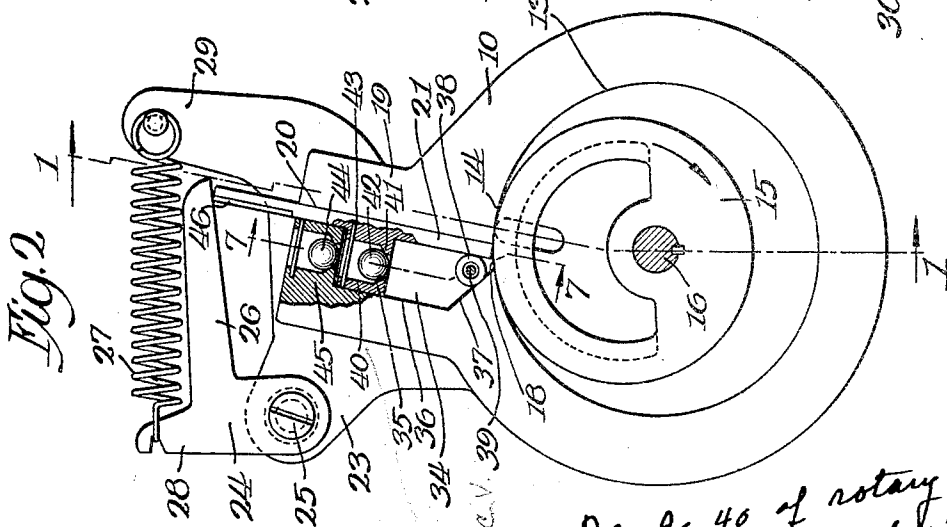
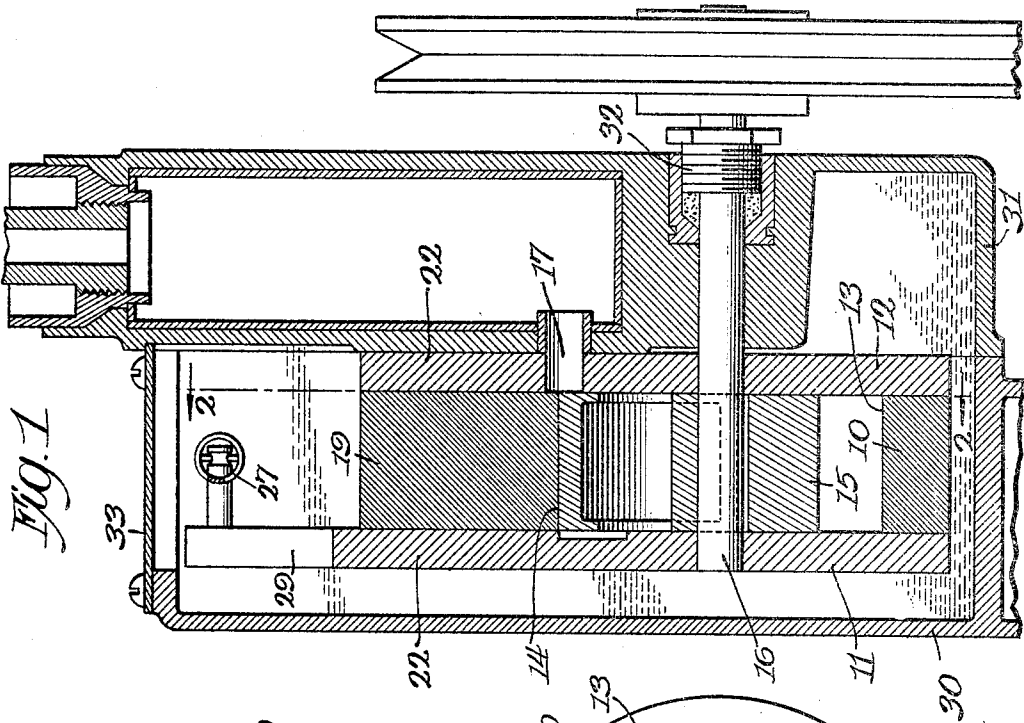
J. DUBROVIN

1,890,571

PUMP

Filed Oct. 11, 1928

2 Sheets-Sheet 1



Blade 46 of rotary pump
acts as a piston for a second
or boosting pump, in series
and for securing high vacu.

Inventor:
John Dubrovin
By Gilson, Mann & Co.
Attys.

Dec. 13, 1932.

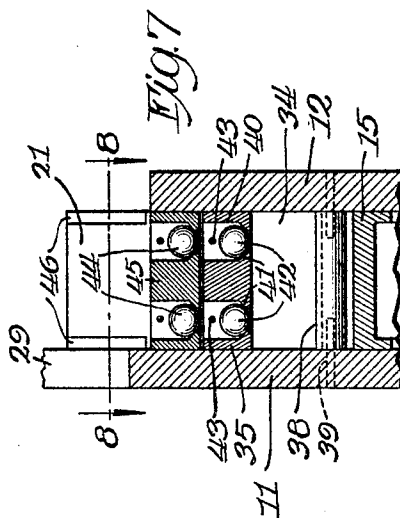
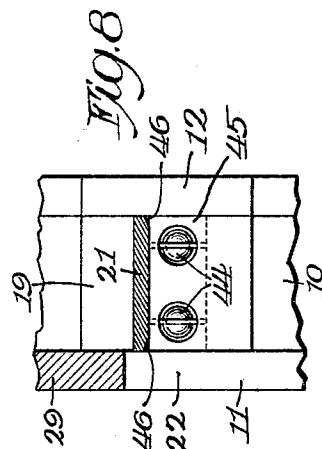
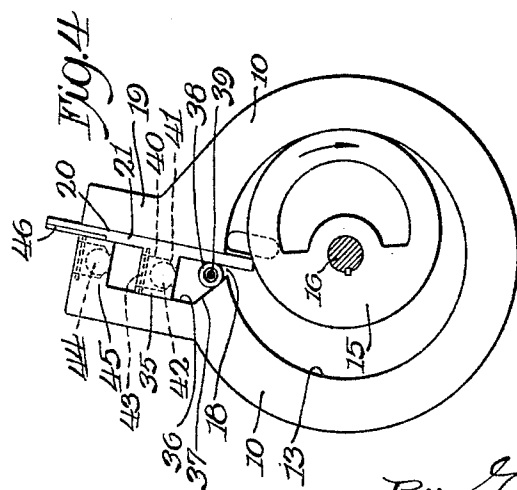
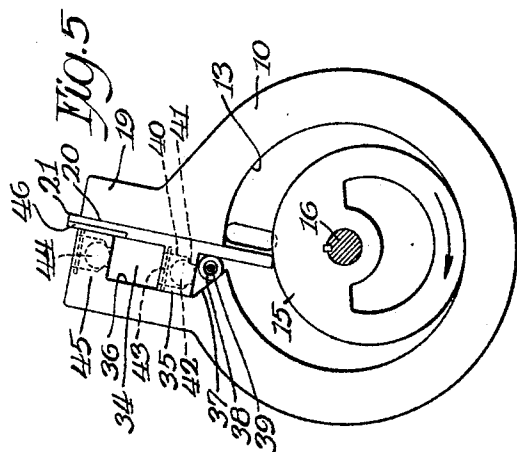
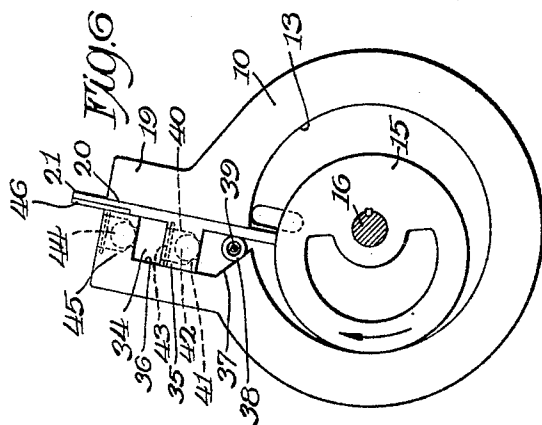
J. DUBROVIN

1,890,571

PUMP

Filed Oct. 11, 1928

2 Sheets-Sheet 2



Inventor:
John Dubrovin
By Nelson, Mann & Co. Attys.

UNITED STATES PATENT OFFICE

JOHN DUBROVIN, OF CHICAGO, ILLINOIS, ASSIGNOR TO CENTRAL SCIENTIFIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

PUMP

Application filed October 11, 1928. Serial No. 311,733.

This invention relates to pumps especially adapted for producing high vacua, though, of course, capable of other uses, and has for its principal object to produce a plurality of stages of pumping with more simplicity and economy than has heretofore been found possible, which is attained in the preferred embodiment here shown by making the in and out movement of the blade, of the well known eccentric pump, perform a pumping operation distinct from that performed by the eccentric rotor.

Further objects and advantages of the invention will become apparent as the disclosure proceeds and the description is read in connection with the accompanying drawings, in which

Fig. 1 is a sectional view through a pump, similar to one unit of the device disclosed in the patent to Twardowsky, No. 1,385,101, of July 19, 1921, supplemented according to this invention;

Fig. 2 is a section taken on the line 2—2 of Fig. 1, with the oil bath omitted;

Fig. 3 is a perspective view of the modified blade;

Figs. 4, 5 and 6 are views similar to Fig. 2, illustrating successive positions of the parts in a cycle of operations;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 2; and

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 7.

But it will be understood that this specific illustration, and the correspondingly specific description, are used to set forth the preferred embodiment as the best illustration of the invention now known, but they are not intended to indicate the limits of the invention or to impose restrictions on the claims that would permit its substance to be appropriated without infringement.

The eccentric pump casing includes a ring 10 and two plates 11 and 12 clamped at opposite sides thereof. The inner surface 13 of the ring 10 is cylindrical for cooperation with a similarly formed zone or area 14 on a rotor 15, eccentrically mounted on a shaft 16 passing through the plates 11 and 12. The intake port 17 is made by drilling the plate

12, and the exhaust port is made at 18 through the periphery of the ring 10.

The ring is provided with a lateral extension 19, which is slotted at 20 to receive a slide or blade 21, the inner end of which constantly engages the periphery of the rotor 15 and divides the intake from the exhaust. The plates 11 and 12 have similar extensions 22 which cooperate with the edges of the slide.

The extension 22 of the plate 11 is provided with an ear 23, upon which a lever 24 is fulcrumed at 25. One arm 26 of that lever is constantly pressed against the upper end of the blade or slide 21 by a spring 27, having one end stretched between another arm 28 of that lever and another ear 29 on the extension 22.

The pump is mounted in an oil bath including a casing 30, one side of which, 31, is removable, and, for convenience in assembling the pump, is mounted on this removable side, which is equipped with a suitable stuffing box 32 for the shaft 16. Access to the bath for filling and ordinary inspection is had by removing the cover 33.

Pumps of this general type are as a rule used in two units connected in series for producing high vacua and other similar work. According to this invention one of the units is omitted entirely and the other is equipped with a much cheaper pumping unit operated by the blade, slide, or whatever mechanical movement may be used to separate the intake and exhaust of the eccentric unit. For convenience, this second pump unit will be termed an auxiliary or booster pump and is so characterized because of its supplemental action in operating upon and compressing the air or other fluid exhausted from the eccentric pump unit.

As shown, the slot 20 for the blade 21 is extended laterally to form a chamber 34 (Fig. 2) which, for convenience, may be called a cylinder; and the blade 21 is equipped with an intermediately located projection 35 which, for the same reason, may be called a piston, and which is, of course, fitted to the inner walls of the extensions 22 on the plates 11 and 12, and the left wall 36 of the cylinder.

Near the bottom this latter wall connects with the inclined bottom 37, the lower extremity of which is separated from the lower end of the blade 21 to provide the exhaust port 18.

Communication through this port is controlled by a check valve consisting of a simple hollow cylinder 38, having its periphery cooperating with the adjacent surfaces of the blade 21 and the bottom 37, and its ends bearing against the plates 11 and 12. A pin 39, fixed to one of the plates and projecting into the cylinder 38, confines its movement to desirable limits.

The piston 35 is equipped with a plurality of check valves comprising cylindrical bores 40 having spherical or conical seats 41 to cooperate with balls 42, whose movement away from the seats is limited by pins 43 extending across the bores 40.

The upper corners of the blade 21 are beveled at 46, to provide for lubrication by oil from the bath.

The operation of the eccentric pump is familiar, and is illustrated in Figs. 2, 4, 5 and 6, which show the parts in four successive positions in a cycle of operation. As the rotor 15 turns clockwise from the position shown in Fig. 2, air or other material in the pump chamber is forced through the exhaust port 18, and at the same time suction through the intake port 17 is created and constantly increased on the opposite side of the blade 21. As the parts pass through the successive positions shown in these figures, the contents of the pump chamber of the eccentric pump are delivered through the exhaust port 18 into the cylinder 34, and a new charge is drawn into the pump through the intake port 17.

As the rotor moves successively from the position shown in Fig. 2 through that shown in Fig. 4 to that shown in Fig. 5, the blade 21, with its piston 35, descends and the air forced from the eccentric unit or stage through the exhaust port 18 passes the valve 38 and also the valves 42, except for a small portion remaining above the valve 38 in the position shown in Fig. 5.

As the rotor moves from the position shown in Fig. 5 through that shown in Fig. 6 to that shown in Fig. 2, the charge in the cylinder 34 is discharged through valves 44, in the head 45, which are similar to the valves 42 in the piston 35, after which it escapes through the oil in the bath.

With the proportions of the parts shown the volume delivered by the eccentric stage, when the vessel to be exhausted is near atmospheric pressure, will be in excess of the volumetric capacity of the cylinder 34 at the same pressure, and for that reason air will be forced past the check valves 38, 42 and 44 throughout the greater part of the rotor's revolution. But as the pressure in the vessel to be exhausted is decreased this condition

changes, and at length the chamber 36 will be able to take the exhaust of the eccentric unit between the positions shown in Figs. 5 and 2, during which time the piston 35 will exhaust from the chamber 34 the previous charge. Later, as the rotor moves between the positions shown in Figs. 2 and 5, the exhaust from the eccentric unit will pass the check valves 38 and 42 in almost equal amounts.

The plurality stage pump here disclosed has a capacity comparable with two eccentric units, as recommended in the Twardowsky patent, and the chamber 34, piston 35, and valves which make up the auxiliary stage can be produced much more cheaply than the additional parts necessary to a second eccentric unit or stage.

I claim as my invention—

1. A pump comprising a casing having a cylindrical chamber and an auxiliary chamber in communication therewith, said auxiliary chamber having an inclined bottom adjacent to the cylindrical chamber, an eccentric rotor in the cylindrical chamber cooperating with its periphery, and a blade mounted in the casing and cooperating with the periphery of the rotor, and a valve cooperating with the inclined bottom of the auxiliary pump chamber and the blade.

2. A vacuum pump comprising a casing provided with a chamber, an eccentric rotor in said chamber, said casing being provided with intake and discharge ports and passages leading to and from said ports, a sliding blade between said ports, a discharge valve for said discharge port and means in said discharge passage located radially outwardly from said chamber for receiving air passing through said discharge port and for positively discharging the same from said passage.

3. A vacuum pump comprising a chamber, a rotary piston for said chamber, intake and discharge ports for said chamber, means cooperating with said piston for drawing air into said chamber and for discharging the same into a discharge passage leading from said discharge port, and means including a reciprocating piston within said discharge passage for receiving air from said discharge port and for discharging the same from said passage.

4. A vacuum pump comprising a casing having inlet and exhaust ports connected with a cylindrical chamber, an eccentric rotor in the chamber having a zone of contact with the periphery of the chamber, and a blade cooperating with the periphery of the rotor and moving in and out with respect to the chamber as the rotor revolves, in combination with a second pump including a chamber equipped with inlet and exhaust ports, a piston for said last named chamber operated by said blade, a valve in said second named inlet port con-

tiguous to said second named chamber and in close proximity to said first named chamber.

5 5. A vacuum pump comprising a casing having a cylindrical chamber, an auxiliary chamber communicating therewith, a check valve controlling communication between the chambers, an eccentric rotor in the cylindrical chamber, a blade cooperating with the
10 periphery of the rotor, and a piston on the blade operating in the auxiliary chamber, said piston having a passage therethrough and a valve for said passage.

15 6. A multi-stage vacuum pump comprising, an eccentric pump unit, a reciprocating pump unit comprising a piston in said reciprocating unit deriving its motion through cooperation with said eccentric pump unit, the outlet port of one pump and the inlet
20 port of the second pump being in common, and a valve for the common port in close proximity to the two pumps and constituting the intake valve for one pump and the exhaust valve for the other pump.

25 7. A multi-stage vacuum pump comprising, in combination, an eccentric pump unit, a reciprocating pump unit, including a piston having a passage therethrough, a short passage connecting the two units and forming
30 the inlet of one pump and the outlet of the other, the piston of such reciprocating pump deriving its motion through cooperation with parts of the eccentric pump unit and performing work upon fluids discharged through said short passage by the eccentric
35 pump, a displacement valve in the passage through said piston between and in proximity to the pump units and an inertia operated valve in the reciprocating piston for closing the passage therethrough.

40 8. In a vacuum pump, a casing, a pump chamber in said casing, an eccentric piston, for said chamber, a reciprocating blade for cooperating with said eccentric piston,
45 said casing being provided with an enlarged passage forming a second pump chamber, a piston rigidly connected to said blade and reciprocating in said passage, the inlet of one pump chamber and the outlet of the other
50 being in common, and discharge valves for said reciprocating piston and said enlarged passage.

In testimony whereof I affix my signature.

JOHN DUBROVIN.

35

30

65