

Jan. 7, 1930.

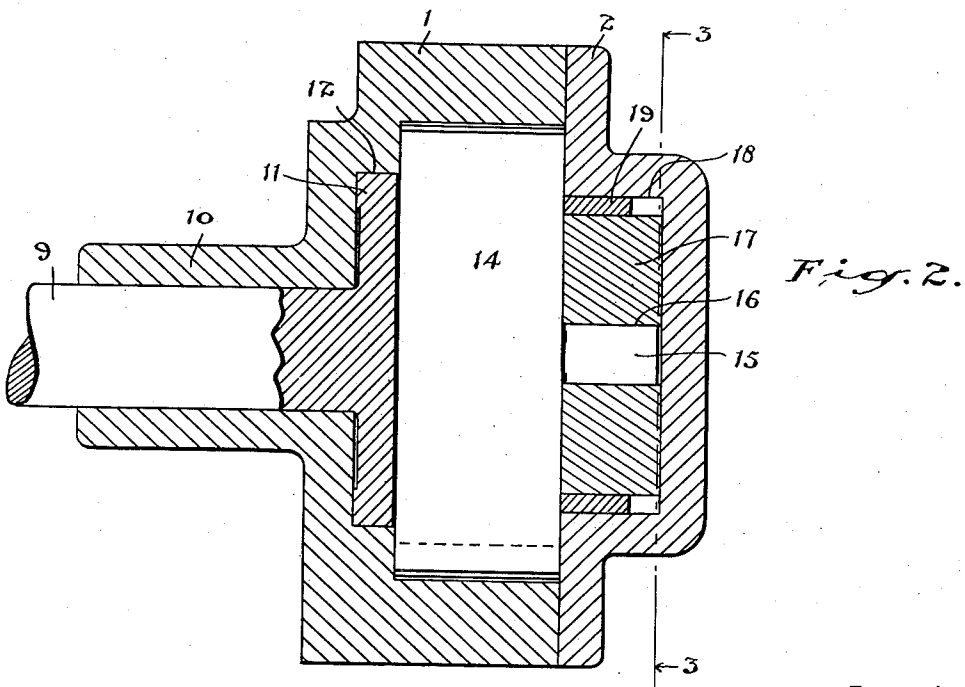
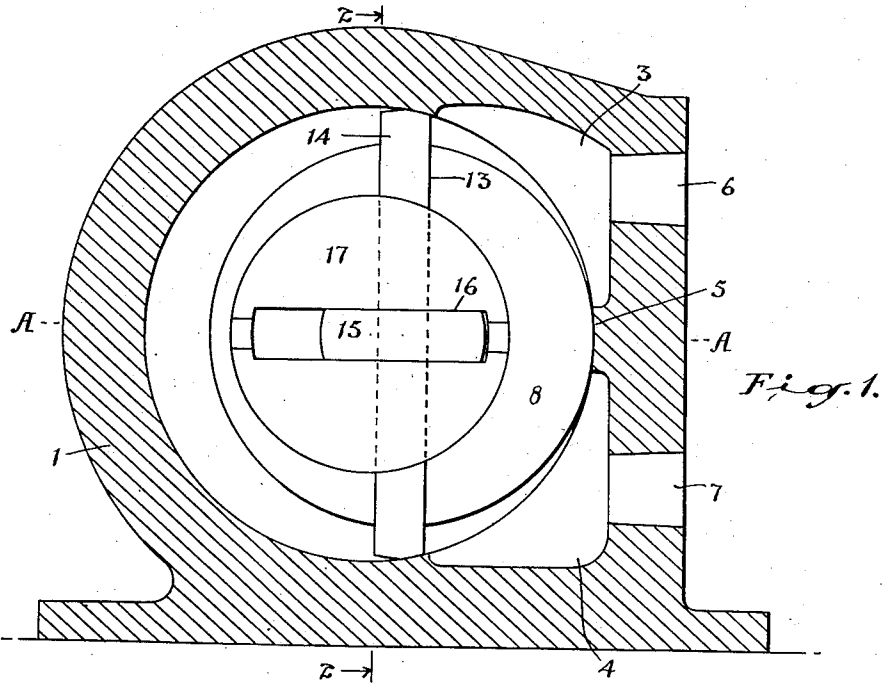
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1,742,731

ROTARY COMPRESSOR

Filed Jan. 10, 1927

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

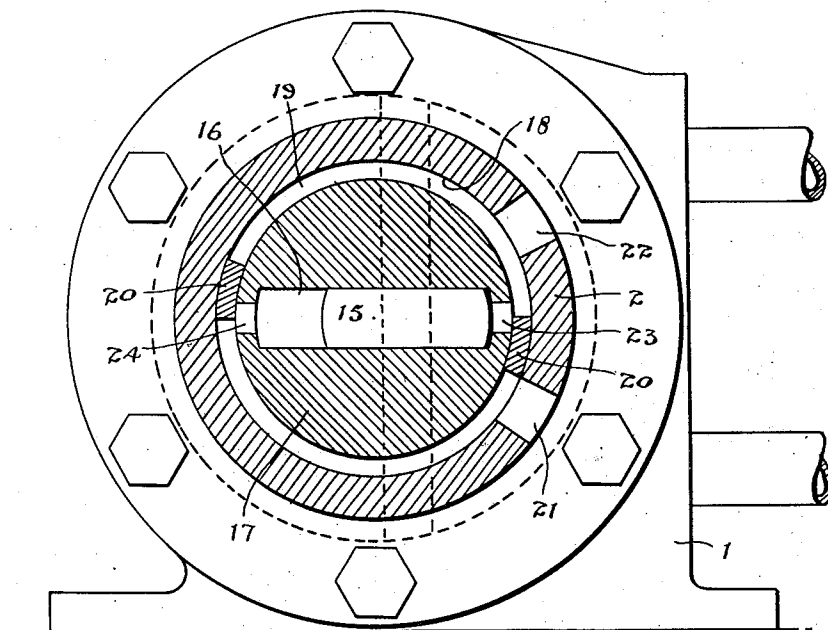


Fig. 3.

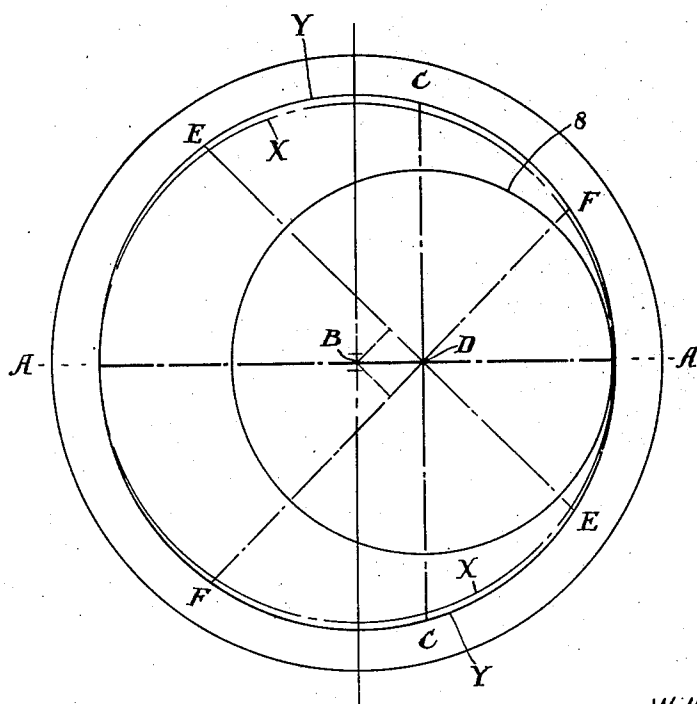


Fig. 4.

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UNITED STATES PATENT OFFICE

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ROTARY COMPRESSOR

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The principal objects of the invention are, to devise a small, compact high duty compressor capable of being operated at extremely high speeds, producing high pressure and high temperature of discharge and particularly adaptable for use in the burning of oil as a fuel.

The principal feature of the invention consists in the novel construction of the pump cylinder, eccentric rotor and an impeller vane, whereby the vane rotates about a changing axis and maintains constant contact at both its ends with the cylinder surface, free from destructive end thrust.

In the drawings, Figure 1 is a mid-sectional view through the casing of my improved pump showing the rotor and impeller vane in elevation.

Figure 2 is a vertical sectional view through the pump taken on the line 2—2 of Figure 1.

Figure 3 is a vertical sectional view through the pump on the line 3—3 of Figure 2.

Figure 4 is a diagram illustrating the peculiar shape of the cylinder and the path of movement of the impeller vane.

In the construction of rotary pumps many devices have been conceived for the purpose of reducing the frictional contact of the impeller vanes caused by centrifugal force and while some methods adopted have been partially successful in this respect very high speeds have not been attainable.

The present construction is extremely simple yet it has enabled the attainment of extraordinarily high speeds with resultant accomplishments of high pressures, high vacuum and high temperature of discharge which for certain purposes is extremely desirable.

The construction as illustrated in Figures 1 to 4 consists of a cylinder casing or block 1 having the open side thereof closed by a cap 2.

The cylinder block 1 is provided with a pair of recesses 3 and 4 forming the intake and discharge recesses respectively. These are separated by a division wall 5 and openings 6 and 7 lead to and from said recesses.

The cylinder cavity is of a peculiar formation, the transverse axis A—A through the centre of the division wall 5 being arranged in alignment with the axis of the rotor 8

and the rotor axis is offset laterally from the centre of the cylinder so that the periphery of the rotor engages the division wall 5 at one side of the cylinder but is spaced from the cylinder wall forming a crescent-shaped cylindrical chamber.

The diameter of the cylinder perpendicular to the transverse axis A—A is greater than the diameter through said transverse axis and the walls are therefore eccentric each side of the transverse axis. This is illustrated very clearly in Figure 4 where the dotted line X indicates a true circle scribed about the centre B. The full lines Y which diverge from the dotted line X from the transverse axis A—A indicate the actual cylinder wall. The curve of the cylinder wall is determined by the position of a transverse axis through the rotor centre of a fixed length.

The illustration in Figure 4 is exaggerated from the actual dimensions of a working pump as illustrated in Figure 1, but it will be seen on reference to this diagram that if a line C—C is drawn through the longitudinal axis of the rotor 8 perpendicular to the line A—A and of the same length, the ends of the line C—C will extend beyond the circle X.

It will be noted that the centre B of the cylinder and the centre D of the rotor are transversely in line and that a line drawn through said centres will be the true diameter of the circle scribed about B, but if the line is caused to move about the centre D and must remain the same length then the moment that the rotor rotates to swing the line A—A out of the horizontal on account of the difference in centres between the cylinder and the rotor, the ends of the line, if retained in balanced arrangement at either side, must extend beyond the cylinder circle, first in increasing ratio which reaches the maximum when the line is in the position C—C. It then reduces and draws inwardly until it again merges into the true circle on the horizontal axis A—A.

The rotor 8 is mounted upon a shaft 9 journaled in a bearing 10 in the cylinder block and is concentric to said shaft and is here shown formed with a portion 11 jour-

nalled in a recess 12 at one side of the cylinder casing.

The portion of the rotor extending into the cylinder cavity is formed with a transverse diametrical slot 13 which is of a substantial width and in this slot is slidably mounted a flat blade 14 which forms the impeller.

The blade 14 has a maximum length equal to the minimum diameter of the cylinder on the transverse axis A—A cutting through the centres B and D of the cylinder and rotor, but as will be understood from the foregoing description this blade could not operate within a cylinder having a circular cross-section but the cylinder must be eccentrically cut both sides of the transverse axis to accommodate the blade as it is rotated about its constantly changing axis.

In the diagram illustrated in Figure 4 the lines C—C indicate the position of the centre line of the blade when said blade is perpendicular to the line that cuts both cylinder and rotor centers but other lines E—E and F—F are shown at 45° angles, merely to illustrate the centre line of the blade at different points.

It will be seen that as the rotor rotates the blade 14 has an oscillating movement in a direction right angular to the blade as the blade moves from the centre D to the centre B and the blade is provided with a lug 15 central of its length extending from one edge thereof arranged with its bearing faces at right angles thereto and this lug extends into a slot 16 in a disc 17 rotatably mounted in the cylindrical recess 18 in the cap 2 which is concentrically arranged in relation to the cylinder.

The disc 17 rotates concentrically with the cylinder and the blade 14 rotates in the cylinder but oscillates in the manner described as it is turned by the action of the eccentrically journaled rotor.

For certain classes of service it may be desirable to utilize a metering pump in connection with the compressor and this is very simply accomplished by arranging within the recess 18 in the cap 2 surrounding the disc 17 a ring 19 which is of lesser width than the disc but is provided with a pair of lug projections 20 extending to the full depth of the disc.

The ring 19 is fixed in the cap with one of the lugs spaced adjacent to an opening 21 in the periphery of the cap. The other lug is arranged diametrically opposite and a second opening 22 is arranged in the cap at the other side of the lug from the opening 21.

The fluid to be pumped enters through the opening 22 and fills the recess between the lugs in the same circular recess at the end of the ring 19.

Openings 23 and 24 are arranged at each end of the slot 16. As the opening 23 passes one of the lugs 20, the passage communicates with the intake opening and as the lug 15 oscillates in the slot, it draws a quantity of the

liquid contained in the recess into the slot. When the opening 23 passes the opposite lug 20, the movement of the lug 15 reverses and ejects the fluid contained in the slot into the passage connected with the discharge opening 21. A definite quantity of fluid is thus pumped and discharged each revolution.

A pump constructed as described may be operated at very high speeds as it will be readily understood that because of the practically perfect balancing of the impeller vane there will be no destructive centrifugal force to overcome and therefore no peripheral friction. The pump has been operated at a speed considerably over five thousand revolutions per minute. The velocity of discharge is such that a practically true adiabatic condition exists.

The parts are extremely small and simple but the working members are comparatively large and are easy to lubricate.

It will be understood that the term "contact" or similar expressions in the foregoing specification and appended claims does not mean an actual metal-to-metal contact between the ends of the vane and the inner surface of the cylinder but simply that the ends of the vane are so close to the surface of the cylinder as to effect a sealing or operating contact with said surface.

Though in the specification and claims I have termed my device a compressor, it will be understood that its use does not necessarily involve the building up of any particular degree of pressure. The pressure at the outlet end of the device obviously depends upon the conditions and may be greater than or equal to or less than atmospheric pressure. The word "compressor" as herein used is to be so understood.

What I claim as my invention is:—

1. A rotary compressor, comprising a cylindrical casing, a rotor eccentrically mounted in said casing and having a slot extending transversely through its axis, an impeller vane formed with a single flat blade slidable in the slot in said rotor and extending beyond the periphery thereof on either side, and means operatively connected with said impeller vane and arranged concentric to the cylindrical casing adapted to support the vane in central balance with its ends maintained with a uniform sealing contact with the walls of the cylindrical casing.

2. A rotary compressor, comprising a cylindrical casing, a rotor mounted eccentrically in said casing and having a transverse slot extending across the axis thereof, and an impeller vane extending through said slot and engaging the wall of the casing in constant operating contact, said wall being profiled eccentrically on either side of the plane extending through the centres of the casing and the rotor to form a sliding contacting seal between the face of the casing wall and the end

surfaces of the impeller as the impeller revolves around the mean centre between the axis of the rotor and the axis of the casing.

3. A rotary compressor, comprising a cylindrical casing, a shaft mounted eccentrically of said casing, a cylindrical rotor on the end of the shaft supported within said casing and having a transverse slot through its axis, a cap closing the cylindrical casing, a disc rotatably mounted in said cap concentric with the casing and having a slot extending through its axis, and an impeller vane sliding in the slot in the rotor and engaging the inner walls of the cylindrical casing in constant contact, said vane having a rigid extension of a length less than the diameter of said disc arranged in a plane right angular to the plane of the vane and engaging the walls of the slot in said disc in sliding contact.

4. A rotary compressor, comprising a cylindrical casing, a rotor mounted eccentrically of said casing and having a transverse slot through its axis, an impeller vane slidable in said slot and having constant contact with the casing wall, a lug on said impeller vane arranged centrally of the length and at one side thereof and extending in a plane in right angular relation to the plane of the vane, a cylindrical recess formed in one end of the casing and having a pair of semi-circular channels in the periphery, openings leading to each of said channels through the casing, and a disc rotatably mounted in said recess concentrically with the casing and having a slot extending across the axis thereof, said slot being of greater length than the lug projection of said impeller and having a sliding contact with the faces of said lug, the opposite ends of said slot communicating alternately with the peripheral passages communicating with the openings leading through the casing.

5. A rotary compressor, comprising a cylindrical casing, a rotor journaled eccentrically in said casing and having a slot extending diametrically therethrough and presenting continuous parallel surfaces, a vane having continuous parallel faces in sliding engagement with the faces of said slot, said vane projecting from the rotor and having both ends sealing the wall of the casing, a rotatable member journaled in the casing, and means connected centrally of the length of said vane and engaging said rotatable member to maintain both ends of said vane in constant operating contact with the walls of the casing supporting the same from end thrust in either direction.

6. A rotary compressor, comprising a cylindrical casing, a rotor journaled eccentrically in said casing and having a slot extending diametrically therethrough and presenting continuous parallel surfaces, a vane having continuous parallel faces in sliding engagement with the faces of said slot, said vane projecting from the rotor and having

both ends engaging the wall of the casing, a cylindrical recess of lesser diameter than said cylindrical casing and opening from one side thereof and arranged concentric thereto, a disc rotatably mounted in said recess and having a diametrical parallel sided slot therein, and a flat lug unitary with the impeller vane arranged centrally of the length thereof and in right angular relation thereto and having a sliding bearing in the slot in said disc, the inner face of said disc being flush with the adjacent end wall of the cylindrical casing and bearing against the longitudinal edge of the impeller vane.

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