April 9, 1935. E. O. RODAWAY 1,997,233

ROTARY PUMP

Filed Dec. 16, 1933 4 Sheets-Sheet 1

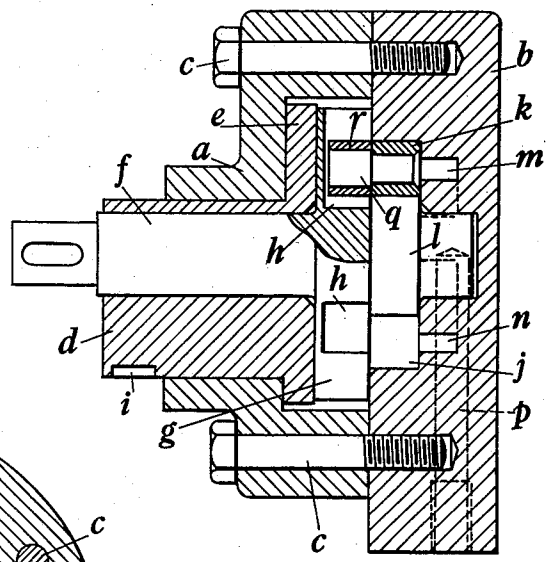


Fig.1

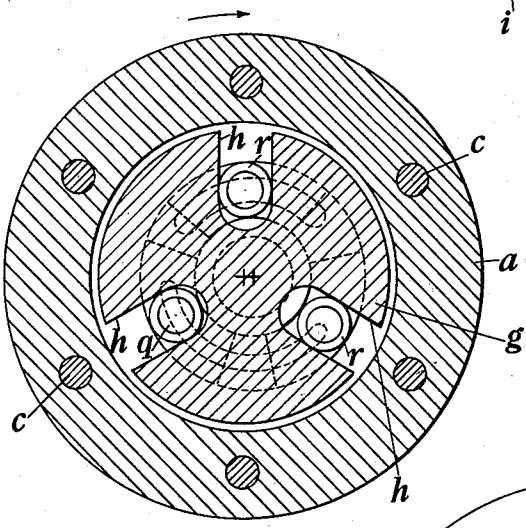


Fig.2

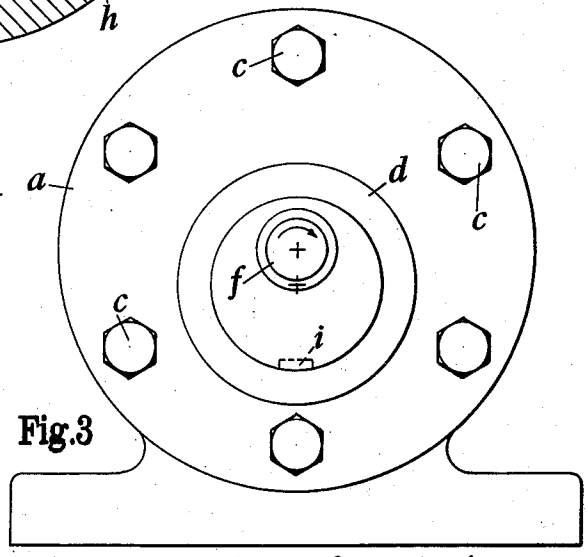


Fig.3

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ROTARY PUMP

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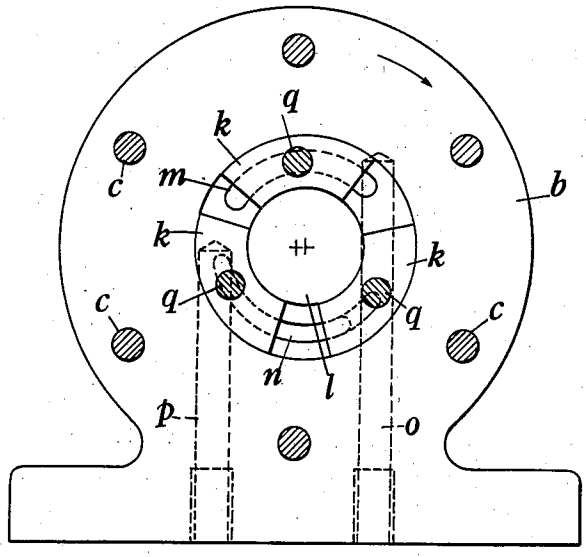


Fig.4

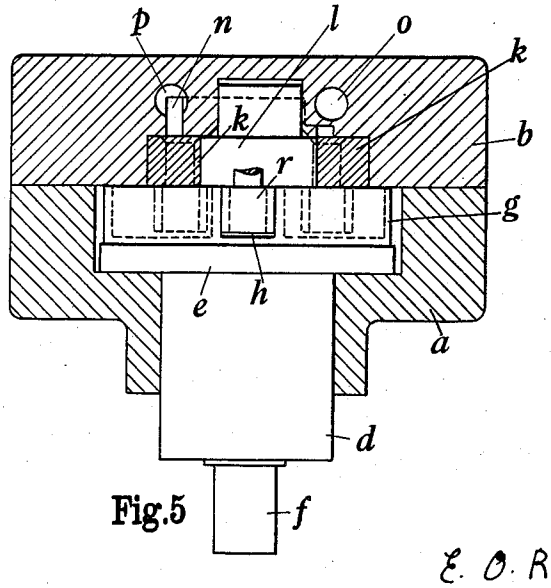


Fig.5

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ROTARY PUMP

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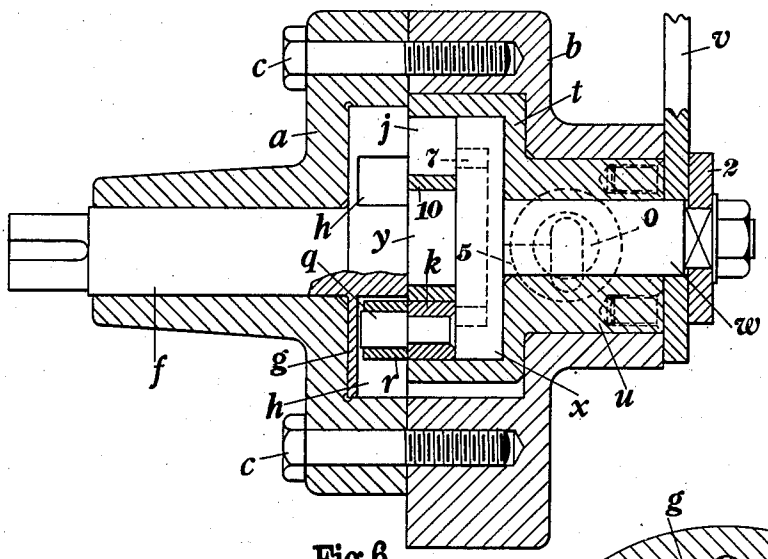


Fig.6

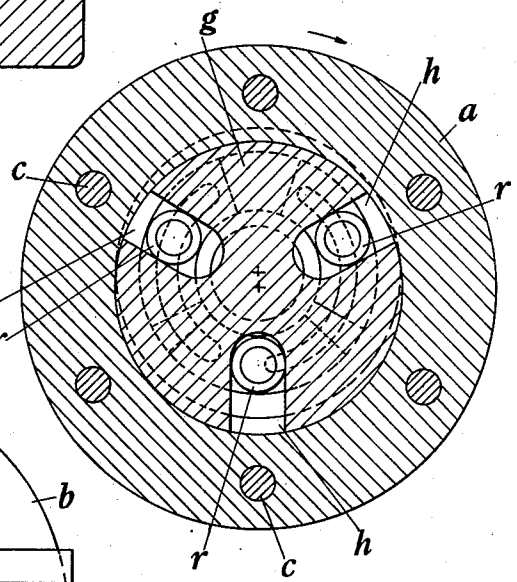


Fig.7

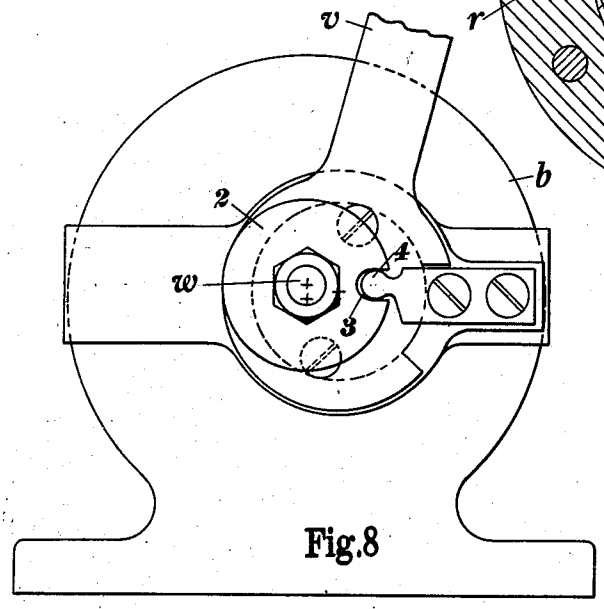


Fig.8

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ROTARY PUMP

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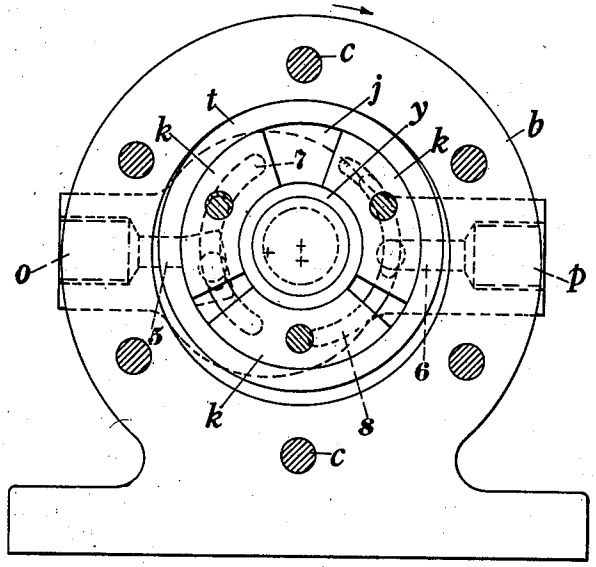


Fig.9

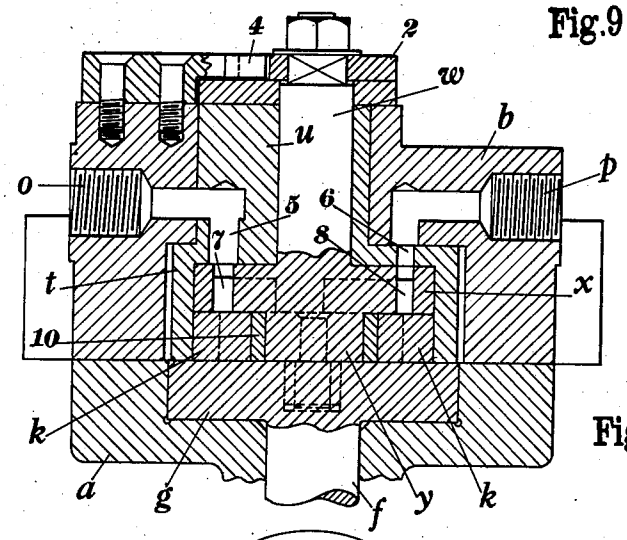


Fig.10

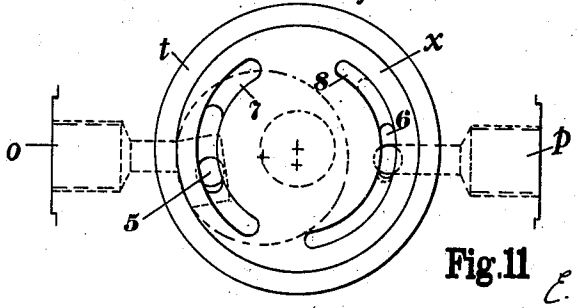


Fig.11

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UNITED STATES PATENT OFFICE

1,997,233

ROTARY PUMP

Edgar Orlando Rodaway, Birmingham, England, assignor to Thomas Savery Pumps Limited, London, England

Application December 16, 1933, Serial No. 702,773
In Great Britain December 19, 1932

6 Claims. (Cl. 103—129)

This invention relates to rotary pumps of the kind in which an annular channel is provided within the pump body part. In this channel are arranged impellers which closely fit the sides of the channel. The impellers are connected to another and eccentrically placed part, and the operation of the pump is effected by relative rotation of the impellers and the annular channel.

The object of the present invention is to provide improved pumps the output of which can be readily adjusted or varied to suit different working conditions.

The invention comprises pumps as aforesaid wherein the relative eccentricity of the annular channel and the part connected to the impellers is effected by rotation of an eccentrically mounted adjusting member.

In the four accompanying sheets of explanatory drawings:—

Figure 1 is a longitudinal section of a rotary pump constructed in accordance with this invention, the adjustment of output being obtained by altering the position of the axis of the driving spindle relatively to the axis of the impellers. Figure 2 is a cross section through the member which drives the impellers, and Figure 3 is an end view of the pump showing the driving spindle and its adjustable mounting.

Figure 4 is an elevation showing the annular channel and impellers, and Figure 5 is a sectional plan of the pump. Figure 6 is a longitudinal section of a rotary pump constructed in accordance with this invention in which the adjustment of output is obtained by movement of the axis of the annular channel and impellers relatively to the axis of the driving spindle. Figure 7 is a cross section through the member which drives the impellers and Figure 8 is an end elevation showing a controlling device to be hereinafter described and associated with the annular channel.

Figure 9 is an elevation showing the annular channel and impellers, and Figure 10 is a sectional plan of the pump.

Figure 11 is a detail view showing the passages between the annular channel and the inlet and outlet connections.

Referring to Figures 1–5, the body part of the pump consists of two main parts *a*, *b*, which are held together by screws *c*. In the one (*a*) is mounted a rotatable bush *d* which at one end is formed with a flange *e* having a small clearance between its periphery and the adjacent wall of the cavity in *a* in which it is contained. The bush carries eccentrically the driving spindle *f* on the inner end of which is formed a flange *g* which abuts at one side against the adjacent face of the aforesaid flange *e*, and in the opposite face of the flange *g* are formed three radial slots *h*. Rotary motion is imparted to the spindle *f* in any suitable and convenient manner, and the outer end of the bush *d* is adapted, as by means of a notch *i* for engagement by a tool or lever whereby the bush can be rotated for altering the position of the axis of the spindle *f*.

The annular channel *j* containing the segmental impellers *k* is formed in the body part *b*. In the construction shown a circular recess is formed in the inner face of the body part *b*, and in the centre of the space is secured a plug *l*, the annular space between the outer periphery of this plug and the inner periphery of the recess forming the channel. In the base of the channel are cut two segmental grooves *m*, *n*. One of them (*m*) communicates with an inlet passage *o* in the body part, and the other (*n*) communicates with the outlet passage *p*. To avoid intersection of the groove *n* by the passage *o* the groove *n* is stepped or made shallower adjacent to the passage than elsewhere as shown at the right hand side of Figure 5.

On looking at the drawings, it will be seen that whereas the axis of the spindle *f* is in the same plane as the axis of the channel in the elevation shown at Figure 1, the two axes are displaced slightly in the horizontal plane as shown in Figures 2, 4 and 5. The amount of this displacement, upon which the rate of delivery of the pump depends, can be varied by rotational adjustment of the bush *d* in the body part *a*. The disposition of the axis of the bush in relation to the other two axes, is such that when the bush is rotated the axis of *f* moves along an arc of a circle relatively to the axis of *j* such that the movement is almost along a short straight line. The amount of adjustment movement which can be given to the spindle *f* is limited by the contact of one side or the other of the flange *e* against the adjacent wall of the chamber in which it lies. This flange serves therefore in part as a stop for limiting the adjustment movement. Its flat faces by close contact with the adjacent flat faces of the body part and the member *g* serve to maintain a fluid tight seal which prevents leakage of fluid from the interior of the pump.

Rotary motion of the impellers around the channel *j* is effected by pegs *q* the outer ends of which are fitted with rollers *r* and are located in the radial slots *h* of the part *g*. These slots do not extend right through the part *g* but are closed at one side as shown in Figure 1 to avoid cutting into the flat surface of the part *g* which coacts with the corresponding surface on the part *e*.

In the modification shown in Figures 6–11, the adjustment of output is obtained by moving the annular channel relatively to the axis of the spindle *f*. The two pumps are essentially the same in action and the description of Figures 1–5 applies to a large extent to Figures 6–11. In

the following additional description of Figures 6–11 I will therefore confine myself to the differentiating features. Here the annular chamber mounted in the part *b* is formed by a member *t* having a circular recess or cavity in its front end. This part *t* is formed on one end of an eccentric bush *u* which can be rotated by a handle *v* or other means. Within the bush *u* is mounted a spindle *w* on which is formed a flange *x* which serves as the base of the annular chamber, and a central portion *y* carrying a hardened ring 10 the periphery of which serves as the inner circumferential wall of the chamber, the outer wall being formed by the part *t*. The connection between the impellers *k* in the annular chamber and the slotted flange *g* of the driving spindle *f* is effected as already described.

The part *t* lies within a circular cavity in the body part *b* and is movable in relation thereto by rotating the bush *u*, the amount of movement being limited by contact of peripheral portions of *t* with adjacent parts of the cavity in *b*. Looking at Figures 6 and 9 the position of the axis of the bush *u* is such that rotational movement of the bush causes the axis of the spindle *w* to move along a short arc in relation to the axis of the spindle *f* and so alter the relative positions of those axes for varying the output of the pump. It is necessary, however, to avoid imparting to the part *x* (in which are formed passages 7, 8) the same rotational movement as is imparted to the bush *u*, and this is effected by securing on the outer end of the spindle *w* a collar 2 (Figure 8) having formed at one side of it a notch 3 which is engaged by a projection 4 fixed on the body part *b*. By this device when the bush *u* is rotated it is rotated around the spindle *w* and the latter receives only or mainly a simple displacement of its axis relatively to the axis of *f*.

The inlet and outlet passages in the body are indicated by *o* and *p*, and these communicate through passages 5, 6, in the bush *u*, and arcuate slots 7, 8, in the part *x*, with the annular channel containing the impellers, and the shape and disposition of these various passages (together with the device 3, 4, above described) are such that adjustment of the bush *u* can be effected without interfering with the proper relationship of the passages and the gaps between the impellers.

By this invention I am able to effect the required adjustment of delivery in pumps of the kind to which the invention relates in a very simple and convenient manner. The invention is not limited to the examples above described, and it will be readily understood that the parts may be so arranged that the impellers are held stationary and the rotary motion is given to the channel. If desired also both the impeller and the annular channel may be separately adjustable.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a rotary pump, the combination of relatively adjustable rotor and stator members, an annular channel in one of said members, a plurality of impellers slidably fitted in said channel and connected with the other of said members, suction and delivery passages communicating with said channel, a driving spindle rigid with the rotor member, and a rotatable adjusting bush which carries one of the said members and which is eccentrically mounted relatively to the driving spindle and to the annular channel, substantially as described.

2. In a rotary pump, the combination of a stator, an annular channel in the stator, an adjustable rotor having a driving spindle, a plurality of impellers slidably fitted in said channel, interconnecting means between the impellers and the rotor, suction and delivery passages communicating with said channel, and a rotatable adjusting bush which eccentrically carries the said spindle and which is itself eccentrically mounted relatively to the said annular channel, substantially as described.

3. In a rotary pump, the combination of a stationary body part, a cylindrical cavity in the body part, an annular channel in one of the flat walls of the cavity, an adjustable rotor arranged in the cavity and having a driving spindle, radial slots formed in the rotor, a plurality of impellers slidably fitted in said channel, projections carried by the impellers and slidably engaging said slots, suction and delivery passages communicating with said channel, and a rotatable bush eccentrically carrying the said spindle, the said bush being eccentrically mounted, relatively to the annular channel, in the other of the said flat walls, and being provided with an integral flange which is contained in said cavity and is adapted to limit the adjustment movement of the bush by the contact of its periphery with the circumferential wall of the cavity, substantially as described.

4. In a rotary pump, the combination with a rotor having a fixed axis and provided wth a driving spindle, of a stator including adjustable and non-adjustable parts, an annular channel in the adjustable part, a plurality of impellers slidably fitted in said channel, interconnecting means between the impellers and the rotor, suction and delivery passages communicating with said channel, and a rotatable adjusting bush which eccentrically carries the said adjustable part and which is itself eccentrically mounted relatively to the said driving spindle, substantially as described.

5. A rotary pump as claimed in claim 4, in which the adjustable part of the stator comprises a cylindrical part forming the outer wall of the annular channel, a second cylindrical part forming the inner wall of the channel, a circular piece forming the base of the channel, and a supporting spindle carrying both the said second cylindrical part and the circular piece, the said supporting spindle being carried by the adjustable bush and having means for engaging the non-adjustable part of the stator.

6. In a rotary pump, the combination with a rotor having a fixed axis and provided with a driving spindle, of a stator including adjustable and non-adjustable parts, a cylindrical cavity in the non-adjustable stator part, an annular channel in the adjustable stator part, radial slots formed in the rotor, a plurality of impellers slidably fitted in said channel, projections carried by the said impellers and slidably engaging said slots, suction and delivery passages communicating with said channel, a rotatable adjusting bush which eccentrically carries the said adjustable part and which is itself eccentrically mounted relatively to the said driving spindle, the said adjustable part being provided with an integral flange which surrounds the said channel and which is mounted in the said cavity so that the adjustment movement of the bush is limited solely by contact of the periphery of the flange with the circumferential wall of the cavity, substantially as described.

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