May 27, 1941. E. O. RODAWAY 2,243,653

ROTARY PUMP

Filed Dec. 17, 1938 4 Sheets-Sheet 1

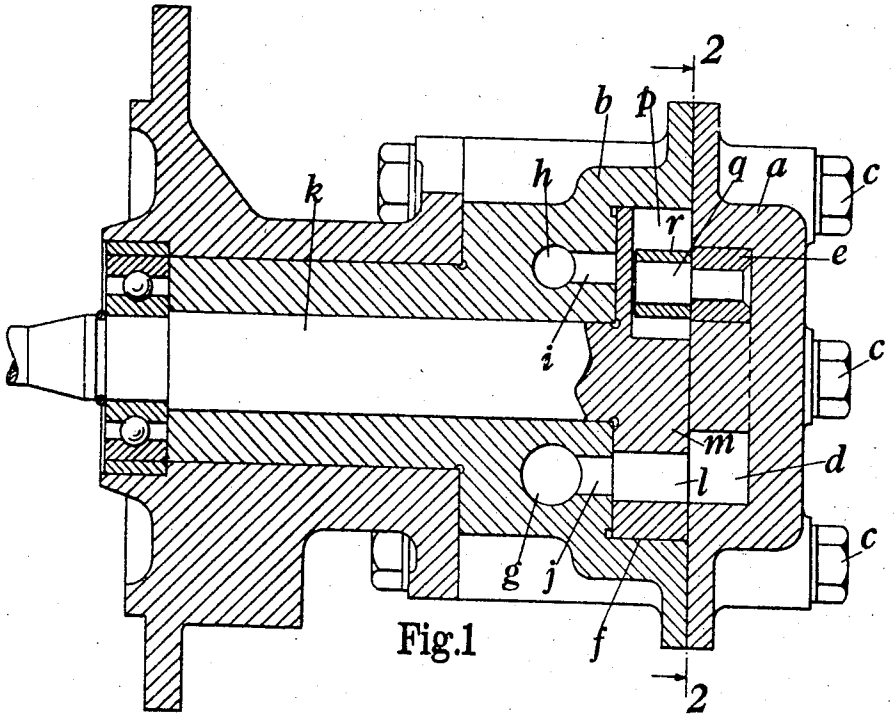


Fig.1

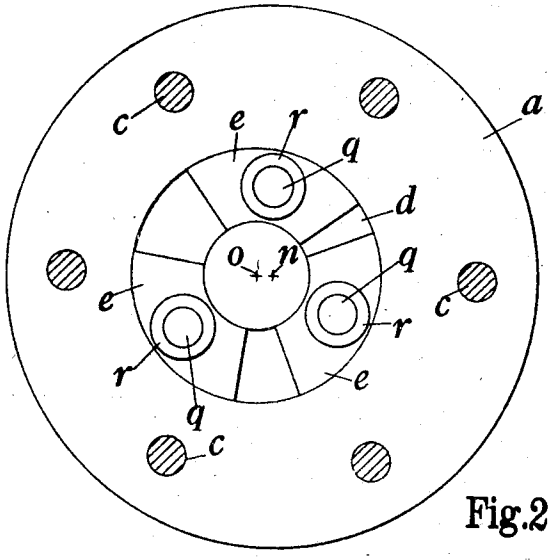


Fig.2

E. O. Rodaway
Inventor

By: Glascock Downing & Seebold
Attys.

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ROTARY PUMP

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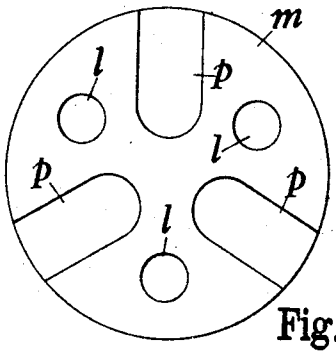


Fig.3

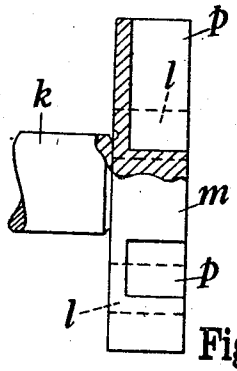


Fig.4

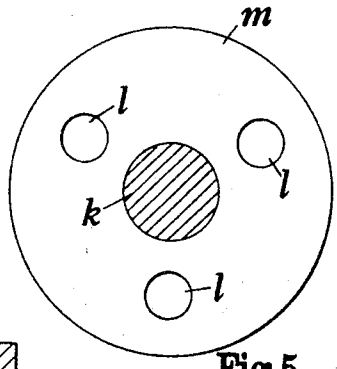


Fig.5

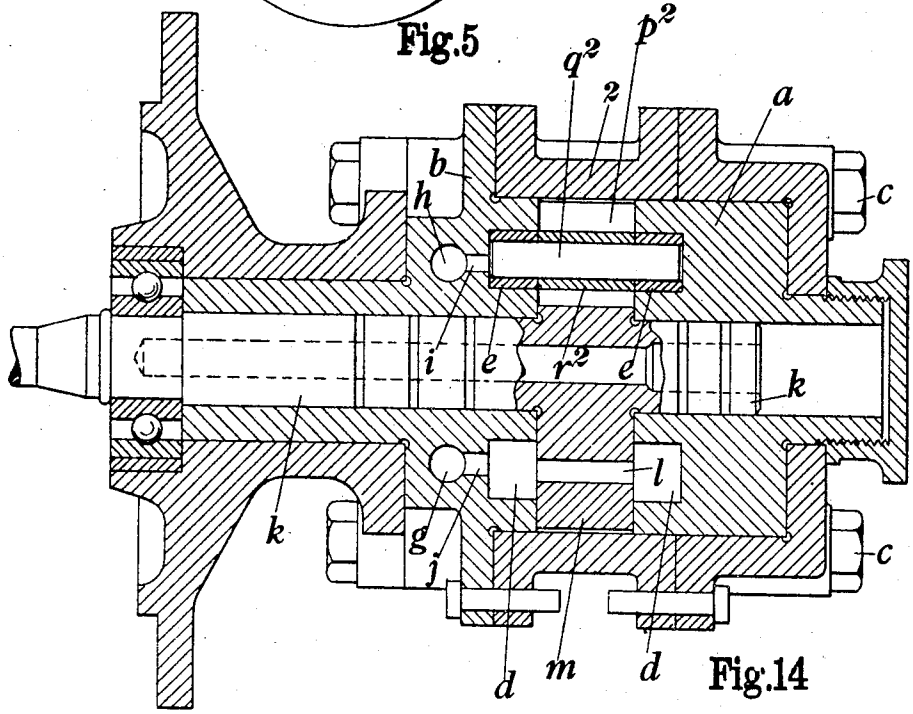


Fig.14

E. O. Rodaway
Inventor
By: Glascock Downing & Seebold
Attys.

May 27, 1941. E. O. RODAWAY 2,243,653

ROTARY PUMP

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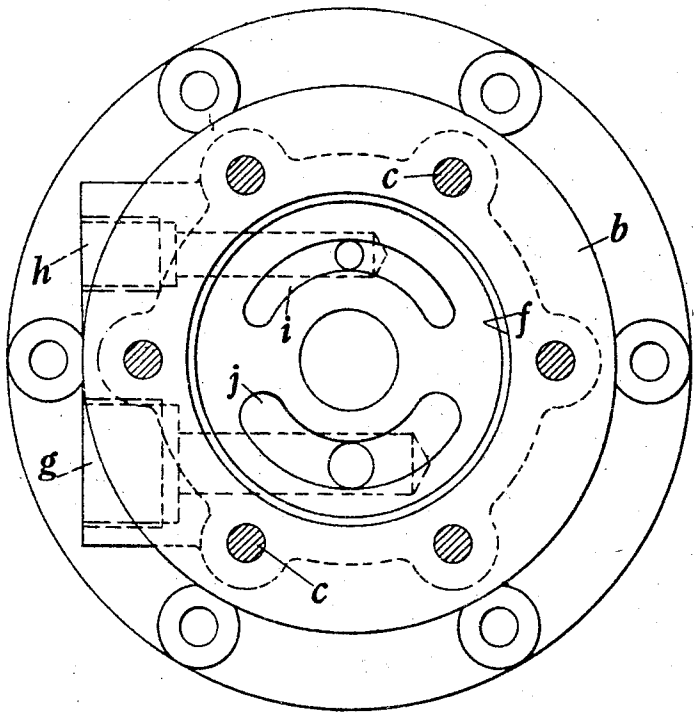


Fig.6

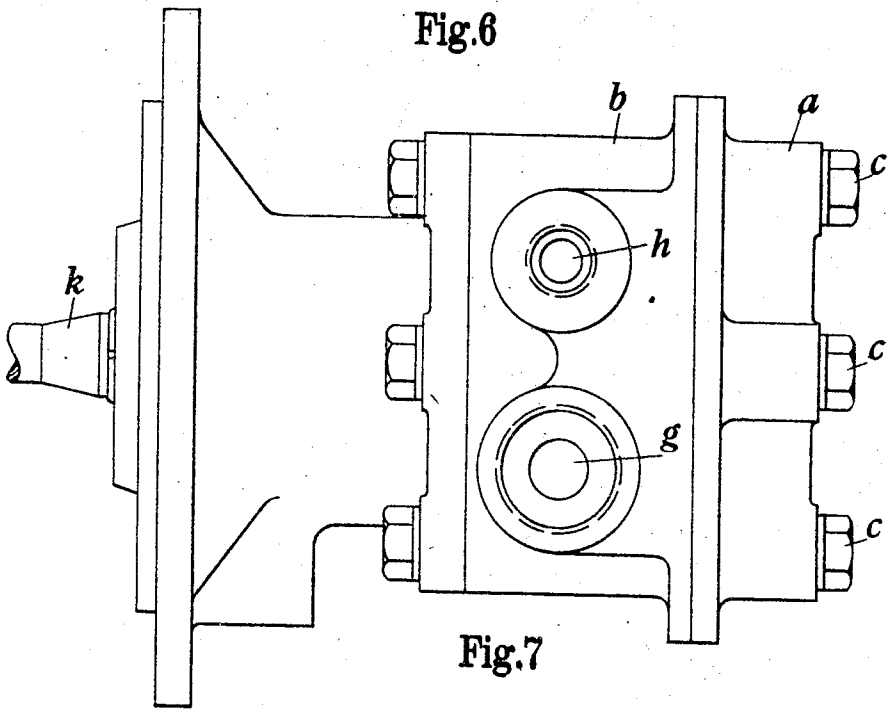


Fig.7

E. O. Rodaway
Inventor

By: Glascock Downing & Seibold
Attys.

May 27, 1941. E. O. RODAWAY 2,243,653

ROTARY PUMP

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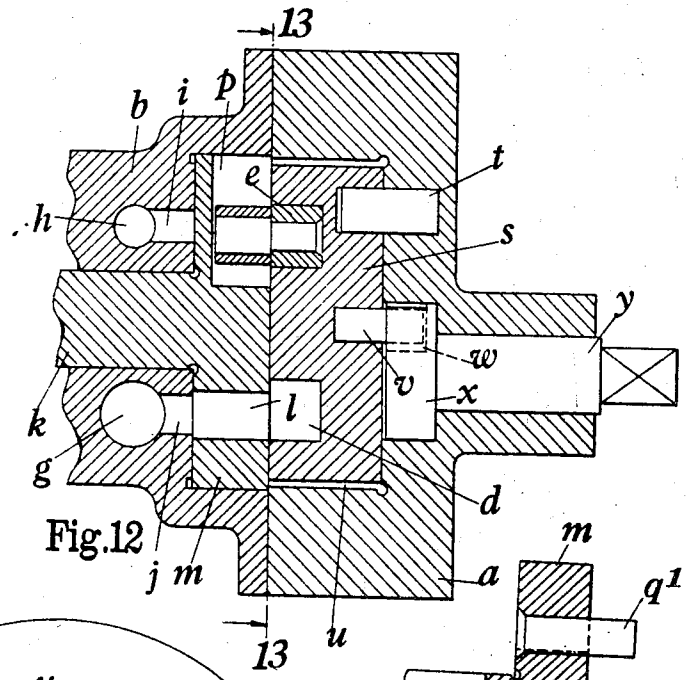


Fig.12

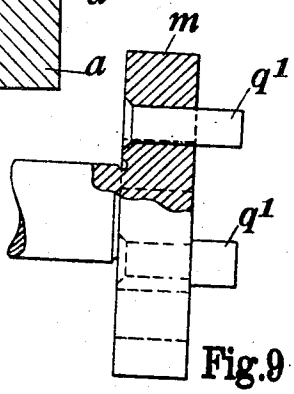


Fig.9

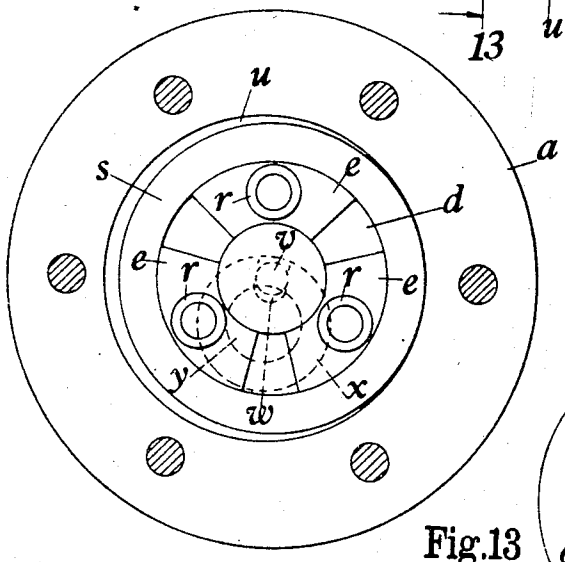


Fig.13

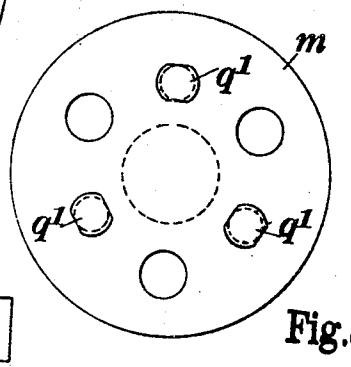


Fig.8

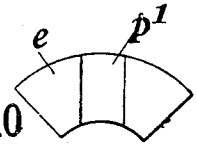


Fig.10

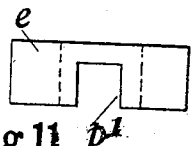


Fig.11

E. O. Rodaway
Inventor

By: Glascock Downing & Seibold
Attys

Patented May 27, 1941

2,243,653

UNITED STATES PATENT OFFICE

2,243,653

ROTARY PUMP

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

Application December 17, 1938, Serial No. 246,472
In Great Britain December 23, 1937

4 Claims. (Cl. 103—129)

This invention relates to a rotary pump of the kind in which segmental impellers mounted in an annular chamber are, during rotation around the chamber, caused to move towards and away from each other for effecting the required pumping action. The object of the invention is to provide a high pressure pump of small size and capable of operating at a high rate of speed.

In the accompanying sheets of explanatory drawings:

Figure 1 is a sectional side elevation of a rotary pump embodying the invention.

Figure 2 is a section on the line 2—2 of Figure 1 looking in the direction of the arrows.

Figures 3 to 5 are respectively a front view, a part sectional side view, and a rear view of the rotor of the pump shown in Figure 1.

Figure 6 is an end view of the pump shown in Figure 1 with some of the parts removed to expose the rotor chamber.

Figure 7 is a side elevation of the pump shown in Figure 1.

Figures 8 and 9 are respectively a front view and a part sectional side view of a modified form of the rotor.

Figures 10 and 11 are respectively a front view and a plan of one of the impellers used with the modified form of rotor shown in Figures 8 and 9.

Figure 12 is a sectional side elevation of a pump similar to that shown in Figure 1 but provided with means for enabling the delivery of the pump to be adjusted to suit different working conditions.

Figure 13 is a section on the line 13—13 of Figure 12 looking in the direction of the arrows.

Figure 14 is a sectional side elevation of a rotary pump embodying a modified form of the invention.

In carrying the invention into effect as shown in Figures 1 to 7, I employ a body consisting of two main parts *a*, *b*, having flat or other corresponding intermediate faces, these parts being secured together by screws or bolts *c*. In the part *a* of the body is formed an annular chamber *d* having a flat end or bottom surface, and in this chamber are placed two or more (three in the example shown) segmental impellers *e* having surfaces which closely fit the surface of the chamber, the lengths of the impellers being such as will provide the required pumping spaces between their ends.

The other part *b* of the body is formed with a cylindrical recess *f* having a flat end or bottom surface, suction and delivery passages *g*, *h*, communicating with segmental ports *i*, *j*, in the said surface, and a bearing aperture for the spindle *k* of the rotor *m*, the axis *n* of this latter being eccentric to the rotational axis *o* of the impellers *e* as shown in Figure 2. The diameter of the recess *f* is made larger than the outer diameter of the annular channel *d*.

The rotor *m* consists of a disc the surfaces of which closely fit the surfaces of the cylindrical recess *f*, and from one side of the rotor extends its driving spindle *k* which is supported in the above mentioned bearing aperture. One face of the rotor *m* abuts against a part of the adjacent face of the body part *a* containing the impellers *e*, and also against the adjacent faces of the impellers.

The driving connection between the rotor *m* and impellers *e* may be effected by various means. For example, I may form in the outer face of the rotor radial grooves *p* for engagement by projections *q* on the impellers as shown in Figures 1 to 5, the projections *q* being preferably provided with anti-friction rollers *r*. Or I may provide projections q^1 on the rotor *m* for engagement with transverse grooves p^1 in the impellers *e* as shown in Figures 8 to 11. In the latter case the projections q^1 may be provided with anti-friction rollers if desired.

Further, the rotor *m* is provided with passages *l* arranged parallel with its axis and opposite the pumping spaces between the ends of the impellers *e*, the purpose of these passages being to connect the said pumping spaces with the segmental suction and delivery ports *i*, *j*, alternately. The number of the passages *l* corresponds with the number of impellers. Thus three such passages are provided in the examples shown, but when only two impellers are used (this number being ordinarily sufficient in a small pump) only two passages are provided in the rotor.

When it is desired to make the output of the pump variable, this condition can be met by making any suitable provision for varying the relative eccentricity of the rotor and impellers. For example as shown in Figures 12 and 13 the impeller channel *d* is formed in a disc-like component *s* which is made separately from the body part *a* of the pump, and which is pivotally supported by an eccentrically arranged peg *t* in a cylindrical recess *u* formed in the body part *a*, the arrangement being such that by pivotal adjustment of the component *s* the relative eccentricity of the rotor *m* and impellers *e* can be varied as required. The amount of adjusting movement that can be imparted to the component *s* is limited by contact of peripheral

parts of the component with adjacent parts of the peripheral wall of the recess *u*. For enabling this movement to be imparted to the component *s* the latter carries at the centre of, or at any other convenient position on, its inner face a peg *v* which engages a radial recess *w* in the adjacent face of a disc *x* on one end of an adjusting spindle *y*. This disc *x* and its spindle *y* are rotatably supported eccentrically to the disc-like component *s* in the body part *a*, the end of the spindle remote from the disc being exposed and being of square or other non-circular form for engagement by any convenient operating implement. By turning the spindle *y* the disc-like component *s* is pivotally adjusted about the axis of the peg *t* by the interaction of the recess *w* in the disc and the peg *v* on the disc-like component. In other respects the example shown in Figures 12 and 13 is similar to that previously described.

Instead of forming the impeller channel *d* in an adjustable component made separately from the body part *a* as above described, the rotor *m* and its spindle *k* may be mounted in a separately made and rotatably adjustable component of the body part *b*.

Rotation of the rotor *m* causes the impellers *e* to move with it, and on account of the relative eccentricities of these parts the spaces between the impeller ends alternately expand and contract during each rotation. While either of these spaces is expanding liquid is drawn into it through the adjacent rotor port *l* and the segmental suction port *i*, and when the space is subsequently contracted the liquid is discharged through the same rotor port *l* and the segmental delivery port *j*. During the short interval in which the rotor ports *l* are passing the region between the adjacent ends of the segmental ports *i*, *j*, there is little or no change in the volume of the pumping spaces.

In the modification shown in Figure 14 I arrange the rotor *m* between and in contact with adjacent flat faces of the body parts *a*, *b*, which may each be provided with a bearing aperture for accommodating a corresponding part of the rotor spindle *k*, the adjacent peripheral portions of the body parts *a*, *b*, being surrounded by an annular member **2** which serves with the said body parts to enclose the space occupied by the rotor. Also I form in each of the adjacent flat faces of the parts *a*, *b*, an annular chamber *d* containing impellers *e* as above described, the outer faces of the impellers being in contact with the adjacent faces of the rotor. One of these chambers *d* communicates through the segmental ports *i*, *j*, with the suction and delivery passages *g*, *h*, in the body part *b*, and the pumping spaces between the ends of the impellers in this chamber communicate through the passages *l* in the rotor *m* with the pumping spaces between the impellers in the other chamber. As in the previous examples the axis of the rotor *m* is eccentric to the rotational axis of the impellers *e*. The driving connection between the rotor *m* and the impellers *e* is effected by spindles as q^2 which at opposite ends engage corresponding impellers in the two chambers *d*, and which pass through radial slots as p^2 in the rotor *m*, anti-friction rollers as r^2 being preferably provided on the parts of the spindles q^2 lying within the slots p^2. During the operation of this pump liquid is drawn into and delivered from the pumping spaces between the impellers *e* through the suction and delivery passages *g*, *h*, in the body part *b*, the passages *l* in the rotor *m* serving to permit the flow of liquid between the corresponding pumping spaces at opposite sides of the rotor, and thereby enabling the pressures exerted on opposite sides of the rotor by the liquid being pumped to be balanced.

By this invention I am able to construct high efficiency, high pressure pumps of the kind specified in a small and compact form and capable of being satisfactorily operated at relatively high speeds.

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

1. A rotary pump comprising the combination of a body provided with suction and delivery ports, a rotor mounted in said body, an annular chamber provided in said body at one side of said rotor, at least two segmental impellers mounted in and rotatable around said chamber, said rotor being provided with ports which are in constant communication with spaces between the ends of the said impellers, and which are successively brought into communication with said suction and delivery ports during rotation of said rotor, and means for effecting a driving connection between said rotor and impellers so that, when the pump is in action, said impellers rotate around said chamber and alternately approach and recede from each other.

2. A rotary pump comprising the combination of a body provided with suction and delivery ports, a rotor mounted in said body, an annular chamber provided in said body at each side of said rotor, at least two segmental impellers mounted in and rotatable around each of the annular chambers, said rotor being provided with ports which are in constant communication with spaces between the ends of said impellers, and which during rotation of the rotor are successively brought into communication with said suction and delivery ports through the spaces between the impellers in one of said chambers, and means for effecting a driving connection between said rotor and impellers so that, when the pump is in action, said impellers rotate around said chambers and alternately approach and recede from each other.

3. A rotary pump comprising the combination of a body provided with suction and delivery ports, a rotor mounted in said body, an annular chamber provided in said body at one side of said rotor, at least two segmental impellers mounted in and rotatable around said chamber, said rotor being provided with ports which are in constant communication with spaces between the ends of the said impellers, and which are successively brought into communication with said suction and delivery ports during rotation of said rotor, and means for effecting a driving connection between said rotor and impellers, said means comprising elongated radial slots in said rotor and pins secured to said impellers and projecting laterally into said slots.

4. A rotary pump as claimed in claim 1, and having means for varying the relative positions of the axis of the rotor and the rotational axis of the impellers, the said means comprising the combination with the body, of a separate component in which the impeller chamber is formed and which is pivotally mounted in a recess in the body, and an adjusting spindle having an operative connection with the said component.

EDGAR ORLANDO RODAWAY.