Jan. 3, 1928. 1,655,339

C. RIX

ROTARY PUMP

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Fig. 1.

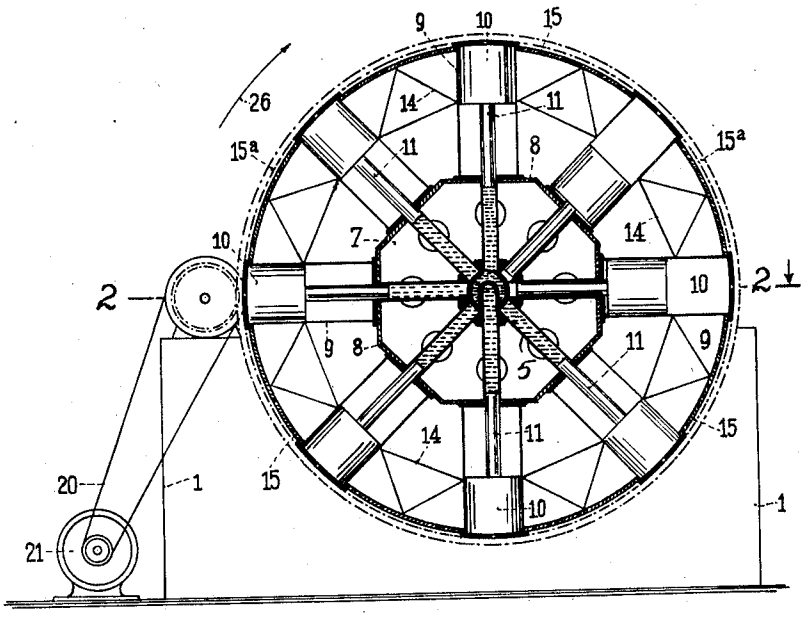
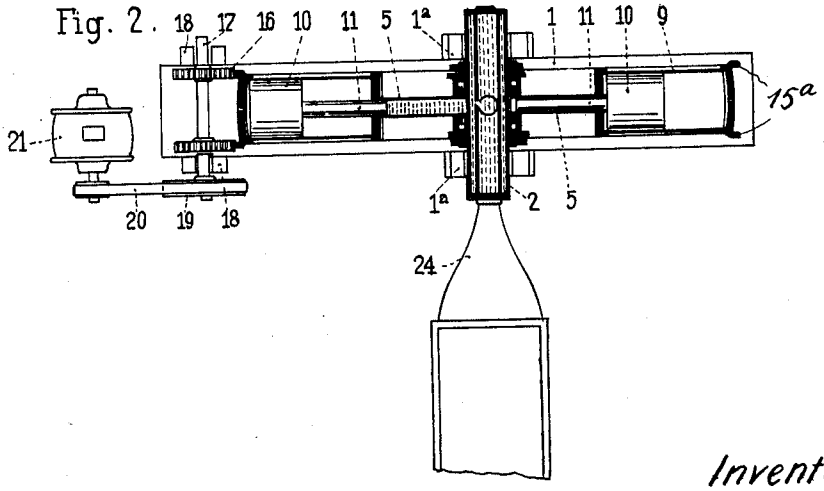



Fig. 2.




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Fig. 3.

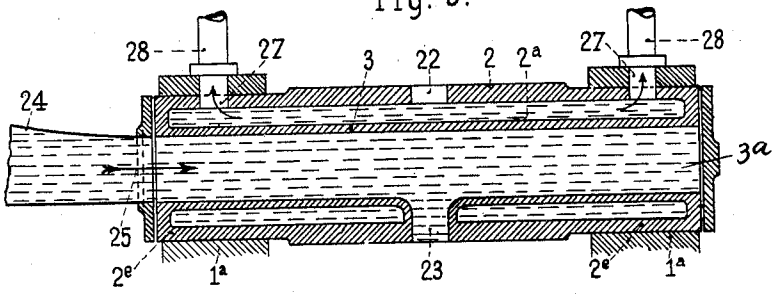



Fig. 4.

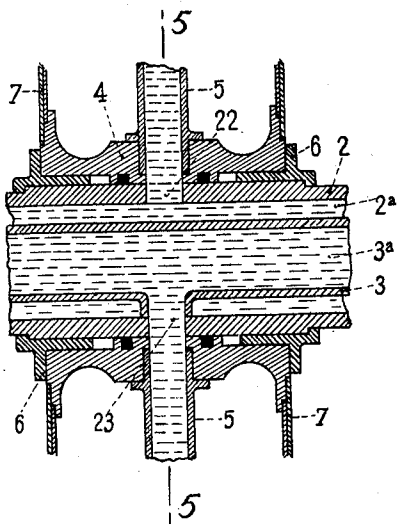



Fig. 5.

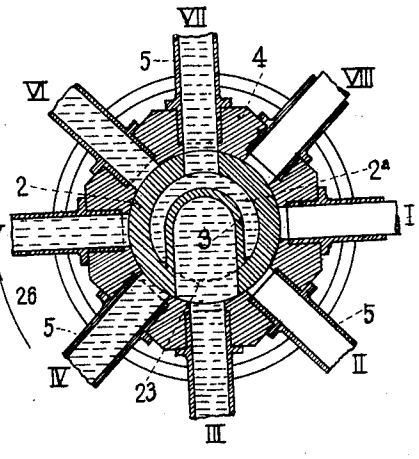
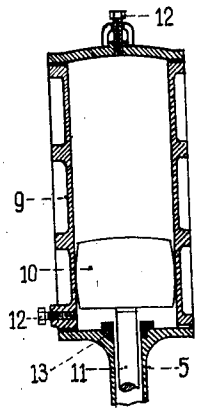



Fig. 6.




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# UNITED STATES PATENT OFFICE.

CARL RIX, OF EMDEN, EAST FRIESLAND, GERMANY.

## ROTARY PUMP.

Application filed June 10, 1926, Serial No. 115,104, and in Germany June 15, 1925.

This invention relates to a rotary pump of the kind having an impeller embodying a plurality of radially arranged cylinders fitted with gravity-operated pistons, said impeller being rotatably supported on a horizontal cylindrical body which contains the suction and delivery channels and which is provided with ports through which said channels are set in communication with the different cylinders.

The object of the invention is to reduce the friction to a minimum and to ensure a smooth running of the pump, and the invention consists essentially in arranging the delivery port so that the pressure stroke of the pistons takes place only when they are in a substantially vertical position. The weights of the pistons, moreover, are guided in cylinders wherein the air is trapped so as to serve as a buffer for the weight in both end positions.

Fig. 1 of the accompanying drawings represents a vertical section of the pump,

Fig. 2, a horizontal section of the same, taken on the line 2—2 of Fig. 1,

Fig. 3, a longitudinal section on an enlarged scale of the stationary body of the pump,

Fig. 4, a partial section of the same and of the adjacent part of the impeller,

Fig. 5, a section on the line 5—5 of Fig. 4, and

Fig. 6, a longitudinal section of one of the guide cylinders for the weights.

The pump frame 1 is provided with clamps $1^a$ in which the ends $2^e$ of a cylindrical hollow body 2 are held so as to maintain the body stationary in horizontal position. The body has an internal cylindrical wall 3 which divides it into two separate chambers or channels. The central channel $3^a$ receives the liquid from a supply 24 at one end of the body and communicates with a port 23 which opens at the underside of the body midway of the length of the latter. The outer channel $2^a$ communicates with a port 22 arranged at the top of the body opposite the port 23. It also communicates with two delivery pipes 28 which open into the body through the supports $1^a$.

The impeller consists of a plurality of cylinders 5 which are fitted radially into a central boss 4, the latter being rotatably arranged on the stationary body 2 between flanged collars 6 and tightened to the body by suitable packings. The cylinders open into the centre bore of the boss and pass across the ports 22 and 23 in succession. The outer ends of the cylinders are held in the peripheral wall 8 of a casing 7 which is built around the boss 4. This casing also carries a plurality of larger cylinders 9 arranged radially and in axial alignment with the cylinders 5. The cylinders 9 serve as guides for weights 10 to which pistons or plungers 11 are connected so as to be reciprocated within the cylinders 5. Packings 13 surrounding the pistons 11 ensure the necessary tightness between the cylinders 5 and 9. The weights 10 fit the cylinders 9 snugly so that the air will be trapped at the ends of the cylinders and form at each end of the cylinder a buffer whereby the shock of the falling weight will be absorbed. This buffer effect can be regulated by means of adjusting screws 12 fitted in appropriate air vents. The outer ends of the cylinders 9 are held by a circumferential rim 15 which is formed with two sets of teeth $15^a$ which mesh with pinions 16 whereby rotation is imparted to the impeller. The pinions 16 are mounted on a shaft 17 which is supported in bearings 18 and fitted with a pulley 19. The pulley receives motion from a motor 21 through the medium of a belt 20.

A triangular arrangement of struts and braces 14 is provided for strengthening purposes between each pair of adjacent cylinders 9.

The diameter of the port 22 is substantially the same as the internal diameter of each cylinder 5.

The modus operandi is as follows:

The impeller moves in the direction of the arrow 26. When a cylinder arrives in the position III (Fig. 5) it enters into communication with the suction port 23, and as the weight 10 drops towards the outer end of the cylinder 9, carrying with it the piston 11, water flows in the direction of the arrow 25 into the channel $3^a$ and thence into the cylinder 5. In the further movement of the impeller, the communication with the port 23 closes, and the piston and weight remain in the outermost position while passing through the positions IV, V and VI. In the vertical position VII, the cylinder enters into communication with the delivery port 22, and as the water is then free to leave the cylinder under the pressure of the weighted piston, the latter drops back towards the inner end of the cylinder, and water is forced

up the pipes 28. This process is repeated for each cylinder. As the pressure stroke cannot take place until communication is established between the cylinder and the port 22, and as this is effected when the cylinder is in a substantially vertical position, the piston movement will be opposed almost exclusively by the liquid, and friction between the weight and piston and their respective cylinder walls will be reduced to a minimum. Thus the elements will be protected from wear, and little lubrication will be required.

At the ends of the cylinders the weights 10 will be opposed by the air buffers, and no shocks will therefore be caused by the dropping of the weights.

The pistons remain in the inner ends of the cylinders while passing through the positions VIII and I and commence the outward movement while passing through the position II.

I claim:

1. A rotary pump of the character described, comprising a stationary cylindrical body supported in horizontal position and formed with a suction and delivery channel as well as with circumferentially opening, diametrically opposite ports communicating with said channels, the delivery port being situated at the highest point of the cylinder, an impeller arranged rotatably on said body, said impeller comprising a plurality of radially disposed cylinders having open inner ends and arranged so that said ends communicate with the ports only when the cylinders are in a substantially upright position, pistons arranged to telescope within said cylinders, weights connected directly to the pistons so as to operate the latter and separate cylinders in which said weights are guided.

2. The structure claimed in claim 1 wherein the cylinder for each piston and the cylinder in which its weight is guided are rigidly connected to each other.

3. The structure claimed in claim 1 wherein the guide cylinders for the weights are closed at both ends so as to cooperate with the weights and with the enclosed air for producing a buffer effect.

4. The structure claimed in claim 1 wherein the guide cylinders for the weights are closed at both ends except for small air vents so as to cooperate with the weights and with the enclosed air for producing a buffer effect, and means for adjusting the area of the air vents so as to regulate the buffer effect.

5. The structure claimed in claim 1 wherein the suction and delivery channels are concentric with each other.

6. The structure claimed in claim 1, a toothed rim surrounding the cylinder groups and connected to the outermost cylinders, and a driving motor arranged in gear with said rim.

7. The structure claimed in claim 1 and flanged collars secured to the cylindrical body so as to maintain the impeller in position thereon.

8. The structure claimed in claim 1, and flanged collars secured to the cylindrical body so as to maintain the impeller in position thereon, the impeller being tightened to said body by means of packings.

9. The structure claimed in claim 1, a boss whereby the impeller is mounted on the cylindrical body, and packings located in recesses in said boss for tightening the impeller to said body.

10. The structure claimed in claim 1 wherein the guide cylinders for the weights are closed at both ends and provided with small air vents so as to cooperate with the weights and with the enclosed air for producing a buffer effect, the air vents at the inner ends of the cylinders being situated at the sides of the latter at a small distance from the bottom.

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