

Oct. 13, 1925.

A. R. WILFLEY
CENTRIFUGAL PUMP
Filed June 9, 1924

1,556,657

3 Sheets-Sheet 1.

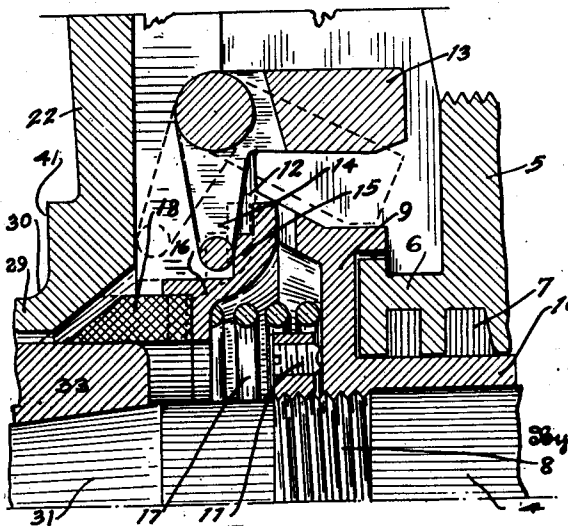
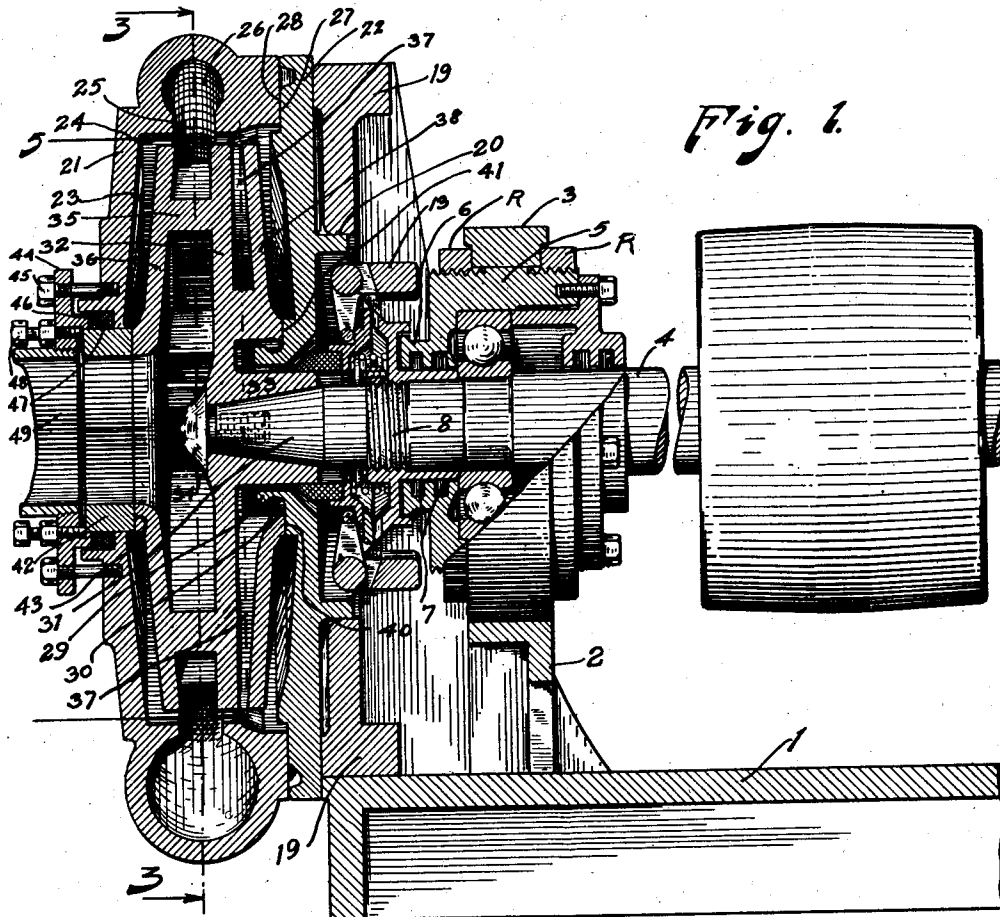


Fig. 2.

Inventor
Arthur R. Wilfley.
A. R. Wilfley
Attorney

Oct. 13, 1925.

1,556,657

A. R. WILFLEY

CENTRIFUGAL PUMP

Filed June 9, 1924

3 Sheets-Sheet 2

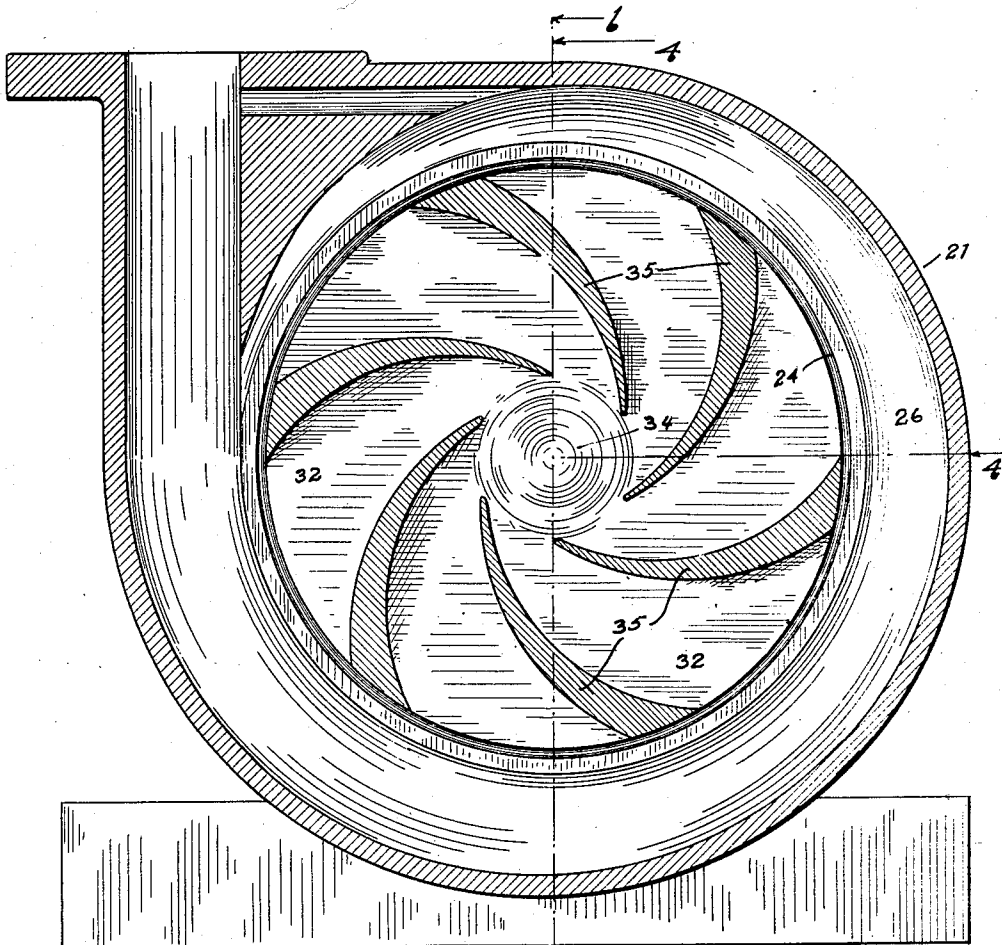


Fig. 3.

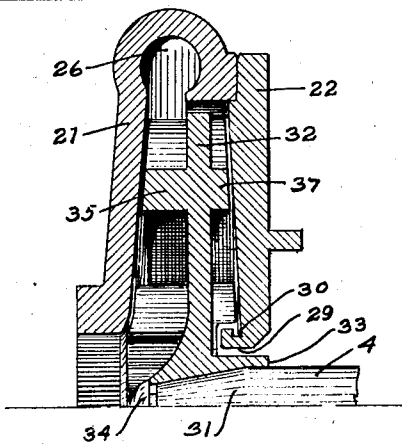


Fig. 4.

Inventor
Arthur R. Wilfley

By *W. O. Brien*

Attorney

Oct. 13, 1925.

1,556,657

A. R. WILFLEY

CENTRIFUGAL PUMP

Filed June 9, 1924

3 Sheets-Sheet 3

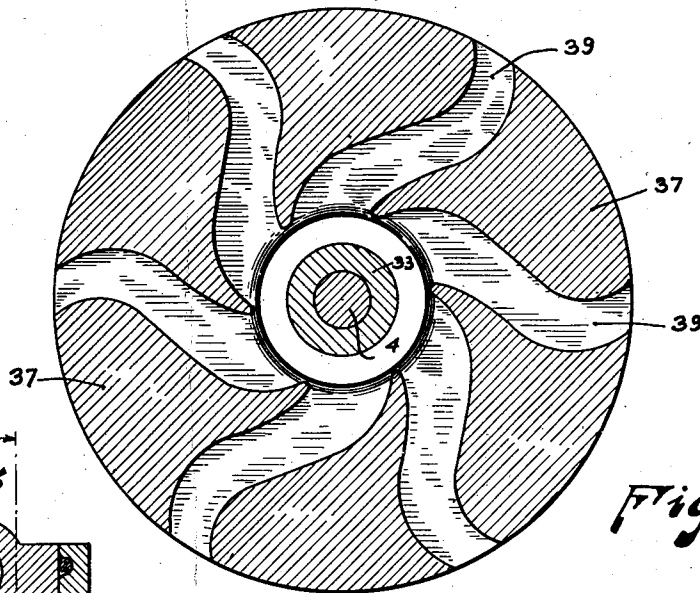


Fig. 5.

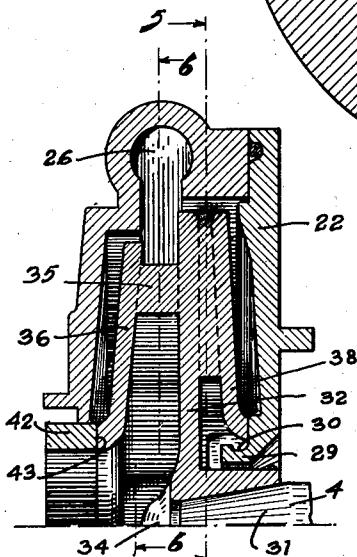


Fig. 7.

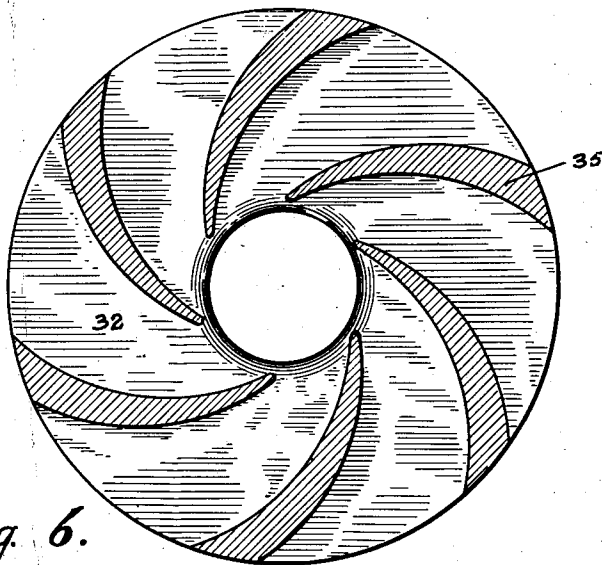


Fig. 6.

Inventor
Arthur R. Wilfley.

384 A. J. O'Brien

Attorney

UNITED STATES PATENT OFFICE.

ARTHUR R. WILFLEY, OF DENVER, COLORADO.

CENTRIFUGAL PUMP.

Application filed June 9, 1924. Serial No. 718,850.

To all whom it may concern:

Be it known that I, ARTHUR R. WILFLEY, a citizen of the United States, residing at Denver, in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Centrifugal Pumps; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in centrifugal pumps and has reference more particularly to pumps of the type used in connection with mines and other places where water containing sand and grit is to be handled, and where high suction is required, although the pump is equally adapted to handle clean water.

In pumps of this type it is essential that the runner shaft shall not directly engage the portion of the runner casing through which it passes. The hole through which the shaft enters the casing is therefore made larger than the shaft, which leaves an annular opening about the latter.

It is my object to provide means for keeping the opening around the shaft, and which forms communication between the runner chamber and the atmosphere, free from liquid when the pump is in operation, and additional means for sealing the opening when the pump is inactive, in order to prevent any liquid which may be above the pump casing, as in a stand pipe, for instance, from leaking out through the same.

My invention consists in particular combination and arrangement of parts, which can best be described when reference is had to the accompanying drawing, in which the preferred embodiment of my invention is shown, and in which:

Fig. 1 is a view showing a section taken on line 1—1, Fig. 3, a portion of the pump being shown in elevation;

Fig. 2 is a fragmentary section to a some-

what enlarged scale showing the means for sealing the opening when the pump is inoperative;

Fig. 3 is a section taken on line 3—3, Fig. 1;

Fig. 4 is a fragmentary section taken on line 4—4, Fig. 3, showing a slightly modified form of runner;

Fig. 5 is a section taken on line 5—5, Figs. 1 and 7.

Fig. 6 is a section taken on line 6—6, Fig. 7; and

Fig. 7 is a fragmentary section showing a second modification.

My improved pump has a base 1 provided with a bearing supporting bracket 2 near one end. This bracket has a ring 3 within which is mounted a bearing in which the shaft 4 rotates. As my present invention has nothing to do with the specific bearing employed, I will refrain from describing the same in detail.

Another bearing bracket similar to bracket 2 is secured to the other end of the base, but this has not been shown. That part of the bearing support designated by the numeral 5 has a hub portion 6 provided on its inner surface with grooves for the reception of rings 7 of felt or similar material. Shaft 4 has a threaded portion 8 to which is secured a member 9. This member has a hub 10 that projects towards the ball bearing and whose outer surface contacts with the inner surfaces of the rings 7. The hub 10 also extends to the other side of the flanged portion of the part indicated by the numeral 9 in Fig. 2 and has its inner surface threaded so as to engage the threaded portion 8 of the shaft. A set screw 11 serves to distort a portion of the hub to produce a binding action that will lock member 9 against rotation with respect to the shaft. Pivoted to the outer ends of the arms 12 are centrifugal governor elements formed in the shape of bell cranks, one end 13 of which is heavy and constitutes a weight. The other end, marked 14, engages the outwardly extending flange 15, which forms a part of the ring 16. This ring is impelled towards the left (Figs.

1 and 2) by means of a spring 17 and has attached to it another ring 18 that serves as a sealing means in a manner that will presently appear. It will be apparent from the above description, taken in connection with Figs. 1 and 2, that when the shaft 4 rotates, the weights 13 will tend to move outwardly and to turn the bell crank levers counterclockwise on their pivots, thereby moving the ring 16 towards the right against the force exerted by the spring 17. When the shaft rotates slowly or is stationary, the spring 17 functions and moves ring 16 toward the left. Formed integral with or secured by proper means to the base 1 is a bracket member 19. This member has a central opening 20 and serves as a support for the runner chamber which will now be described. The runner chamber is formed from two members 21 and 22. Member 21, seen as a section taken on line 3—3, Fig. 1 is shown in Fig. 3. The inner surface 23 of the front side terminates in a cylindrical wall 24. A passage 25 connects the runner chamber with the discharge channel 26, which forms a portion of the delivery port of the pump. Member 22 has an annular flat surface 27 which fits against a corresponding surface 28 and forms the rear wall of the runner chamber. Member 22 has a central opening bounded by the inwardly extending hub portion 29. The outer surface of this hub has a groove 30 in its outer surface. The parts 21 and 22 are secured together and to the supporting bracket 19 by suitable means (not shown) and normally occupy the positions shown in Fig. 1. Secured to the tapered end 31 of the shaft is a runner. This runner consists of a circular imperforate flange 32 having a hub 33 which has a tapered central opening for the reception of the tapered end 31 of the shaft. A bolt 34 serves to hold the runner in place on the shaft. Blades 35 of substantially the shape shown in Fig. 3 and constituting the main or pumping blades, connect the flange 32 with the annular wall 36 and thereby form a plurality of openings through which the water may flow. An auxiliary set of sealing blades 37 connect the rear side of the flange 32 with the annular rear wall 38. The blades 37 are spaced apart to form channels 39. The wall 38 has a surface 40 that has a running clearance with the corresponding annular surface 41 on the member 22. The front wall 21 of the runner chamber has a central intake opening within which is slidably mounted the cylindrical member 42 whose inner end is held in sliding engagement with the surface 43 of the wall 36.

In order to permit adjustments to be made for wear, I have provided means for moving the surface 40 towards 41 and for moving the member 42 inwardly from time to time. The first adjustment is accomplished by

means of the adjusting rings R which move the bearing 5 with respect to the frame member 3, and since the inner raceway is secured to the shaft the latter is also moved and the second adjusting means comprises a ring 44 that is secured to the wall member 21 by means of bolts 45. This ring has an annular projection 46 that serves to hold the packing material 47 in place. Bolts 48 pass through the member 44 and engage the end of the ring 42 and serve to move the latter inwardly whenever this becomes necessary. A pipe 49 leads to the water supply.

The runner may be modified slightly if desired. The main pumping blades 35 are usually given a backward curve as shown in Fig. 3. When there is no pressure, but rather a suction, in intake pipe 49, the auxiliary sealing blades 37 may be given a backward curve, (Fig. 6) similar to blades 35. However, when there is pressure in intake 49, some means must be provided so that blades 37 will withstand this excess pressure over the pressure produced by the centrifugal action of blades 35. This may be accomplished by making the auxiliary sealing blades of larger diameter than the main pumping blades as shown in Fig. 7 or by any other equivalent means.

The pump operates in the following manner:

Assuming that the pipe 49 is connected to a source of water supply and that the shaft 4 is being rotated by a suitable motor, the action will be as follows:

When the shaft starts rotating, the main pumping blades 35 will develop a pressure tending to make the water flow out through the discharge channel 26 and at the same time the weights 13 will develop a centrifugal force that tends to move the sealing ring 18 away from the wall of the opening about the shaft. When the speed has attained the proper amount, the pressure developed by the action of the blades 35 will cause the water to flow outwardly and the sealing ring 18 to be moved away from the walls of the opening. The pressure of the water will cause the spaces between the runner and the front and rear walls of the runner casing to become filled with water and thereby approximately balance the pressure on opposite sides of the runner. Water will also be forced into the openings 39 between the auxiliary sealing blades 37 and will extend towards the shaft to such a distance that the pressure due to the centrifugal force developed, will balance the pressure in the channel 26. Since the blades 37 develop a pressure at least equal to that in the delivery channel, the water will not flow towards the center and out through the unsealed opening while the pump is running. Any water that slips down past the surfaces 40 and 41 and into the groove 30, will be taken up by the

auxiliary blades and forced outwardly so that it will not enter the unsealed opening. Air cannot enter the pump in amounts sufficient to cause injury when it is running, for the reason that the openings 39 between the auxiliary blades are sealed with water and water also fills the spaces between the runner and the walls of the chamber. When the pump is stopped the spring 17 forces the sealing ring 18 into place and prevents water from flowing out of the runner chamber.

If the auxiliary blades are made longer in the manner shown in Fig. 7 the operation will be just the same, the only effect of the longer blades being to prevent the sealing water from entering the opening 39 as far as it would if the blades were shorter.

The removal of the walls 36 and 38 in the manner shown in Fig. 4, makes no material difference in the operation, but simplifies the manufacture of the runner.

Applicant desires to call particular attention to the fact that the auxiliary blades are separated from the main or pumping blades by an imperforate flange or disk and that they bear such relation to the pumping blades that they develop a pressure at least equal to that in the discharge channel. Another point that should be borne in mind is that the auxiliary or sealing blades are employed in a combination where there is an unsealed opening about the shaft. If the opening about the shaft were sealed as is the custom, then the auxiliary blades would have to perform a different function or be eliminated entirely.

The imperforate member is to cut off all direct communication between the intake opening 49 and the unsealed opening around the shaft, thereby preventing air from entering the runner proper and the auxiliary sealing blades prevent the liquid from flowing out the unsealed opening.

Having now described my invention, what I claim as new is:

1. In combination, a casing forming a runner chamber having an intake opening on one side and a circular shaft-receiving opening on the other side, a shaft projecting through said last named opening and into the chamber said shaft being of smaller diameter than the opening through which it passes whereby a passageway is formed about the shaft, a runner secured to the shaft and mounted for rotation within said chamber, said runner having a central imperforate flange with a set of main pumping blades on the side nearest the intake opening and a set of auxiliary sealing blades on the side nearest the shaft-receiving opening, and means for sealing the passageway about the shaft when the pump is inoperative and for opening the same when the pump operates.

2. In combination, a casing forming a runner chamber having an intake opening on one side and a shaft-receiving opening on the other side, a shaft projecting through said opening and into said chamber, a runner secured to said shaft and mounted for rotation within the runner chamber, said runner having a central imperforate flange with a main set of pumping blades on the side nearest the intake opening and a set of auxiliary sealing blades on the side nearest the shaft receiving opening, and means for taking up wear between the main pumping blades and the adjacent side of the runner chamber and between the auxiliary sealing blades and the adjacent side of the runner chamber.

3. In a centrifugal pump, in combination, a casing forming a runner chamber provided at one side with an intake opening and at the other side with a shaft-receiving opening, a shaft projecting through the last-named opening, said shaft being of smaller diameter than the opening whereby a passage is formed about the shaft, a runner secured to the end of the shaft within the runner chamber, said runner having a main set of pumping blades adjacent the intake opening and an auxiliary set of sealing blades adjacent the shaft-receiving opening, said sets of blades being separated by an imperforate member, and means for closing the passageway about the shaft when the pump is inoperative and for opening the same after the pump has started to operate.

4. In a centrifugal pump, in combination, a casing forming a runner chamber having an intake opening on one side and a circular shaft-receiving opening on the other side, a shaft projecting through the shaft-receiving opening and into the chamber, said shaft being of a smaller diameter than the opening whereby a passageway is formed about the shaft, a runner secured to the shaft and mounted for rotation within said chamber, said runner having a central imperforate flange provided with a set of main pumping blades on the side nearest the intake opening and a set of auxiliary sealing blades on the side nearest the shaft-receiving opening, and means for closing the passageway about the shaft when the pump is inoperative and for opening said passageway when the pump operates.

5. In a centrifugal pump, in combination, a casing forming a runner chamber having an intake opening on one side and a circular shaft-receiving opening on the other side, a shaft projecting through the shaft-receiving opening and into the chamber, said shaft being of a smaller diameter than the opening whereby a passageway is formed about the shaft, a runner secured to the shaft and mounted for rotation within

said chamber, said runner having a central imperforate flange provided with a set of main pumping blades on the side nearest the intake opening and a set of auxiliary sealing blades on the side nearest the shaft-receiving opening, and means for closing the passageway about the shaft when the pump is inoperative and for opening said passageway when the pump operates, said last-named means comprising a centrifugal device operatively connected to the shaft. 10

In testimony whereof I affix my signature.

ARTHUR R. WILFLEY.