April 16, 1929. A. V. JENSEN 1,709,580

ROTARY PUMP

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Fig. 1.

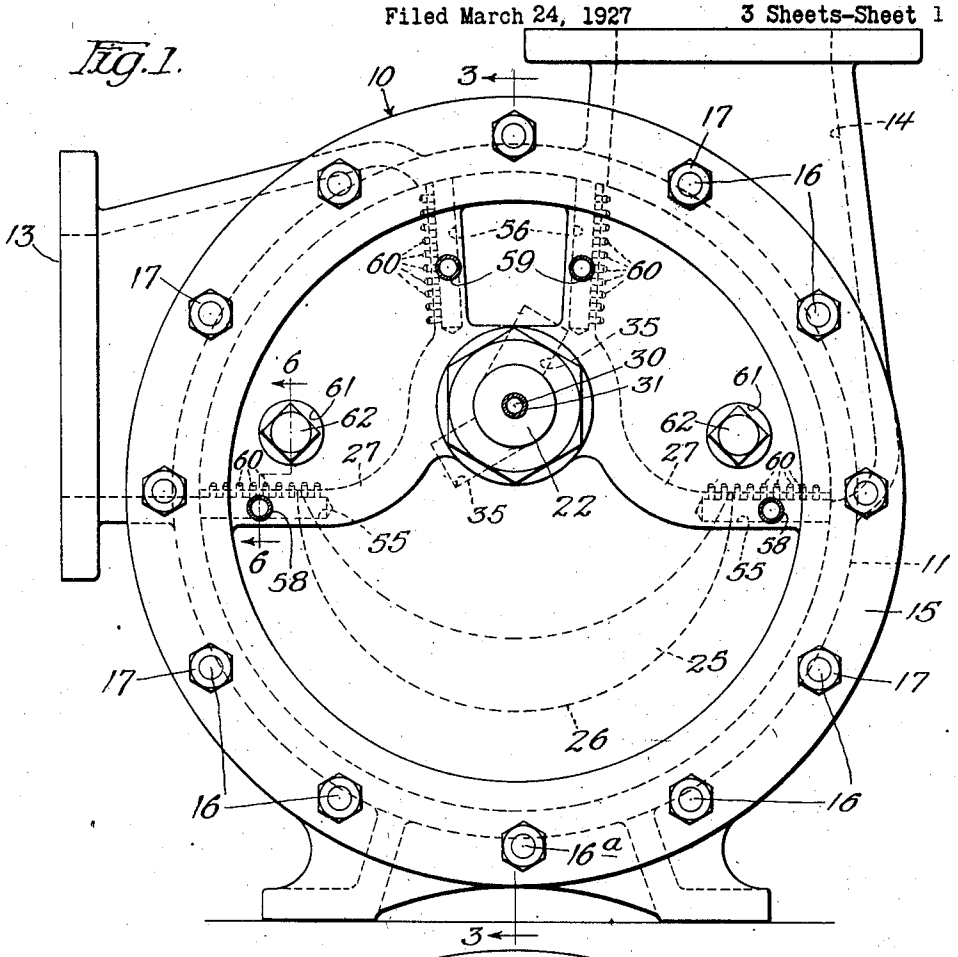
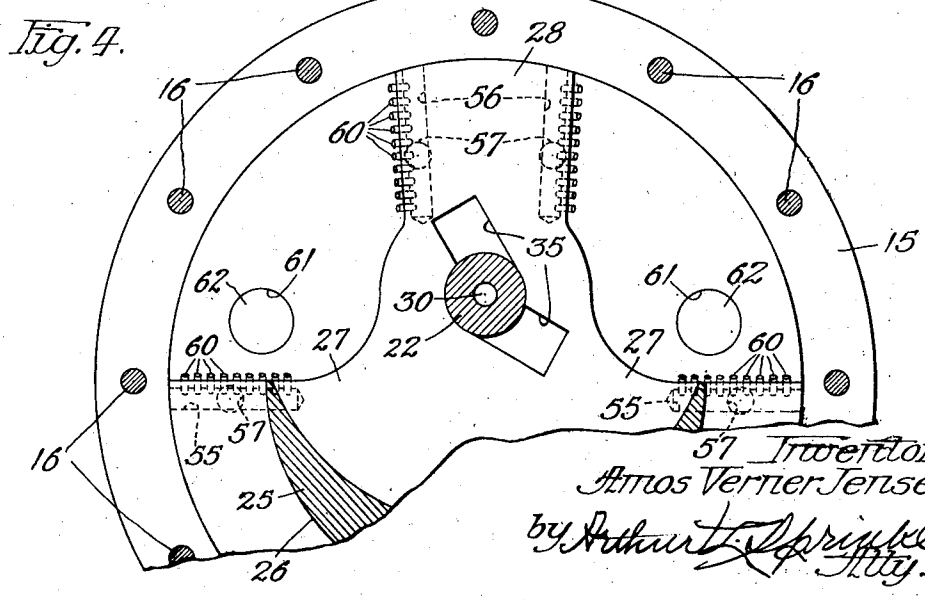


Fig. 4.



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ROTARY PUMP

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Fig. 2.

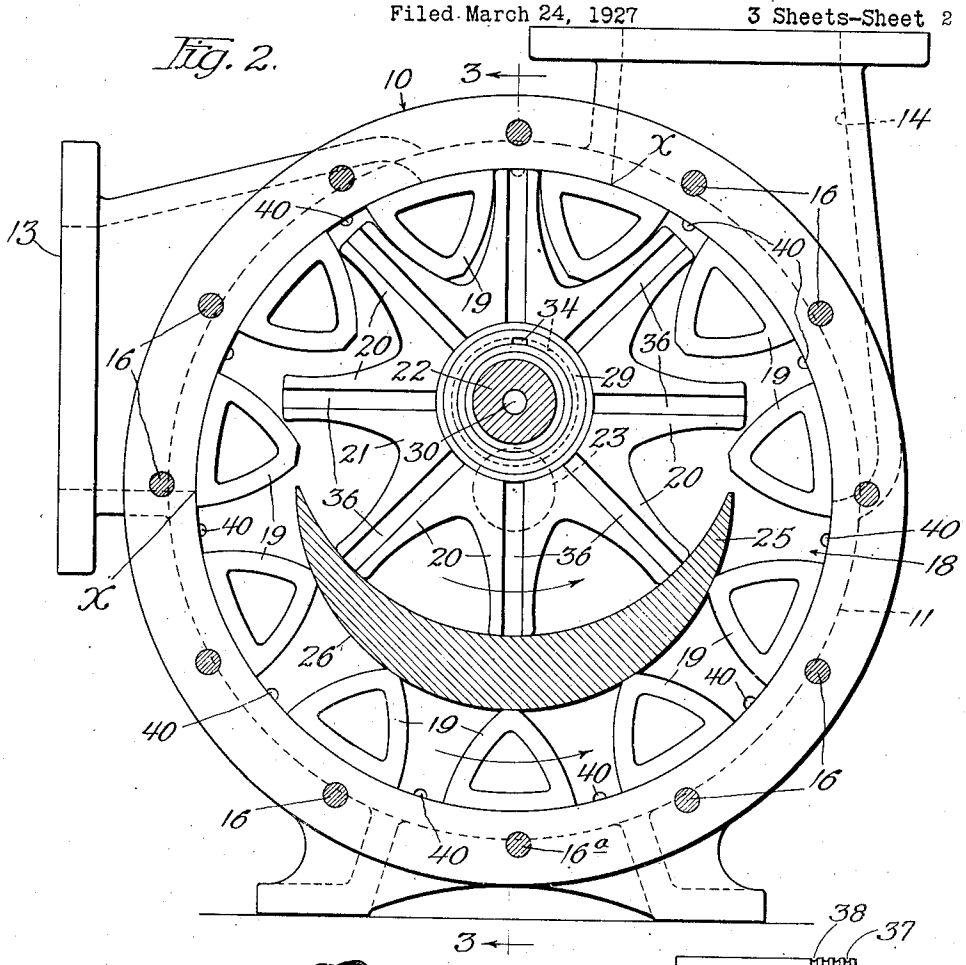


Fig. 5.

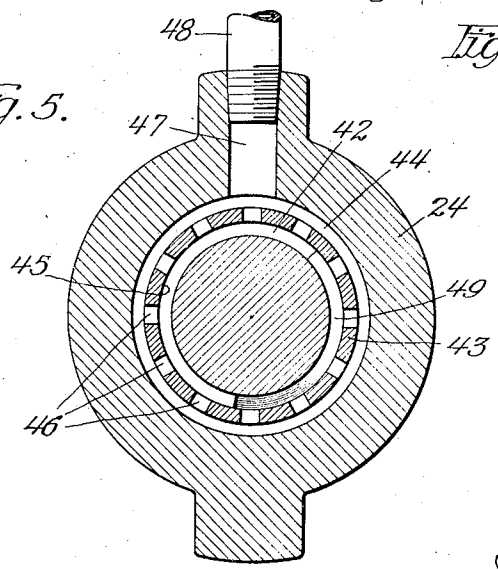
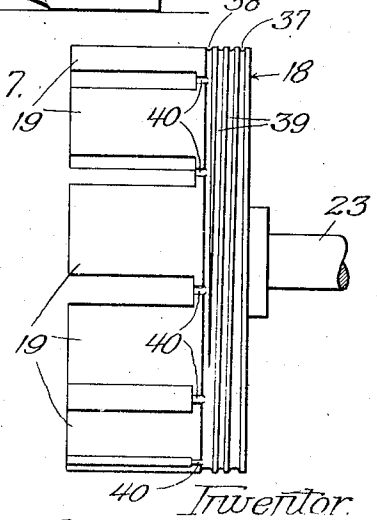


Fig. 7.



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ROTARY PUMP

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Fig. 3.

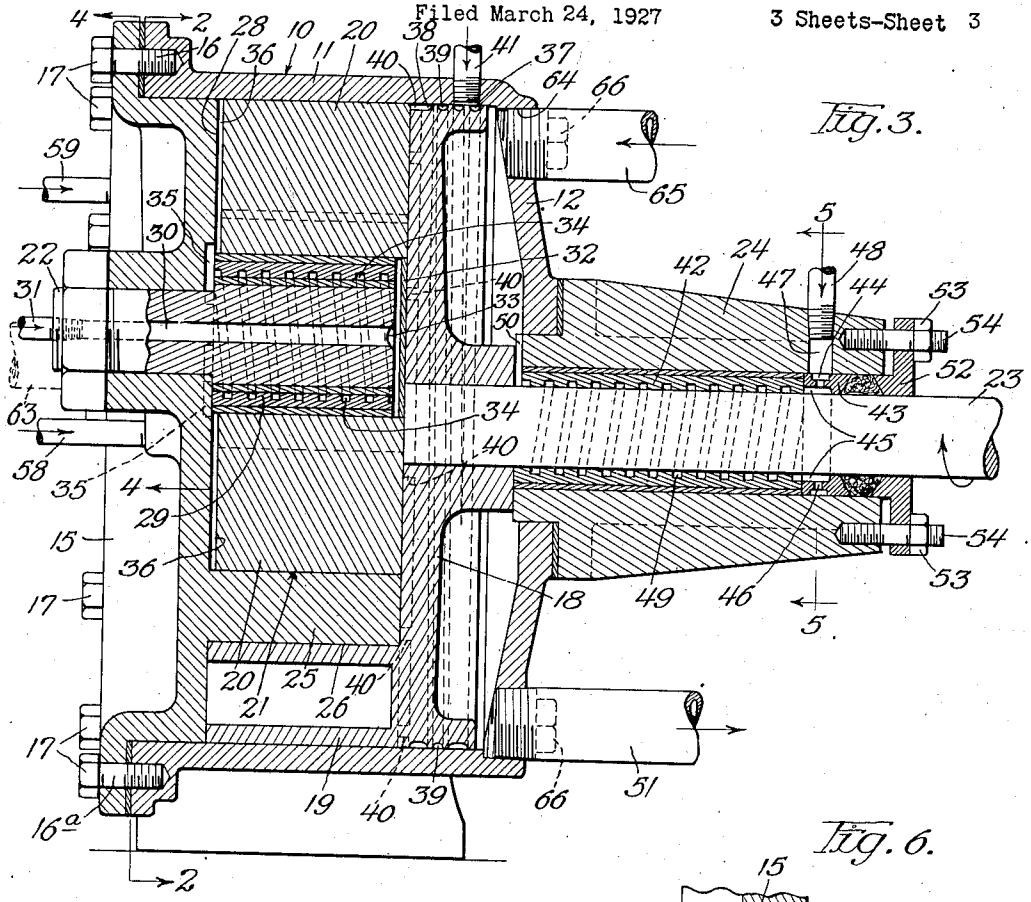


Fig. 6.

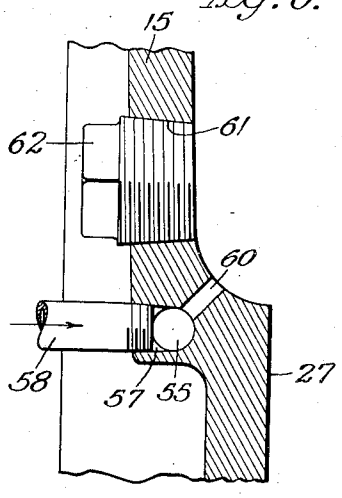
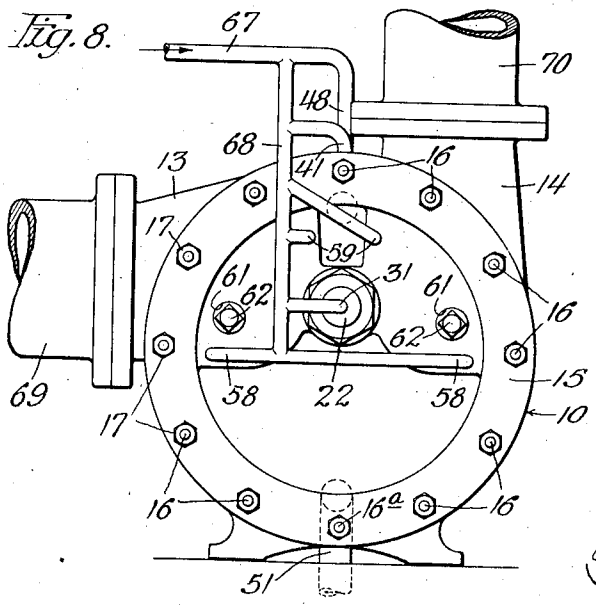


Fig. 8.



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Patented Apr. 16, 1929. 1,709,580

UNITED STATES PATENT OFFICE.

AMOS VERNER JENSEN, OF CEDAR FALLS, IOWA, ASSIGNOR TO THE VIKING PUMP COMPANY, A CORPORATION OF IOWA.

ROTARY PUMP.

Application filed March 24, 1927. Serial No. 177,912.

This invention relates to rotary pumps and is particularly adaptable to such pumps when used in the paper making industry for pumping or handling pulp in solution such as paper and wood pulp, or in other industries where it is desired to handle by means of a pump, a fluid having a consistency similar to pulp or the like.

Heretofore in attempting to handle pulp or the like by the use of rotary pumps, it has been discovered that the pulp fibers or the like tend to accumulate and wad or ball up in pockets or depressions in the pump, thus causing the pump eventually to jam, and resulting in delay and loss of time while the pump is being cleared. It has been discovered also that the pulp tends to work into the bearings, thereby causing sticking and heating, and possible scoring or "freezing" of the bearings.

The present invention is intended to provide a novel construction and arrangement of elements whereby the above and certain other objectionable results are overcome, and wherein a system of novel construction and arrangement is employed for conducting a fluid such as water, used in the present instance in a pulp pump, to and through various parts of the pump to keep the pump free from the accumulation of pulp fibers, which, if permitted to wad or ball up in the pump and collect on the rotating parts, would seriously interfere with the efficient operation of the pump.

One of the objects of the invention is to provide a casing wherein objectionable pockets or depressions in which the pulp may collect and wad up are entirely eliminated, and wherein the inlet and outlet ports are so positioned, and certain portions of the casing adjacent the said ports are so arranged as to co-operate with the peripheral edges of the rotor teeth or vanes to produce a cutting or shearing action on the pulp at these points, thereby preventing the rolling and jamming of pulp between the casing and rotor, and contributing to the efficient operation of the pump.

Another object of the invention is to provide a construction and arrangement for insuring the proper positioning of the head plate with its crescent shaped partition on the casing in a manner to position the said partition accurately with respect to the rotor and idler pinion.

Another object of the invention is to provide means for insuring the removal of pulp from adjacent the sealing portions or abutments formed in the head plate intermediate the inlet and outlet ports.

Another object of the invention is to provide a novel construction and arrangement for keeping the bearings of the idler pinion and rotor shaft free from the accumulation of pulp, thereby preventing heating of the bearings.

Another object of the invention is to provide a construction and arrangement for effectually washing the sealing faces of the idler teeth free of pulp just before passing into co-operative relationship with the sealing abutments.

Another object of the invention is to provide means for flushing out the interior of the pump, and also the casing at the rear of the rotor, in case the pump is to be shut down for an appreciable length of time, or in the event that the pump may have been operated during a temporary shortage of water supply.

Another object of the invention is to provide a novel construction and arrangement whereby the pulp is continually forced back into the interior of the pump, thus preventing the passage of pulp to the rear of the rotor and its subsequent passage and loss through the drain or flush-out hole at the rear of the casing.

A further object of the invention is to relieve excessive friction at the hub of the rotor due to possible end thrust on the rotor tending to force it rearwardly in the casing.

A still further object of the invention is to improve devices of this character in sundry details hereinafter described and particularly pointed out in the appended claims.

One embodiment of the invention is shown for illustrative purposes in the accompanying drawings, in which

Fig. 1 is a front elevation of a pump illustrating the embodiment of certain features of the invention.

Fig. 2 is a front elevation, partly in section, of the pump shown in Fig. 1, with the head plate removed to show the interior of the pump and the relative position of the rotor, idler pinion and crescent partition, and to illustrate certain other features of the invention, the view being taken substantially on the line 2—2 of Fig. 3.

Fig. 3 is a vertical sectional elevational view taken as indicated by the line 3—3 of

Fig. 1 and showing additional features of the invention.

Fig. 4 is a fragmentary elevational view of the inner face of the head plate taken as indicated by the line 4—4 of Fig. 3.

Fig. 5 is an enlarged transverse sectional elevation through the rotor shaft and associated parts including its bearing sleeve, the view being taken as indicated by the line 5—5 of Fig. 3.

Fig. 6 is an enlarged fragmentary sectional elevational view taken on the line 6—6 of Fig. 1 illustrating the construction of the spray arrangement for removing the pulp from adjacent the sealing portions or abutments formed in the head plate intermediate the inlet and outlet ports.

Fig. 7 is a side elevational view of the rotor.

Fig. 8 is a front elevation of the pump shown in Fig. 1 illustrating diagrammatically a system of pipes or tubing for conducting a suitable fluid, such as water, in the present instance, to the various parts of the pump for keeping the pulp passages and bearings of the pump free from the accumulation of pulp, thereby contributing materially to the efficient operation of the pump.

Referring to the drawings, the type of rotary pump shown, and containing an illustrative embodiment of the invention, comprises a cylindrical casing 10 having an annular wall portion 11 and a back or rear wall portion 12, the annular wall portion being provided with inlet and outlet ports 13 and 14, respectively.

The casing 10 is provided with an open front end portion adapted to be closed by a removable head plate 15 secured to the casing by means of the studs 16 and nuts 17. Rotatably mounted concentrically within the annular wall portion 11 is an internally toothed rotor 18 provided with teeth or vanes 19 adapted to mesh with external teeth 20 on idler pinion 21 rotatably mounted on an idler pin 22 rigidly supported in the head plate 15, and positioned eccentrically with respect to the rotor 18. The rotor 18 is secured to and adapted to be driven by a shaft 23 connected to any suitable source of power supply and rotatably mounted in a bearing sleeve 24, the said sleeve being rigidly secured to the rear wall 12 of the casing 10 in a manner to form in effect, a part of said casing. In the construction shown, the head plate 15 is provided with an integrally formed crescent shaped partition 25 having its outer convex face 26 concentric with the inner faces of the teeth or vanes 19 of the rotor, and its inner concave face concentric with the outer faces of the teeth 20 of the idler pinion 21 and adapted to occupy a position within the casing between the inner faces of the rotor teeth and the outer faces of the pinion teeth and in the space formed by reason of the relative concentric and eccentric mounting of the rotor and idler pinion, respectively. The head plate 15 is also provided intermediate the inlet and outlet ports with relatively large and small abutments 27 and 28, respectively, the said abutments being so positioned with respect to the front face of the rotor 18 as to provide a space between the face of the rotor and the abutment substantially equal to the width of the idler pinion 21, thereby providing a seal between the inlet and outlet ports.

To insure the placing of the head plate 15 on the casing 10 in a manner to position the abutments 27 and 28, and the crescent-shaped partition 25 in proper co-operative relationship with the rotor 18 and idler pinion 21, the lowermost stud, designated by the numeral 16^a, for securing the head plate to the casing, is offset from the uniform spacing of the remaining studs, it being obvious that by such an arrangement, there is but one position of the head plate 15 with respect to the casing 10 where the openings in the head plate will register with the studs 16 and the stud 16^a mounted on the casing, thereby insuring, with absolute certainty, the proper positioning within the casing of the crescent-shaped partition 25 and sealing abutments 27 and 28 carried by the head plate 15.

Referring to Fig. 2 of the drawing, it will be noted that with the rotor 18 and idler pinion 21 being driven in the direction indicated by the arrows, the pulp or other similar fluid will be drawn into the casing through the inlet port 13 and into the interdental spaces of the rotor 18 and idler pinion 21, which will carry it past the crescent partition 25 to the outlet port 14 where it will be discharged by reason of the teeth 20 of the pinion entering the interdental spaces of the rotor, thereby forcing the pulp and liquid radially outwardly between the teeth or vanes 19 of the rotor and into the outlet port.

The pump as thus far described is well known, and further description of the particular type of pump is deemed unnecessary.

As heretofore stated, some difficulties have arisen in the use of this type of pump in handling wood or paper pulp and the like, in that the pulp fibers in time gradually work into the bearings, causing them to heat and stick, and, due to the pressure created in the pump, the pulp has a tendency to work past the rotor into the space between the rotor and the rear wall of the casing and into the bearing of the rotor shaft, in which case, difficulties are encountered, and if the pump is provided with a drain through which the pulp and fluid between the rotor and rear wall of the casing may escape, considerable loss of pulp will result.

Furthermore, it has been noted that the pulp fibers have a tendency to collect and wad or ball up in any depressions formed within the pump casing and particularly in the relief

pockets formed in the head 15 adjacent the edges of the sealing abutments 27 and 28.

To overcome these and other difficulties encountered in the use of this type of pump in handling pulp and other fluids of similar consistency, the present invention contemplates the use of a novel construction and arrangement whereby properly directed streams or jets of water are employed for keeping the bearings and relief pockets free from the accumulation of pulp fibers, the streams or jets of water and the construction employed, tending at all times to force the pulp fibers toward the interior of the pump so that they may be properly handled and passed therethrough by the teeth 19 and 20 of the rotor and the idler pinion, respectively.

In the construction shown, the idler pinion 21 is provided with a bronze cased rubber bushing 29 rotatably mounted on the bronze cased idler pin 22 mounted rigidly in the head plate 15. To keep the idler pinion bearing free from the accumulation of pulp and to force back into the interior of the pump any pulp which might have a tendency to work toward the bearing, the idler pin 22 is provided with a centrally disposed longitudinally extending opening 30 adapted to receive at its outer end the pipe or tubing 31 through which a stream of water under pressure may be injected into the interior of the idler pin. The inner end of the idler pin 22 terminates a substantial distance short of the front face of the rotor 18 and the idler plate 32 positioned within the opening formed in the idler pinion 21, thereby forming a pocket or distributor head or chamber between the inner end of the pin 22 and the idler plate 32. The pin 22 may be provided also with radially extending grooves 33 adapted to facilitate the discharge of the water from the opening 30 into the said chamber. The rubber bushing 29 is provided, on its inner face, with a spirally formed groove 34, shown in the present instance, as of left hand construction, adapted to communicate at its inner end with the chamber formed between the end of the idler pin 22 and idler plate 32, and at its outer or opposite end with a pair of water passages or slots 35 formed in the inner face of the head plate 15 adjacent the idler pin 22 and extending outwardly therefrom beyond the outer face of the bronze encased rubber bushing 29. The end or sealing faces of the teeth 20 of the idler pinion 21 adjacent the abutments 27 and 28 are adapted to co-operate with said abutments to form a seal between the inlet and outlet ports 13 and 14, and are each provided with radially extending grooves or slots 36 adapted to communicate at their inner ends at intervals in the course of rotation of the idler pinion 21 with the water passages or slots 35 formed in the head plate 15, and at their outer ends with the interior of the pump. It will be observed from the foregoing description that the water under pressure from the pipe 31 will be forced through the opening 30 in the idler pin 22 and discharged at the inner end of the pin into the distributor head or chamber formed at the inner end thereof, thence through the spirally formed groove 34 of the idler bushing 29 into the passages or slots 35 formed in the head plate 15, and thence outwardly through the grooves or slots 36 formed in the end sealing face of the idler teeth 21, thus forcing back into the interior of the pump any pulp fibers or the like which might otherwise work into the idler pinion bearing and interfere with the operation of the pump. This course and action of the water also keeps the bearing free from the accumulation of pulp fibers, and washes the sealing faces of the teeth 20 of the idler pinion 21 free from pulp at intervals during the rotation of the pinion, the passages or slots 35 being so positioned in the head plate that the sealing faces of the idler pinion teeth will be washed free of pulp just before passing into co-operation with the sealing abutments 27 and 28, thereby presenting a clean face of the idler teeth to the abutments for co-operation therewith to provide an effectual seal between the inlet and outlet ports.

To prevent the escape or passage of pulp from the interior of the pump rearwardly past the rotor 18, and into the space between the rotor and the rear wall 12 of the casing, the outer annular face of the rotor is provided with spaced apart annular grooves or channels 37 and 38 connected together by means of a spirally formed groove or channel 39 shown, in the present instance, as of left hand construction, the annular groove or channel 38 being provided with a plurality of lateral grooves or channels 40 extending longitudinally of the rotor toward the interior of the pump and positioned around the annular face of the rotor intermediate the teeth or vanes 19 thereof.

The annular wall 11 of the casing 10, adjacent the annular grooves 37 and 38, and spiral groove 39 formed in the face of the rotor, is provided with a threaded opening adapted to receive a pipe or tube 41 through which a stream or jet of water under pressure may be injected into the casing 10 and into the said grooves or channels of the rotor. It will be observed that the water injected through the pipe 41, by reason of the rotation of the rotor in the direction indicated in the drawings, and the left hand formation of the spiral groove 39, will force the water through the spiral groove into the annular groove 38, and thence through the lateral grooves 40 into the interior of the pump, thereby preventing the passage of pulp to the rear of the rotor.

If, by any chance, the pulp fibers should

work rearwardly into the space between the rotor 18 and the rear wall 12 of the casing, due to the operation of the pump during a temporary failure of water supply, the following arrangement is provided for preventing the pulp fibers from entering the bearing of the rotor shaft 23.

The bearing sleeve 24 is provided with a bronze cased spirally grooved rubber bushing 42 rigidly mounted therein in a manner to receive the rotor shaft 23. Surrounding the rotor shaft within the bearing sleeve 24 and adjacent the outer end of the bushing 42 is an annular distributor head 43 provided on its outer periphery with an annular groove 44 and on its inner face adjacent the shaft 23 with an enlarged opening 45, the said groove and enlarged opening being connected by means of a plurality of radially disposed annularly spaced ports 46 formed in the distributor head. Communicating with the annular peripheral groove of the distributor head is a radially disposed port 47 formed in the bearing sleeve 24 and adapted to receive at its outer end a water supply pipe or tube 48. The bushing 42 is provided on its inner face adjacent the rotor shaft 23 with a spirally formed groove 49, shown, in the present instance, as of right hand construction, and communicating at its outer end with the enlarged opening 45 of the distributor head 43 and at its opposite or inner end with a radially extending slot or groove 50 formed in the bearing sleeve 24 where the latter terminates within the rear wall of the pump casing. It will be observed from the foregoing description that water under pressure from the pipe 48 will be forced into the distributor head surrounding a shaft 23 and through the annular groove 49 in the bushing 42, and thence out through the radially disposed slot or groove 50 into the space between the rear of the rotor and the rear wall 12 of the pump casing, from which it may be drained by means of a pipe 51, thereby preventing the entrance of pulp into the bearing of the rotor shaft. To prevent the escape of water from the rear or outer end of the bearing sleeve 24, suitable packing may be provided around the shaft 23 within the bearing sleeve and a packing gland 52 provided for suitably compressing the packing by means of nuts 53 in screw threaded engagement with studs 54 mounted in the end of the bearing sleeve.

It will be noted that the groove 49 in the fixed bushing 42 of the rotor shaft 23 is of right hand formation and that the shaft in rotating, as indicated by the arrow in Fig. 3, will tend to carry the water from the pipe 48 inwardly toward the discharge end of the groove within the casing, while the groove 34 of the rotatable idler pinion bushing 29 as well as the spiral groove 39 formed on the periphery of the rotor 18 for connecting the annular grooves 37 and 38 is of left hand formation, this being due to the fact that the rotor being rotated, as indicated by the arrow in Fig. 3, and the idler pinion and its bushing being rotated in the same direction, will cause the water from the pipes or tubes 31 and 41 to be forced through the respective grooves and channels, with which they are in communication, toward the interior of the pump where the water, together with the pulp from the inlet port 13, may be passed by the teeth of the rotor 18 and idler pinion 21 through the pump casing past the crescent partition 25 to the outlet or discharge port 14.

It will be understood, of course, that in the event that the rotor, rotor shaft and idler pinion were rotated in the opposite direction, the spiral formation of the respective grooves would be reversed.

To prevent the accumulation and wadding or balling up of the pulp fibers in the portion of the relief pockets formed in the head 15 adjacent the abutments 27 and 28, the head is provided, adjacent the edges of said abutments, with a plurality of radially disposed pockets 55 and 56, having lateral openings 57 adapted to receive water supply pipes 58 and 59, the pipes 58 being adapted to supply water under pressure to the pockets 55 adjacent the edges of the larger abutment 27, and the pipes 59 to supply water to the pockets 56 formed adjacent the edges of the smaller abutment 28. Formed in the head plate adjacent the abutments 27 and 28 are a series of spray holes or openings 60 terminating at one of their end portions in the pockets 55 and 56 and at their opposite end portions within the relief pockets formed in the inner face of the plate 15. It will be observed from the foregoing description that water under pressure from the pipes or tubes 58 and 59 will enter the pockets 55 and 56 respectively, the said pockets serving as headers for the distribution of the water to the spray holes 60, where it is forced into the relief pockets formed in the head, thereby keeping the said relief pockets free from the accumulation of pulp fiber, and keeping the pulp at these points agitated in a manner to be easily handled by the teeth of the rotor 18 and the idler pinion 21.

To prevent the wedging of pulp fibers between the peripheral faces of the rotor teeth 19 and the inner face of the annular wall portion 11 of the casing, it will be noted by reference to Fig. 2 that the sides of the inlet and outlet ports 13 and 14, where the teeth 19 of the rotor 18 come into co-operative relationship with the inner face of the annular wall 11, are formed with sharp edges as indicated at X in said figure, thereby producing, in co-operation with the peripheral edges of the rotor teeth or vanes 19, a cutting or shearing action for severing any pulp fibers which may

be caught between the edges of the rotor teeth and the edge portion of the inlet and outlet ports at these points.

The head plate 15 is provided with suitably positioned flush-out openings 61 normally closed by means of plugs 62, and if it should be desired to flush out the interior of the pump when the latter is to be shut down for any considerable length of time, the plugs 62 may be removed and suitable pipe connections 63, one of which is shown in dotted lines in Fig. 3, may be inserted in the flush-out openings 61, through which water under pressure may be injected into the pump for thoroughly washing out any pulp fibers that may have adhered to the interior thereof or to any of the parts of the rotor 18 or idler pinion 21.

Should it be desired at such a time to flush out also the rear portion of the pump casing between the rotor 18 and the rear wall 12, the wall 12 is provided with a flush-out opening 64 in which may be inserted a water supply pipe 65 through which a stream of water may be injected into the rear portion of the casing and drained therefrom by the pipe 51.

If it should be found, in the operation of the pump, that there is a tendency of the rotor to thrust rearwardly in the casing, due to pressure created in the interior of the pump, thereby producing excessive friction between the hub of the rotor and the inner end of the bearing sleeve 24, the opening 64 in the rear wall 12, and the hole in which the drain pipe 51 is normally mounted, may be closed by means of plugs 66 indicated by dotted lines in Fig. 3, thereby permitting the space between the rotor 18 and the rear wall 12 of the casing to fill with water from the pipe 48 and spirally grooved bushing 42 of the rotor shaft, thus creating a pressure on the rear side of the rotor to offset or counter-balance the pressure exerted on the rotor from the opposite side thereof or in the interior of the pump, and by so doing relieve the friction between the hub of the rotor and the inner end of the bearing sleeve 24. The pressure set up in the space between the rotor and the rear wall 12 of the casing would eventually force the water therein between the outer peripheral face of the rotor and the inner face of the annular wall of the casing, thereby providing additional means for preventing the pulp fibers from passing to the rear of the rotor.

In Fig. 8 is shown, diagrammatically, a system of tubing for supplying the various parts of the pump with water for keeping the bearings and other parts of the pump free from the accumulation of pulp fibers and for forcing the fibers toward the interior of the pump. In the arrangement shown, a main supply pipe 67 is provided, having one of its ends connected with a suitable source of water supply under pressure, and at its opposite end with a header 68 having suitable connections with the pipes 48, 41, 59, 31 and 58 for conveying water to the various parts of the pump for the purposes heretofore described. Fig. 8 also shows a pulp supply pipe 69 connected with the inlet port 13 and a pipe 70 connected to the outlet port 14 for the disposition of the pulp in any desired manner.

The use of rubber or resilient bushings in the bearings of the rotor shaft and idler pinion as above described, has been found to be of material advantage in that in the event of any foreign matter entering the bushing by reason of the pump being operated during temporary failure of water supply or because of the presence of foreign matter in the water supply itself, the bushing, by reason of its resiliency, may yield sufficiently to prevent the heating or scoring of any of the rotating parts, and also to enable such foreign matter to eventually free itself and be carried out of the pump by way of the water channels and grooves associated with the bearings of the rotor and idler pinion and other parts of the pump.

It will be observed from the description contained in the foregoing specification, that the present invention provides a novel construction and arrangement of elements for severing any pulp fibers engaged between the rotor vanes and the casing, thereby preventing the rolling and jamming of pulp between the casing and rotor; insuring the proper positioning of the head plate on the casing in a manner to position the crescent partition and sealing abutments accurately with respect to other co-operating parts of the pump, insuring the removal of pulp from, and preventing its accumulation adjacent said abutments; continuously forcing the pulp toward the interior of the pump, and keeping the bearings of the rotor and idler free from any accumulation of pulp; washing the sealing faces of the idler teeth free of pulp before passing into co-operative relationship with the sealing abutments; flushing out the interior of the pump; preventing the passage of pulp to the rear of the rotor, thereby eliminating the loss of considerable pulp by way of the waste or drain pipe; relieving excessive friction at the hub of the rotor, due to end thrust of the rotor in the casing; and for improving devices of the character described in sundry details heretofore pointed out.

Obviously, the present invention is not limited to the precise construction and arrangement shown and described, as the same may be variously modified without departing from the spirit and scope of the invention as set forth in the appended claims. Moreover, all the features of the invention need not be used conjointly, as the same may be used to advantage in variously different combinations and sub-combinations.

What I claim as my invention and desire to secure by Letters Patent is:

1. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor and idler pinion journalled in said casing, and means associated with said rotor and pinion for admitting water under pressure for forcing the material to be operated upon toward the interior of the pump.

2. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor and idler pinion journalled in said casing, and means formed on said rotor for forcing the material to be operated upon toward the interior of the pump.

3. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor and idler pinion journalled in said casing, and means formed in the bearing of said rotor for forcing the material to be operated upon toward the interior of the pump.

4. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor and idler pinion journalled in said casing, and means formed in the bearing of said pinion for forcing the material to be operated upon toward the interior of said pump.

5. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor and idler pinion journalled in said casing, and means formed on said rotor and in the bearings of said pinion and rotor for forcing the material to be operated upon toward the interior of the pump.

6. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor and idler pinion journalled in said casing intermediate said ports and co-operable with each other in a manner to pass the material to be operated upon from said inlet to said outlet port, and means formed in the bearings of said rotor and pinion for admitting water under pressure thereto for preventing said material from entering or accumulating in said bearings.

7. A rotary pump comprising a casing having an open end portion and inlet and outlet ports formed therein, a rotor having vanes formed thereon and an idler pinion journalled in said casing intermediate said ports, said pinion being mounted within and eccentrically with respect to said rotor and having teeth co-operable with said vanes, a head plate having water passages formed therein secured to said casing for closing the open end thereof, means for supplying water to said passages, a crescent-shaped partition carried by said head plate and adapted to be positioned between said pinion and rotor vanes in the vertical plane thereof and intermediate said ports, and a plurality of sealing abutments formed on said plate and adapted to co-operate with the end faces of said rotor vanes and said pinion for providing a seal within said casing intermediate said ports, said pinion having a plurality of grooves formed in its end portion adjacent said head plate and extending radially along the ends of the teeth of said pinion, said grooves being adapted to communicate at their ends with the interior of said casing and at their inner ends with said water passages at intervals in the course of rotation of said pinion, said water passages being positioned with respect to said sealing abutments in a manner to permit a stream of water to be projected radially along the end of each pinion tooth just prior to the passage of the sealing end or face of each tooth into co-operative relationship with said abutments.

8. A rotary pump comprising a casing having an open end portion and inlet and outlet ports formed therein, a rotor having vanes formed thereon, and an idler pinion journalled in said casing intermediate said ports, said pinion being mounted within and eccentrically with respect to said rotor and having teeth co-operable with said vanes, a head plate having water passages formed therein secured to said casing for closing the open end thereof, an idler pin mounted in said plate and having a longitudinal opening extending therethrough, means for supplying water under pressure to said opening, a resilient bushing interposed between said pinion and idler pin and having a spiral groove adapted to communicate with said longitudinal opening and said water passages for supplying water to said passages, a crescent-shaped partition carried by said head plate and adapted to be positioned between said pinion and rotor vanes in the vertical plane thereof and intermediate said ports, and a plurality of sealing abutments formed on said plate and adapted to co-operate with the end faces of said rotor vanes and said pinion for providing a seal within said casing intermediate said ports, said pinion having a plurality of grooves formed in its end portion adjacent said head plate and extending radially along the ends of the teeth of said pinion, said grooves being adapted to communicate at their outer ends with the interior of said casing and at their inner ends with said water passages at intervals in the course of rotation of said pinion, said water passages being positioned with respect to said sealing abutments in a manner to permit a stream of water to be projected radially along the end of each pinion tooth just prior to the passage of the sealing end or face of each tooth into co-operative relationship with said abutments.

9. A rotary pump comprising a casing having an open end portion and inlet and outlet ports formed therein, a rotor and co-operating idler pinion journalled in said casing, a head plate having water passages formed therein secured to said casing for closing

the open end thereof, an idler pin rigidly mounted in said plate and having a longitudinal opening extending therethrough, said pin being adapted to extend inwardly from said plate toward said rotor in a manner to form a distributor chamber between said rotor and the end of said pin, a resilient bushing having a spiral groove formed therein secured to said pinion and rotatably mounted on said pin, said groove communicating at its opposite ends with said chamber and water passages respectively, and means for supplying water to said longitudinal opening in said pin to be conducted through said opening, distributor chamber and spiral groove to said water passages.

10. A rotary pump comprising a casing having an open end portion and inlet and outlet ports formed therein, a rotor and co-operating idler pinion journalled in said casing, a head plate having water passages formed therein secured to said casing for closing the open end thereof, an idler pin rigidly mounted in said plate and having a longitudinal opening extending therethrough, said pin being adapted to extend inwardly from said plate toward said rotor in a manner to form a distributor chamber between said rotor and the end of said pin, a resilient bushing having a spiral groove formed therein secured to said pinion and rotatably mounted on said pin, said groove communicating at its opposite ends with said chamber and water passages respectively, said pinion having radially extending grooves formed in one of its end portions, said radial grooves being adapted to communicate at their inner ends with the water passages formed in said head and at their outer ends with the interior of said casing, and means for supplying water to said longitudinal opening in said pin to be conducted through said opening, distributor chamber, spiral groove, water passages and radially extending grooves to the interior of said casing.

11. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor having vanes formed thereon and an idler pinion journalled in said casing, and means formed on said casing and co-operable with said vanes for producing a cutting or shearing action on pulp fibers engaged between said vanes and casing.

12. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor having vanes formed thereon, and an idler pinion journalled in said casing, and means formed on said casing adjacent said ports and co-operable with said vanes for producing a cutting or shearing action on pulp fibers engaged between said vanes and casing adjacent said ports.

13. A rotary pump comprising a casing having an annular wall portion and inlet and outlet ports formed therein, a rotor having vanes formed thereon and an idler pinion journalled in said casing, and means formed on said annular wall portion adjacent said ports and co-operable with a peripheral edge portion of said vanes for severing pulp fibers engaged between said vanes and the annular wall of said casing adjacent said ports.

14. A rotary pump comprising a casing having inlet and outlet ports formed therein, and a rotor having vanes formed thereon and an idler pinion journalled in said casing, said pinion being adapted to co-operate with the vanes of said rotor for passing the material to be operated upon from said inlet port to said outlet port, said rotor having means formed thereon for forcing said material toward the interior of said casing and preventing the passage of said material to the rear of said rotor and casing.

15. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor having vanes formed thereon and an idler pinion journalled in said casing, said pinion being adapted to co-operate with the vanes of said rotor for passing the material to be operated upon from said inlet port to said outlet port, and means for supplying water to the interior of said casing adjacent the rotor, said rotor having means formed thereon for forcing the water from said supply means toward the interior of said pump.

16. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor having vanes formed thereon and an idler pinion journalled in said casing, said pinion being adapted to co-operate with the vanes of said rotor for passing the material to be operated upon from said inlet port to said outlet port, and means for supplying water to the interior of said casing adjacent the periphery of the rotor, said rotor having communicating spiral and annular grooves formed on the periphery thereof adjacent said water supply means for forcing the water from said supply means toward said vanes and pinion and toward the interior of said pump.

17. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor having vanes formed thereon and an idler pinion journalled in said casing, said pinion being adapted to co-operate with the vanes of said rotor for passing the material to be operated upon from said inlet port to said outlet port, and a pipe for supplying water to the interior of said casing adjacent the periphery of the rotor, said rotor having longitudinally spaced apart annular grooves formed on the periphery thereof adjacent said pipe and a spirally formed groove communicating at its opposite ends with said annular grooves, said rotor having formed also on its periphery a plurality of annularly spaced longitudinally disposed grooves communicating at one of their end portions with

the annular groove adjacent said vanes and at their opposite end portions with the spaces between the vanes of said rotor.

18. A rotary pump comprising a casing having inlet and outlet ports formed therein, a shaft rotatably mounted in said casing, a rotor secured to said shaft within said casing, a bushing having a spiral groove formed therein surrounding said shaft, and means for passing a stream of water through said groove.

19. A rotary pump comprising a casing having inlet and outlet ports formed therein, a shaft rotatably mounted in said casing, a rotor secured to said shaft within said casing, an annular distributor head surrounding said shaft, a resilient bushing having a spiral groove formed therein surrounding said shaft, said groove communicating at one end with said distributor head and at its opposite end with the interior of said casing, means for supplying water to said head for passage through said groove to the interior of said casing and means for draining the water from said casing.

20. A rotary pump comprising a casing having inlet and outlet ports formed therein, a shaft rotatably mounted in said casing, a rotor secured to said shaft within said casing, an annular distributor head surrounding said shaft, a packing gland co-operable with a portion of said head for compressing packing material to prevent the escape of water from one side of said head, a resilient bushing having a spiral groove formed therein surrounding said shaft between said distributor head and said casing, said groove communicating at one end with said distributor and at its opposite end with the interior of said casing, means for supplying water to said head for passage through said groove to the interior of said casing, and means for draining the water from said casing.

21. A rotary pump comprising a casing having inlet and outlet ports formed therein, a bearing sleeve rigidly secured to said casing and having a radial groove formed in the inner end thereof, a shaft rotatably mounted in said sleeve, an annular distributor head mounted in said sleeve and surrounding said shaft, a resilient bushing having a spiral groove surrounding said shaft within said sleeve, said spiral groove communicating at one of its ends with said distributor head and at its opposite end with said radial groove, a water inlet port formed in said sleeve and communicating with said distributor head, a water supply pipe communicating with said water inlet port, and means co-operable with said distributor head for preventing the escape of water from one side thereof.

22. A rotary pump comprising a casing having inlet and outlet ports formed therein, a rotor and idler pinion journalled in said casing intermediate said ports, a sealing abutment co-operable with said rotor and pinion for providing a seal within said casing intermediate said ports, and means for projecting water into the interior of said casing adjacent the edges of said abutment.

23. A rotary pump comprising a casing having an open end portion and inlet and outlet ports formed therein, a rotor and idler pinion journalled in said casing intermediate said ports, a head plate secured to said casing for closing the open end thereof, sealing abutments formed on said plate and co-operable with said rotor and pinion for providing a seal within said casing intermediate said ports, and means for projecting a spray of water into the interior of said casing adjacent the edges of said abutments.

24. A rotary pump comprising a casing having an open end portion and inlet and outlet ports formed therein, a rotor and idler pinion journalled in said casing intermediate said ports, a head plate secured to said casing for closing the open end thereof, sealing abutments formed on said plate and co-operable with said rotor and pinion for providing a seal within said casing intermediate said ports, said plate having a plurality of of water pockets formed in the body portion thereof and a plurality of spray holes communicating with the interior of said casing and with said water pockets, and means for supplying water to said pockets.

25. A rotary pump comprising a casing having an open end portion and inlet and outlet ports formed therein, a rotor and idler pinion journalled in said casing intermediate said ports, a head plate secured to said casing for closing the open end thereof, sealing abutments formed on said plate and co-operable with said rotor and pinion for providing a seal within said casing intermediate said ports, said plate having a plurality of substantially radially disposed water pockets formed in the body portion thereof and a plurality of spray holes adjacent the edges of said abutments, said holes communicating with the interior of said casing and with each of said water pockets, and a pipe for supplying water to said pockets.

26. A rotary pump comprising a casing having an open end portion and inlet and outlet ports formed therein, a rotor and idler pinion journalled in said casing intermediate said ports, a head plate secured to said casing for closing the open end thereof, sealing abutments formed on said plate and co-operable with said rotor and pinion for providing a seal within said casing intermediate said ports, said plate having a plurality of substantially radially disposed water pockets formed in the body portion thereof and a plurality of series of spray holes extending longitudinally of and adjacent each of said edges of said abutments, said series of spray holes communicating with the interior of said cas-

ing and respectively with each of said water pockets, and pipes for supplying water to said pockets.

27. A rotary pump comprising a casing having a rear wall portion, a rotor journalled in said casing in a manner to provide a space or chamber between said rotor and rear wall portion, and means for forcing water into said chamber to create a pressure therein tending to separate said rotor from said wall portion for counter-balancing pressure exerted on the opposite side of said rotor.

28. A rotary pump comprising a casing having a rear wall portion, a shaft rotatably mounted in said casing, a rotor mounted on said shaft, said rotor being positioned in the casing in a manner to provide a space or chamber between said rotor and rear wall portion, and means associated with the bearing of said rotor shaft for forcing water into said chamber to create a pressure therein tending to separate said rotor from said wall portion for counter-balancing pressure exerted on the opposite side of said rotor.

29. A rotary pump comprising a casing having a rear wall portion, a shaft rotatably mounted in said casing, a rotor mounted on said shaft, said rotor being positioned in the casing in a manner to provide a space or chamber between said rotor and rear wall portion, and means associated with the bearing of said rotor shaft for forcing water into said chamber to create a pressure therein tending to separate said rotor from said wall portion for relieving the hub of said rotor from friction due to pressure exerted on the opposite side of said rotor.

30. A rotary pump comprising a casing having a rear wall portion, a rotor journalled in said casing in a manner to provide a space or chamber between said rotor and rear wall portion, said wall portion having a plurality of openings formed therein, means for closing said openings, and means for forcing water into said chamber to create a pressure therein tending to separate said rotor from said rear wall portion.

31. A rotary pump comprising a casing having an open end portion and inlet and outlet ports formed therein, a rotor mounted to rotate in said casing, a head plate having water passages formed therein secured to said casing for closing the open end thereof, an idler pinion having a central opening formed therein and having an idler plate positioned in one end of said opening, an idler pin mounted on said head plate and adapted to extend into the opening in said pinion in a manner to form a distributor chamber within said pinion and between said idler plate and the end of said pin, a resilient bushing having a spiral groove formed therein secured to said pinion and rotatably mounted on said pin, said groove communicating at its opposite ends with said chamber and water passages respectively, and means for supplying water to said longitudinal opening in said pin to be conducted through said opening, distributor chamber and spiral groove to said water passages.

32. A rotary pump comprising a casing having an open end portion and inlet and outlet ports formed therein, a head plate secured to said casing for closing the open end thereof, a rotor and idler pinion journaled to rotate in said casing intermediate said ports, means formed in said casing and plate for admitting water under pressure to said casing for forcing the material to be operated upon toward the interior of the pump during its passage therethrough and for flushing out the interior of said casing.

In testimony whereof I have signed my name to this specification on this 16th day of March, A. D. 1927.

AMOS VERNER JENSEN.