No. 789,664. PATENTED MAY 9, 1905.

L. LOOK.

CENTRIFUGAL PUMP.

APPLICATION FILED JAN. 2, 1902.

FIG. V.

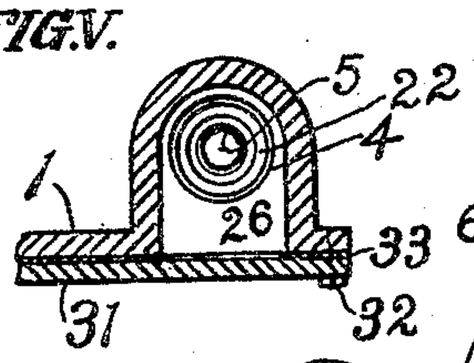


FIG. II.

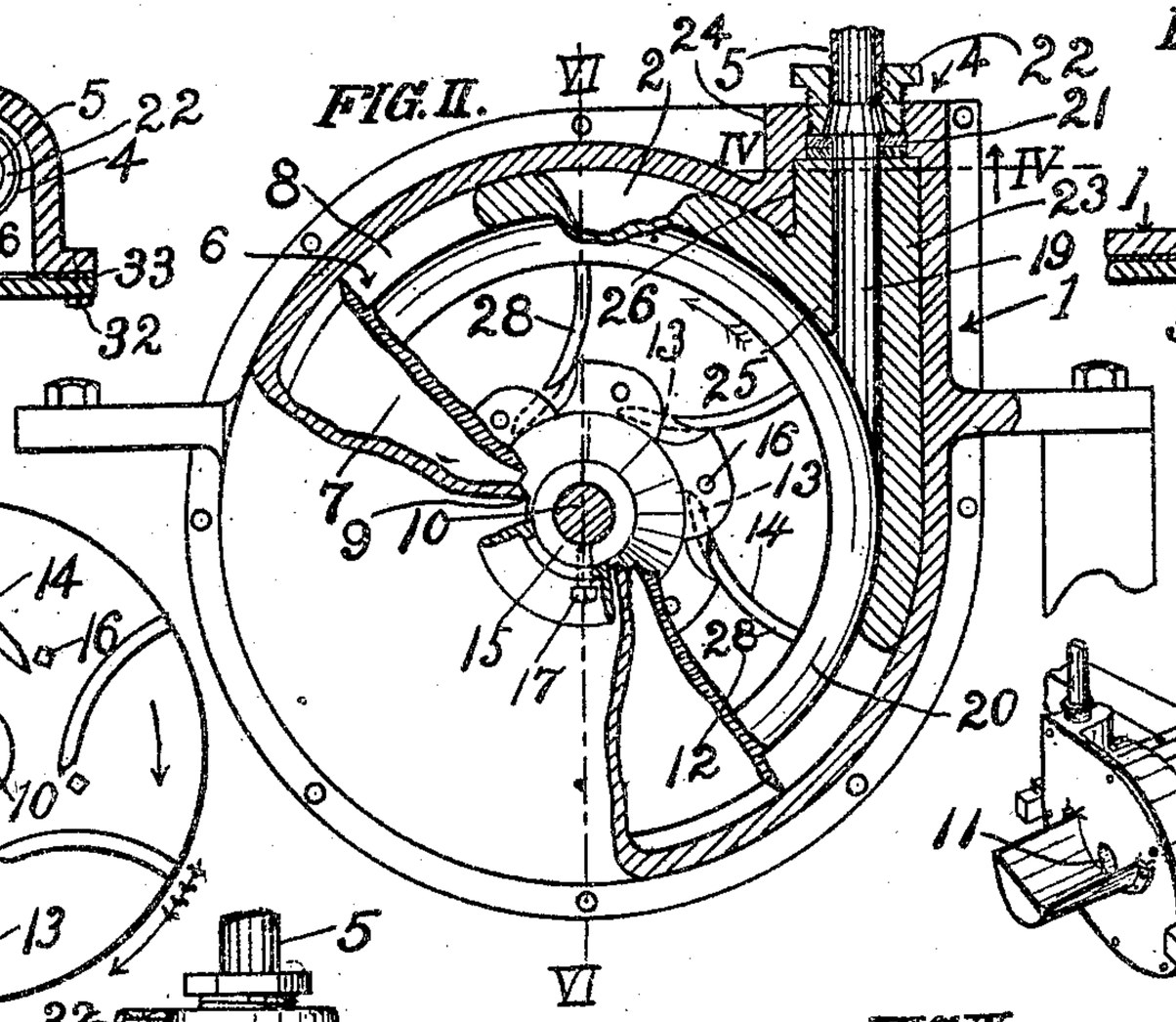


FIG. IV

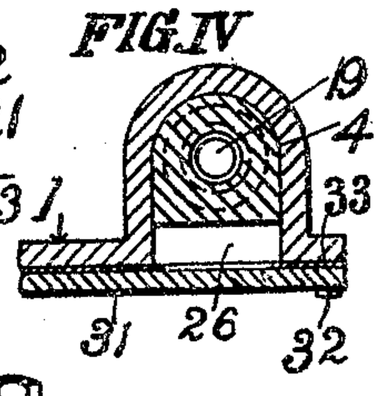


FIG. III.

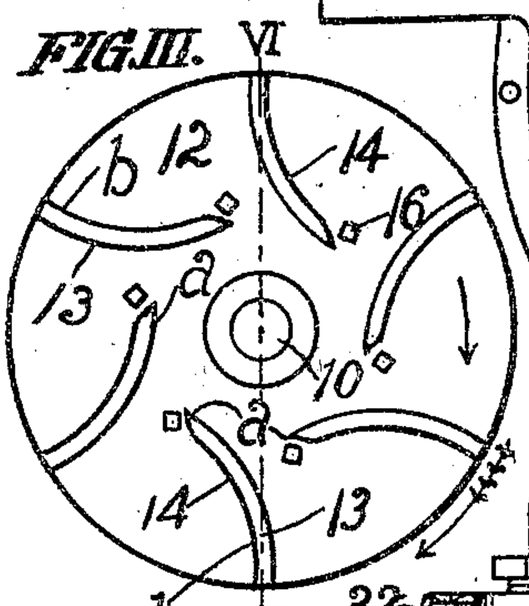


FIG. I.

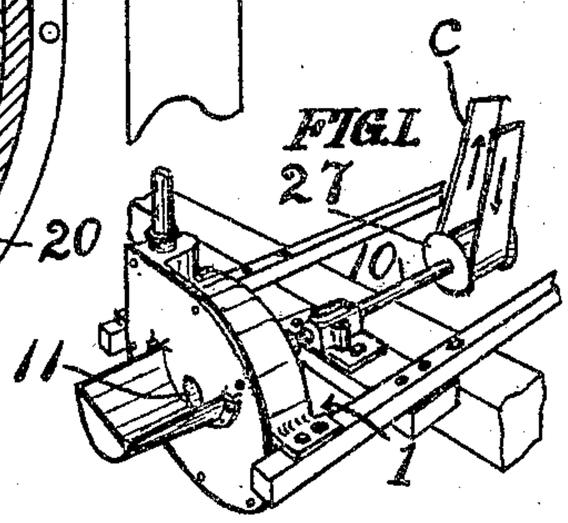


FIG. VI.

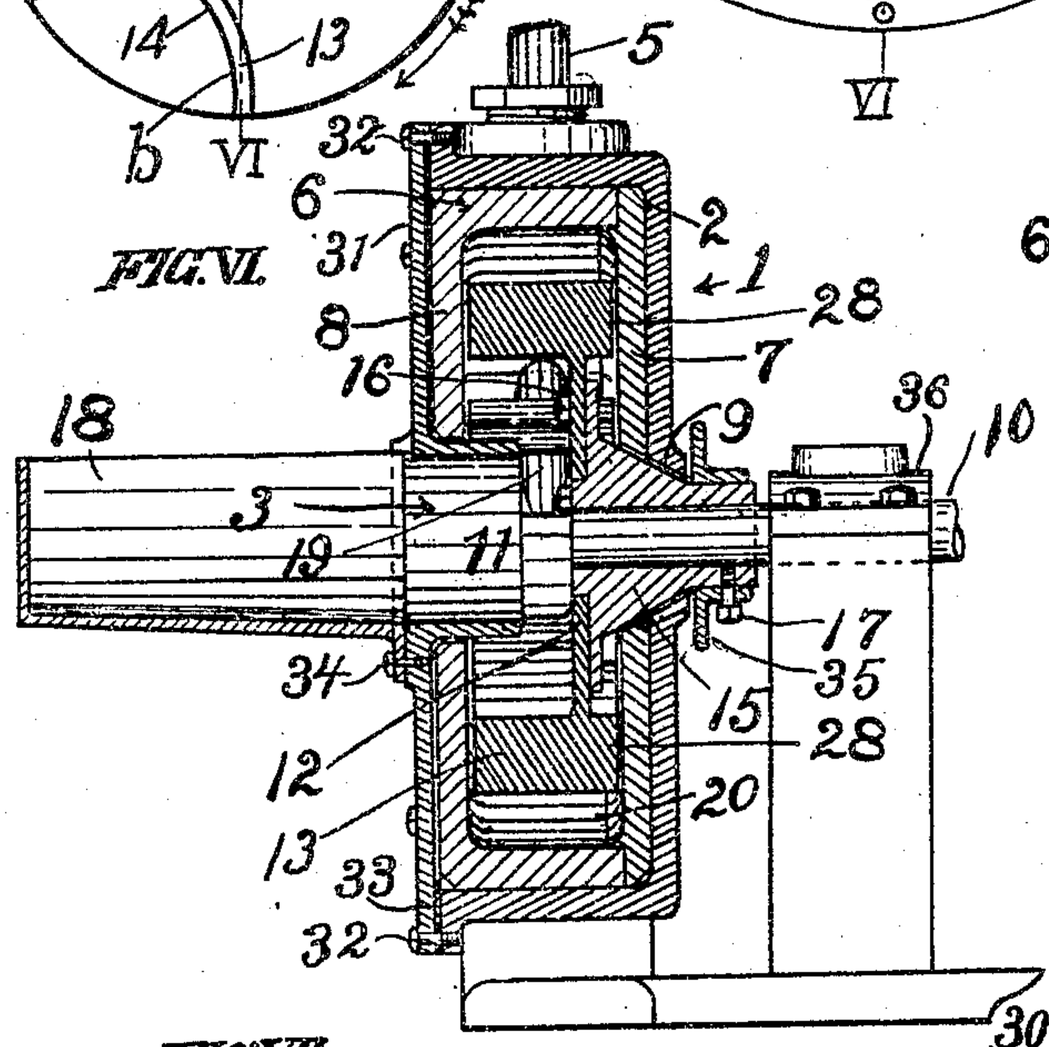


FIG. IX.

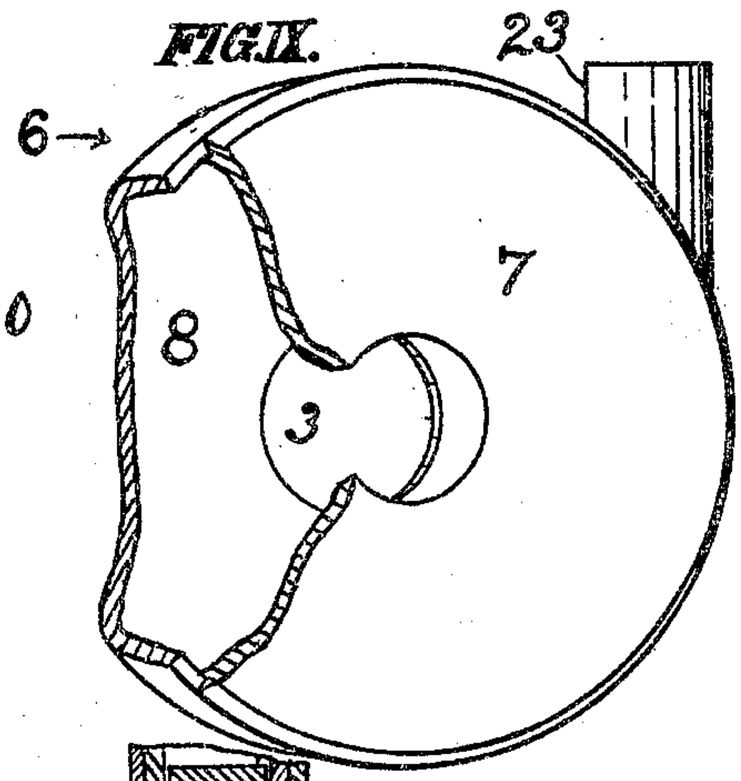


FIG. XI.

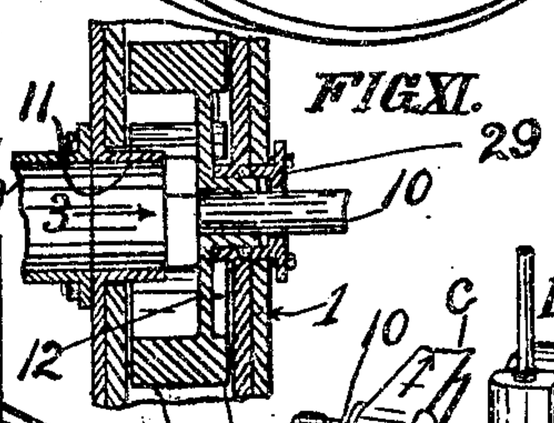


FIG. VII.

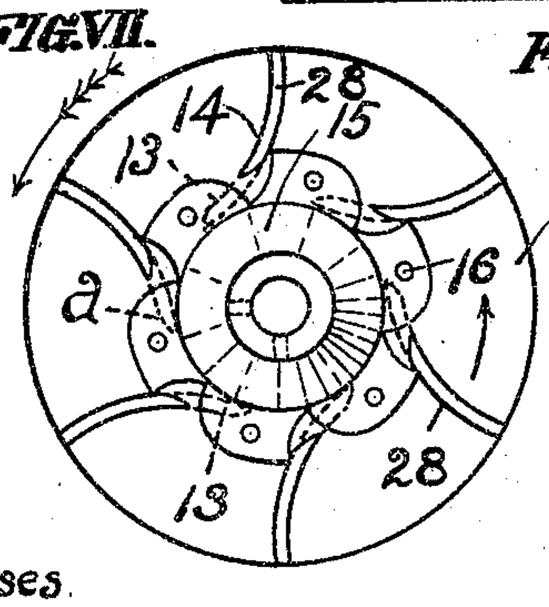


FIG. VIII.

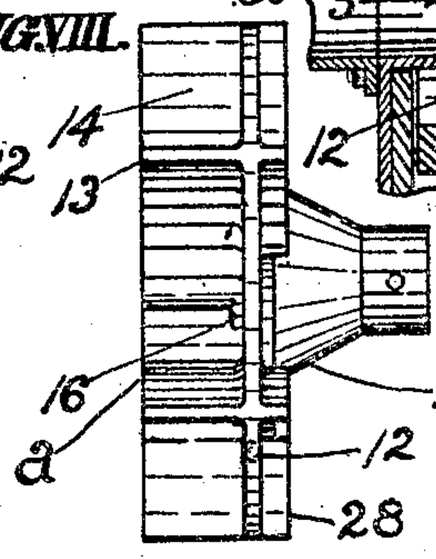
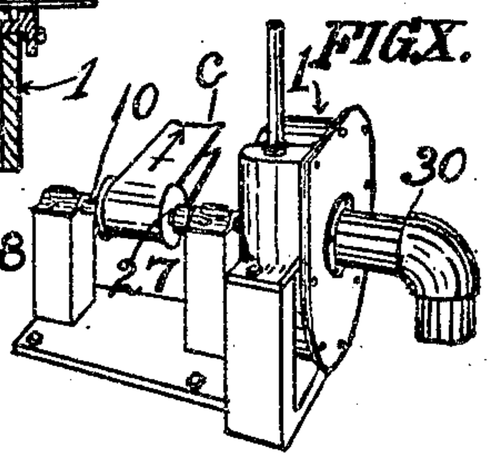


FIG. X.



Witnesses.
C. F. Richey.
F. Townsend.

Inventor.
Luther Look
by Townsend Bro.
his Attys.

No. 789,664. Patented May 9, 1905.

UNITED STATES PATENT OFFICE.

LUTHER LOOK, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO NEW STANDARD CONCENTRATOR COMPANY, OF LOS ANGELES, CALIFORNIA, A CORPORATION OF CALIFORNIA.

CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 789,664, dated May 9, 1905.

Application filed January 2, 1902. Serial No. 88,241.

To all whom it may concern:

Be it known that I, LUTHER LOOK, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Improvement in Centrifugal Pumps, of which the following is a specification.

An object of this invention is to provide a practical pump by means of which liquids carrying solids in suspension may be elevated.

This invention may be used for elevating water or any other liquid; but it is especially adapted for use in ore-concentrators for elevating all kinds of pulverized ores, slimes, and tailings. I do not limit the use of the pump to any particular material or purpose. It may be advantageously used for elevating mercury.

A difficulty to be overcome in elevating tailings and liquids carrying gritty substances in suspension is the destruction of the machine by erosion; and an object of this invention is to so construct the pump that the portions which are subject to wear may be effective though much worn and that they may be readily replaced when worn out.

In one form of this machine the material to be pumped may be supplied to the pump by gravity. In that form of this invention the pump is constructed with a peripheral discharge, rotating wings arranged in a circle, and a spout extending into the circular space between said wings to deliver the material by gravity to the wings as they pass below the spout.

This invention as applied for lifting a liquid carrying solid matter in suspension is adapted to be constructed without a stuffing-box, and when so constructed the feed must be delivered wholly by gravity; but by the use of a stuffing-box the pump may be supplied by suction, as with ordinary centrifugal pumps.

Another object of this invention is to increase the efficiency of the pump. This is accomplished by a peculiar construction and arrangement of the runner-wings whereby the wings cut through the liquid which is introduced near the center of the runner and gradually apply the force to the same to change the direction of motion of the liquid. In this regard the case of the pump is furnished with a central inlet and a peripheral discharge, and the runner in said case has wings constructed and arranged in a circle around the inlet, the inner portions of said wings being approximately tangent to the path of the same, and said wings curving thence outward and terminating in portions which extend radially of the runner.

Another object of this invention is to avoid any contact of the rotating parts with the stationary parts and to avoid leakage without the use of stuffing-boxes, thereby preventing wear and loss of power.

Another object is to avoid any wearing away of the pump-case at the discharge-pipe.

The accompanying drawings illustrate this invention.

Figure I is a perspective view of the pump ready for operation. Fig. II is an elevation of the pump viewed from the power side, portions being broken away to expose interior construction. Portions of the main wings of the runner are indicated in dotted lines. Fig. III is an elevation of the runner mounted on the shaft and viewed from the side opposite that shown in Fig. II. Fig. IV is a fragmental section on line indicated by IV IV, Fig. II, showing the lining in place. Fig. V is a section of the case on said line IV IV, omitting the lining and the elastic washers. Fig. VI is a vertical mid-section on line VI VI of Figs. II and III. Fig. VII is an elevation of the detached runner and its hub viewed from the side shown in Fig. II. Fig. VIII is a side elevation of the detached runner and its hub. Fig. IX is a fragmental perspective view of the case-lining. Fig. X is a perspective view of the invention provided with a suction-pipe. Fig. XI is a fragmental sectional detail of the same, showing a stuffing-box which is applied to enable the pump to produce suction to lift the feed. The pump in this view is reversed from the position

shown in Fig. X. In Figs. I, II, VII, and X arrows indicate the direction of moving parts.

1 designates a hollow case-body furnished with a cylindrical chamber 2 and with a central inlet 3 and a tangential discharge-opening 4, in which is fastened a pipe 5. In order to avoid wearing the outer portion of the pump, the chamber is provided with a separate lining 6, comprising a back member 7 and a front member 8. The lining is only required in the pumps for lifting erosive material or other substances which are liable to destroy the interior parts of the pump. The case-body 1 is provided with a centrally-arranged opening 9, through which the power-shaft 10 enters the case, and may be provided on the opposite side with a feed-spout 11. 12 designates a rotating runner, consisting of a single disk furnished with wings 13, projecting therefrom in a circle around said feed-spout and respectively constructed with their effective faces 14 curved rearwardly and outwardly, the inner portion *a* of each of said wings being respectively approximately at right angles to the radius of the runner intersected by said portion and the outer portion *b* of each of said wings being arranged approximately in a radius of the runner. Said runner is mounted on shaft 10, adjacent to the wall of the casing through which said shaft extends, the wings 13 being formed on the side away from said wall. The feed-spout 11 is constructed and arranged to deliver the feed near the center of the disk into the open space inside the circle described by the rotating wings, the inner portions of the respective wings being adapted to receive the liquid directly from the feed-spout, said wings extending outward in an unbroken curve from the feed-receiving portion of the runner to the discharge portion thereof. The runner 12 is desirably solid and is fastened to the shaft 10 by means of a hub 15, which is bolted to the runner 12 by bolts 16 and is fastened to the shaft by a set-screw 17. 18 designates a device for supplying the liquid to the feed-spout 11.

In practical operation with the form shown in Figs. I to VIII, inclusive, the liquid flows from the feed-spout 11 by gravity and will fall into the path of the rotating wings 13 and will be cut by the front portions *a* of said wings, and by reason of the rearward curve of the effective face 14 of said wings the liquid is gradually acted upon and brought to the required speed, so that its direction is changed from the vertical to the circular with as little violence as possible. The advantage gained by this is of much importance in high-speed pumps. 19 designates the outlet-passage from the chamber 20, in which the runner rotates. The mouth of this passage opens from the chamber 20 tangent at the ascending quarter, as clearly shown in Fig. II.

In practical operation the liquid carrying gritty substance in suspension has a great erosive effect upon the walls of the discharge-passage 19, said liquid being subject at its entrance into the passage 19 to various internal currents, and this erosive effect is especially marked at any joint or seam which may occur in this passage at any place where the liquid has not passed a sufficient distance along the outlet or pipe to destroy such currents. Said currents are ordinarily effective beyond the place at which it is desirable to make the connection for the discharge-pipe 5. In order to avoid any erosion at the joint between the discharge connection and the case and its lining, one or more elastic washers 21 are provided between the discharge connection and the lining of the case.

22 designates a bushing screwed into the case-body 1 against the elastic washers 21 to retain the elastic washers and also to reduce the discharge-opening to any required size. The capacity of the discharge-pipe 5 should be proportional to the quantity of material handled or discharged. A further advantage of the bushing 22 is that it receives wear which otherwise would injure the case, and when worn said bushing can be replaced at small cost.

In practical operation the tendency is to revolve the lining 6 in the case. The lining-body 8 may be furnished with a neck 23, in which the outlet 19 is formed, and the case-body 1 may be furnished with a corresponding neck 24 to receive the neck 23.

25 designates a wearing-body or reinforcing portion formed inside the lining-body 8 at the junction of the tangential opening 19 and the chamber 20. The neck 24 of the case is furnished with a chamber 26, into which the neck 23 of the lining fits, thereby preventing any rotation of the lining-body in the case.

Power may be applied to the shaft 10 by any suitable means. The belt *c* and pulley 27 designate a form of such means.

In order to avoid any liability of leakage around the hub-opening 9, the hub 15 is of greater diameter at its inner portion than at its outer portion, being preferably constructed in tapering form, as shown in the drawings. Any liquid which may reach the hub will tend to adhere thereto and partake of the rotary movement of the hub, and the centrifugal force will tend to carry said liquid to the greatest diameter of the hub, along the sloping face thereof, thus preventing as far as possible the escape of the liquid at the hub-opening. Under some conditions, however, as when the machine is slowing down, some liquid will find its way to the shaft, and I therefore arrange the journal-bearing for the shaft outside of the case, with means between such bearing and the hub to cut off the

flow of liquid from the hub to the bearing, thereby avoiding the risk of cutting or wear of the bearing by grit.

28 designates auxiliary wings constructed in accordance with the principles involved in the main wings 13 and arranged on the opposite or rear face of the runner 12. The purpose of these auxiliary wings is to take up any of the material which may flow onto the rear side of the runner and to cause the same to rotate in the case and to discharge through the outlet 19.

The chamber of the casing being cylindrical and the runner being mounted concentrically therein and being considerably smaller than the cylindrical chamber, there is an annular space of uniform size between the peripheries of the casing and chamber, within which space the fluid, with its contained grit and fragmentary material, may move freely in a circular path without meeting any obstruction such as would be presented by the lip of the outlet in the ordinary spiral chamber. Such an inwardly-extending lip is a serious drawback when operating with fluid containing gravel and sand, as such material is liable to become caught between the lip and the runner and cause undue wear and breakage. For this reason I provide the annular chamber of uniform size between the runner and casing and depend on centrifugal force alone to expel the fluid through the outlet. The annular passage aforesaid is continuous with the main cylindrical chamber—that is to say, the side walls of the cylindrical chamber extend continuously and without obstruction to form the side walls of the annular passage—so that there is no ledge or obstruction to catch the grit and cause wear or jamming of the parts. I find that by provision of the lateral wings 28 on the rear side of the runner leakage or back movement of the pumped material from the annular passage to the back of the runner can be prevented without recourse to any guard-flange at that point.

In the form shown in Fig. XI, 29 designates a stuffing-box around the shaft 10 to prevent air from entering the pump to supply the vacuum. The supply-pipe 30 in this form may extend downward from the case to the source of supply. (Not shown.)

The height to which the material will be lifted from the chamber 20 will depend upon the speed and diameter of the runner. The same is true of the height to which the liquid may be lifted from the source of supply within the limits of the effective suction.

It is to be understood that the spout may be omitted from the suction-pump without detriment.

31 designates means for holding the lining 6 in the case and for closing the inlet side of the case. This may be a member in the form of a plate fastened to the case-body 1 by bolts 32, with packing 33 to close the joint. In Fig. VI the spout 11 is shown integral with the plate 31 and the receptacle 18 is fastened to the plate 31 by bolts 34.

35 designates a flange bolted onto the hub 15 by the set-screw 17, which fastens the hub to the shaft 10. The purpose of the flange is to shield the bearing 36 from any material which might pass through the opening 9 when the pump slows down or at any other time.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a centrifugal pump having a central feed-spout, a casing, a runner mounted to rotate in said casing, said casing being provided with an annular passage around said runner and the said runner being provided with wings around said spout in the form of webs which extend rearwardly in a curve from the inner edge to the outer edge of the runner, the inner portions thereof being approximately at right angles to a radius of the runner intersected thereby and adapted to receive liquid direct from the feed-spout, and the outer portions of the wings being approximately radial of the runner and adapted to discharge the liquid from the runner to the annular passage.

2. A centrifugal pump having a centrally-arranged inwardly-projecting feed-spout; a solid rotating runner furnished with wings having the form of webs projecting therefrom in a circle around said feed-spout, and respectively constructed with their effective faces curved rearwardly and outwardly, the inner portion of each of said faces being approximately at right angles to the radius of the runner intersected thereby, and the outer portion of each of said faces being approximately radial of the runner.

3. A centrifugal pump having a centrally-arranged inwardly-projecting feed-spout; a rotating runner furnished with wings having the form of pointed webs projecting therefrom in a circle around said feed-spout; and auxiliary wings on the opposite side of said runner.

4. In a centrifugal pump, in combination, a case, a central feed-spout, a peripheral discharge, a disk in the case, wings projecting from the feed side of the disk to rotate around the feed-spout, said spout being arranged to deliver the feed near the center of the disk inside the circle described by the inner ends of the rotating wings, a hub for the disk opposite the feed side thereof, and a shaft secured within said hub.

5. A centrifugal pump comprising a case furnished with a peripheral discharge; a central feed-spout; a rotating runner furnished opposite the feed with a conical hub tapering outwardly through the case, and furnished on the side opposite said hub with wings surrounding the feed and constructed to cut

through the liquid flowing from the feed and to give such liquid a rotary motion; a shaft and a journal-bearing therefor exterior to the case, and means between the hub and the journal-bearing to cut off the flow of liquid to the latter.

6. A centrifugal pump comprising a case-body furnished with a peripheral outlet and open at one side and furnished at the other side with an opening for a shaft; a member closing the open side of the case furnished with an inwardly-projecting spout opposite the shaft-opening; a shaft and a hub thereon in said shaft-opening; and a runner detachably fastened to said hub and furnished with wings projecting in a circle around said spout.

7. A centrifugal pump provided with a centrally-arranged inwardly-projecting feed-spout; and a solid rotating runner furnished with wings projecting therefrom in a circle around said feed-spout and furnished with an open space opposite said feed-spout, said spout being arranged to deliver the feed near the center of the disk in the said open space and inside the circle described by the rotating wings.

8. In a centrifugal pump, in combination, a case provided with a peripheral discharge, a central feed-spout, a rotating runner furnished opposite the feed with a conical hub tapering outwardly through the case, and a shield secured to the hub exteriorly of the case.

9. A centrifugal pump comprising a casing having a cylindrical chamber with a central inlet open to the outer air in its side, and a tangential outlet, a shaft mounted concentrically in said casing, a runner mounted on said shaft and having wings on the side next the inlet substantially tangential to the path of movement at their inner ends and curving to substantially radial direction at their outer ends, a feed-spout extending in, through said inlet, into the space between the inner ends of the wings and adapted to supply the fluid by gravity into said space and allow such fluid to fall into contact with the said wings.

10. A centrifugal pump comprising a runner having wings substantially tangential to the path of movement at their inner ends and curving to substantially radial direction at their outer ends, a shaft carrying said runner, a casing having a cylindrical chamber concentric with said runner and shaft and having a central inlet in one side open to the outer air, and means for supplying fluid, through said inlet, by gravity to the space between the inner ends of the runner-wings.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, at Los Angeles, California, this 9th day of December, 1901.

LUTHER LOOK.

Witnesses:

FRANK S. ADAMS,

F. M. TOWNSEND.