No. 695,871. Patented Mar. 18, 1902.

A. T. AMES & S. M. FULTON.

CENTRIFUGAL PUMP.

(Application filed Sept. 7, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

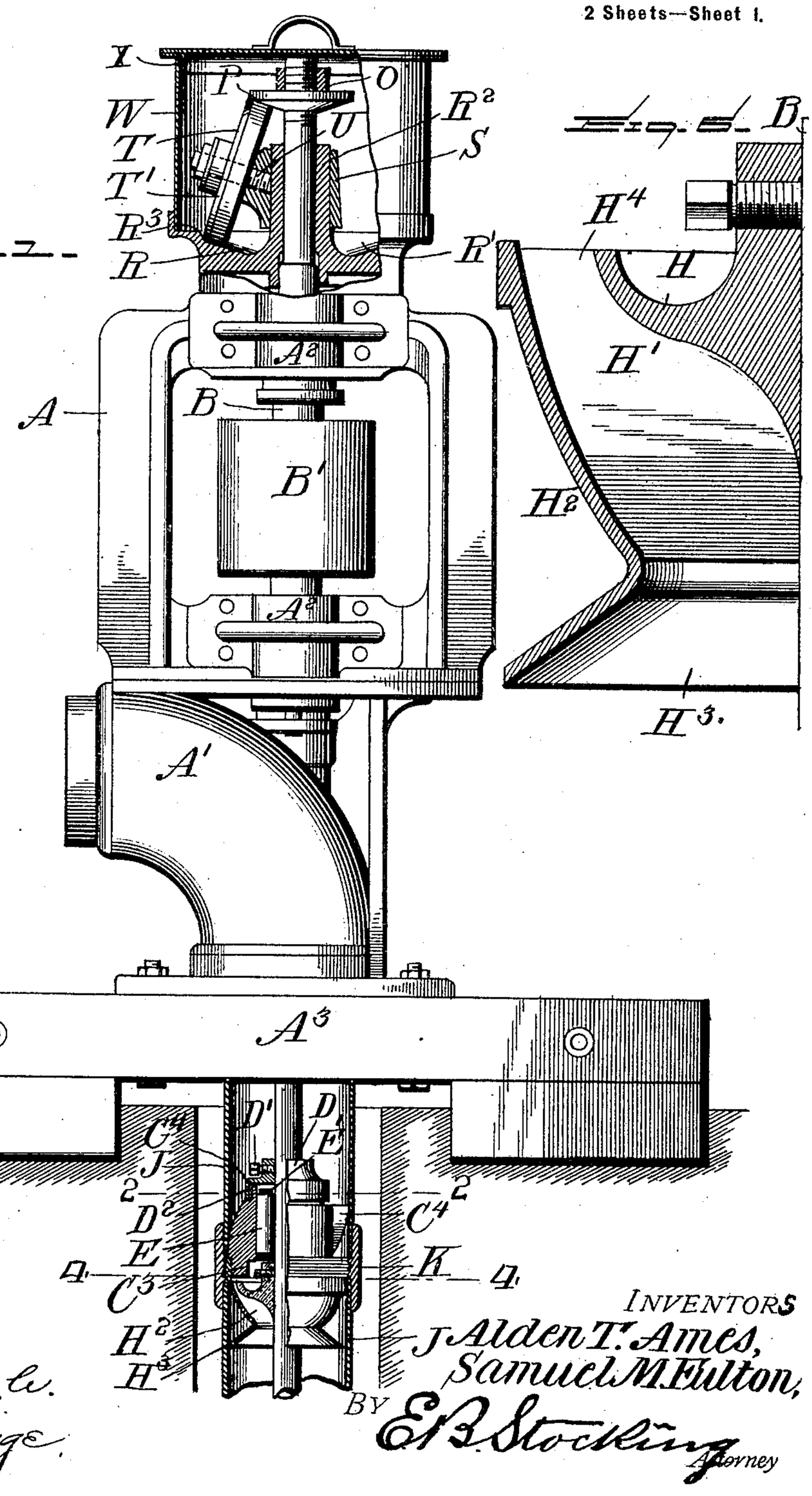

Fig. 3.

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Fig. 4.

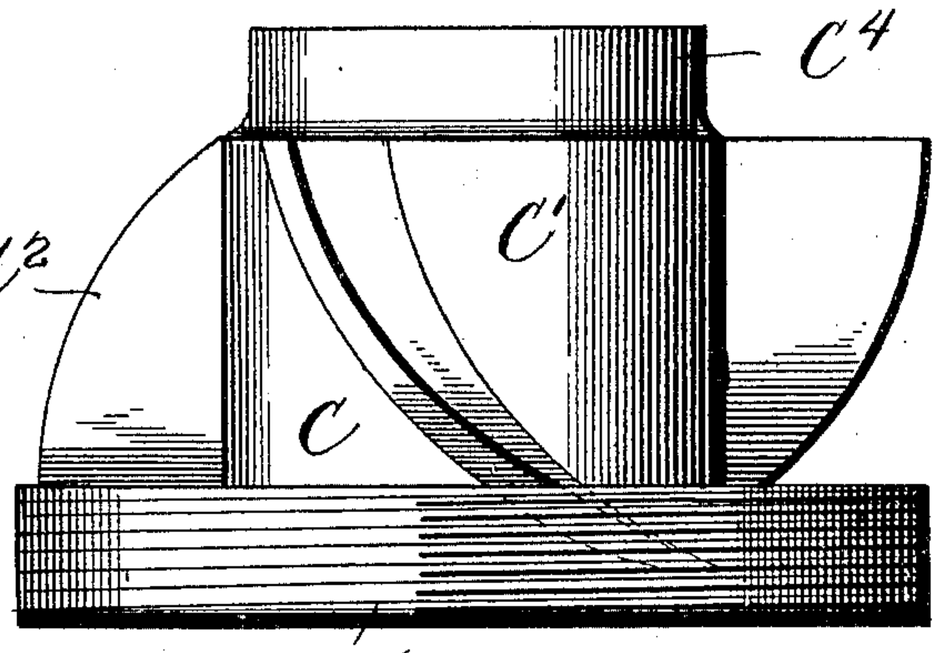


Fig. 6.

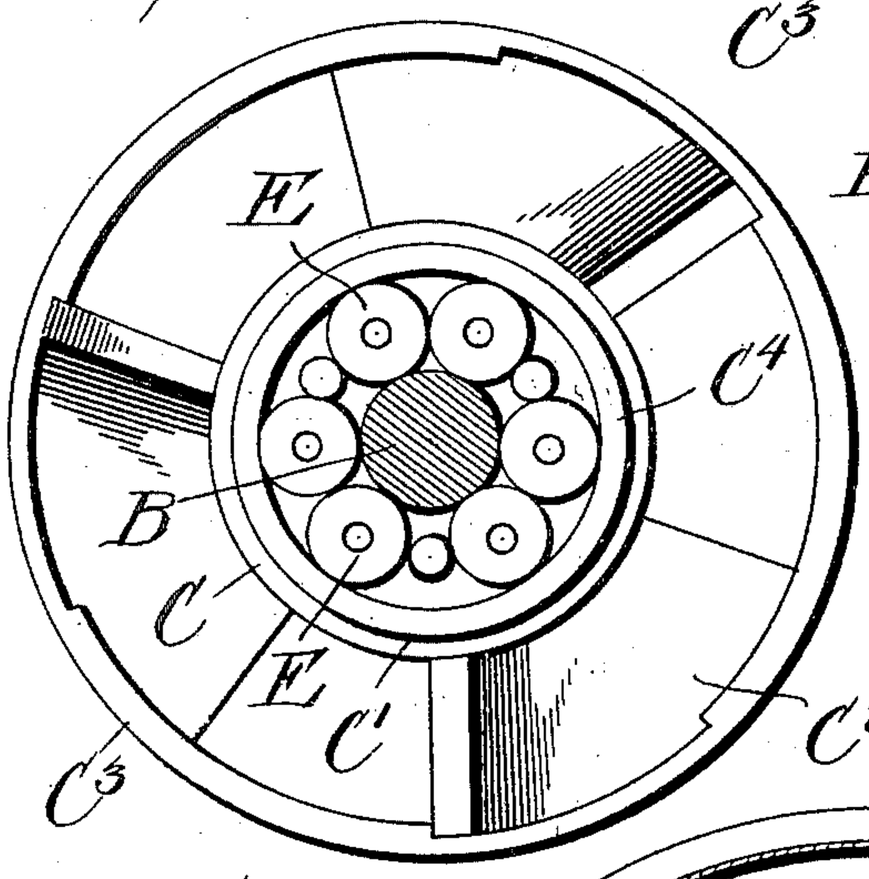


Fig. 7.

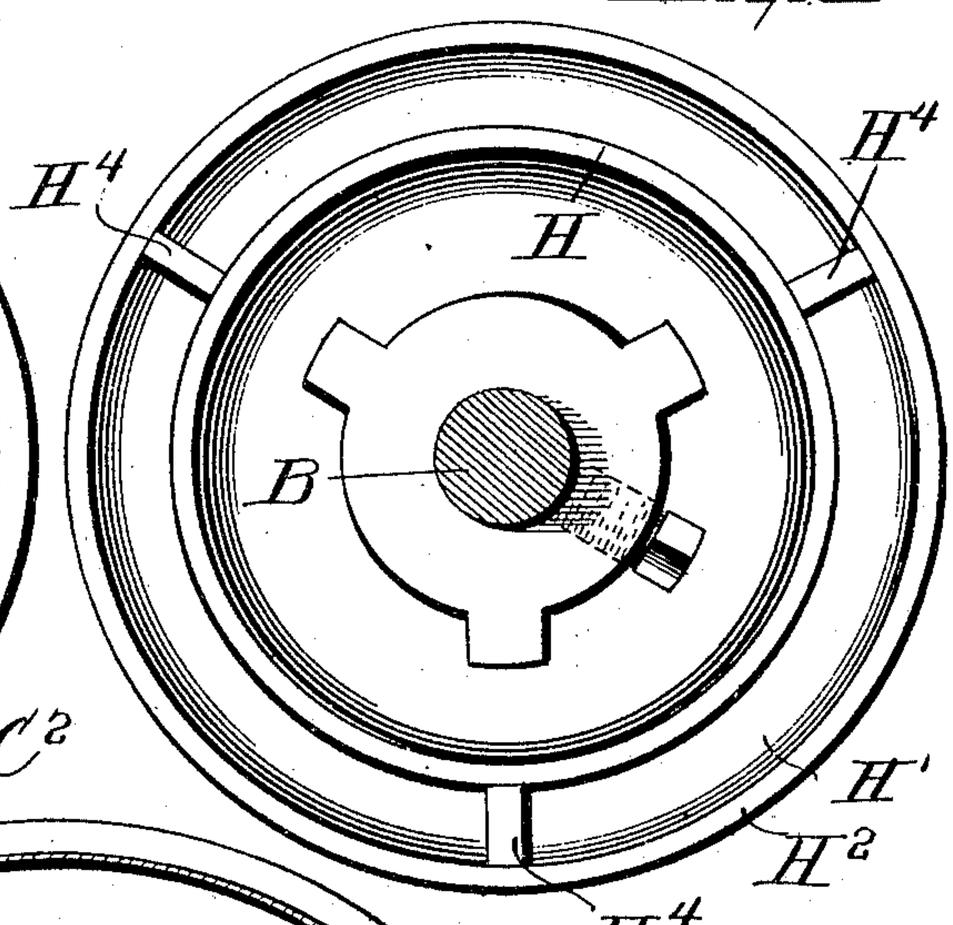
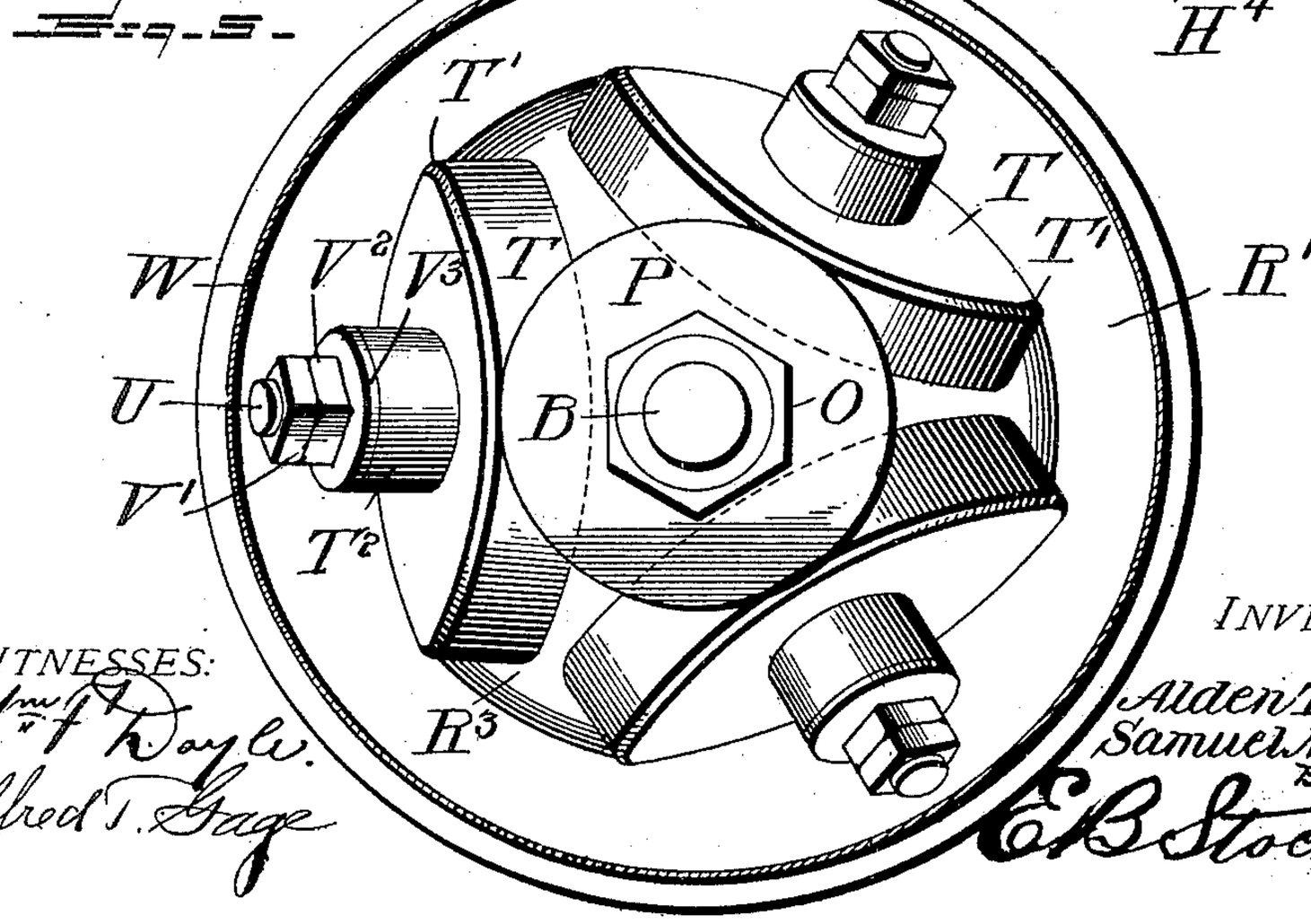


Fig. 5.



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UNITED STATES PATENT OFFICE.

ALDEN T. AMES AND SAMUEL M. FULTON, OF GALT, CALIFORNIA; SAID FULTON ASSIGNOR TO SAID AMES.

CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 695,871, dated March 18, 1902.

Application filed September 7, 1901. Serial No. 74,694. (No model.)

To all whom it may concern:

Be it known that we, ALDEN T. AMES and SAMUEL M. FULTON, citizens of the United States, residing at Galt, in the county of Sacramento, State of California, have invented certain new and useful Improvements in Centrifugal Pumps, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to vertical centrifugal pumps, and particularly to a construction adapted for insertion in wells of small diameter.

The invention has for an object to improve the construction of funnel-shaped runner, which is rotated within the well-casing for the purpose of imparting a centrifugal movement to the water to raise the same.

A further object of the invention is to provide an improved construction of fixed guiding device provided with spiral blades adapted to receive the water from the runner and to convert the rotary movement of the same into a vertical movement.

Other objects and advantages of the invention will hereinafter appear in the following description, and the novel features will be particularly pointed out in the appended claims.

In the drawings, Figure 1 represents an elevation of the pump with parts broken away and in section. Fig. 2 is a horizontal section on the line 2 2 of Fig. 1. Fig. 3 is an elevation of the guide secured to the casing above the runner. Fig. 4 is a horizontal section on the line 4 4 of Fig. 1. Fig. 5 is a top plan of the antifriction supporting device at the pump-head, and Fig. 6 is a partial vertical section through the runner.

Like letters of reference indicate like parts throughout the several figures of the drawings.

The letter A indicates the pump head or casing adapted to support the upper end of the driving-shaft B, which casing is provided with a discharge-nozzle A′ and suitable bearing-boxes A^2 to receive and support the shaft B, which shaft is provided with a driving-pulley B′ of any preferred or desired construction. The frame A for the head is carried by any suitable foundation—for instance, as shown at A^3—and connected to this head is the pipe J, formed in a series of sections and secured together in any desired manner, the lower end thereof being always submerged in the water or fluid to be raised when the pump is in operation. For the purpose of applying the fixed guide C, which supports the shaft B, a coupling is provided between two adjacent sections J, as shown in Fig. 1, which consists of the interiorly-threaded collar K, adapted to engage exteriorly-threaded adjacent ends of the well tubing or pipe J.

The fixed guide C, as shown in Figs. 2 and 3, is composed of a central hub C′, having upon the periphery thereof a series of blades C^2, which are curved or spirally disposed from the upper to the lower portion of said hub. The lower end of these blades terminates at a peripheral ring C^3, which is exteriorly threaded and adapted to be screwed into the collar K and held therein in position by the opposite pipe-sections J. When thus inserted in the pipe, a fixed bearing is formed for the driving-shaft B, and for the purpose of preventing friction or lateral movement of this shaft when in operation a roller-bearing E is provided between the shaft B and the hub C′ of the guide C. Any desired number of these rollers are disposed between the hub and extend the length thereof, which extended bearing prevents the vibration frequently occurring in pumping devices of this character. The bearing-rollers E are supported at opposite ends in rings E′, by which they may be removed and replaced at pleasure and in which they are adapted to have their rotative bearing. For the purpose of preventing the entrance of grit or other objectionable material into this bearing a cap or cover D is provided, as shown in Fig. 1. This is secured to the shaft B by any desired means—for instance, by a set-screw D′—and is provided with a depending flange D^2, adapted to overlap an upwardly-projecting flange C^4, carried by the hub C′. For the purpose of imparting a centrifugal force to the water or liquid in raising the same a runner H is secured to the shaft—for instance, by a set-screw—immediately below the fixed guide C. This runner is provided with an annular funnel-shaped passage H′, divided at intervals by partitions H^4, so that the water in its upward movement

passes between the outer wall H^2 of the funnel and the inner body H thereof. The lower portion of this runner is provided with a funnel or conical portion formed by the inclined wall H^3, which in the rotation of the runner causes the water to move to the center of the funnel H^2, from which it passes upward through the passage H′, as is usual in this class of rotating centrifugal pumps. In the operation of the pump when the runner is rapidly revolved the liquid is drawn by suction into the lower or funnel portion H^3, and upon reaching the blades or partitions H^4 is made to revolve rapidly and thrown upward by centrifugal force until it ascends the length of the inclined surface of the funnel H^2. As the water leaves the upper end of the funnel H^2 it has an upward rotary movement and strikes the spiral blades C^2 upon the fixed guide C, by which it is given an additional upward impulse, while the rotating action thereof is materially restrained. The runners, guides, and coöperating devices hereinbefore described are compounded or repeated at certain predetermined intervals throughout the length of the driving-shaft, the lower runner being always merged in the liquid.

From the foregoing description it will be seen that the driving-shaft B, carrying all of the operative parts, bears such an amount of weight that for the successful operation of the pump all possible friction in the pump-head, from which the shaft is suspended, must be reduced and any lateral vibration of the shaft prevented. With this object in view the upper portion of the head, as shown in Fig. 1, is provided with a casting R, supported from the frame A and through which the upper end of the shaft B extends. This casting is formed with a hollow track or way R′ at its central portion and a vertically-disposed collar R^2, surrounding the shaft B. Upon this collar a loosely-fitting gage S is rotatably mounted and provided at any desired points with studs U, adapted to receive the bearing-rollers T, which carry the weight of the shaft B by contact with the track R′ and a bearing-disk P, secured to the upper portion of the shaft B by any desired means—for instance, a nut O, as shown in Fig. 5—these rollers being located upon the studs U, placed at angles of one hundred and twenty degrees apart, so that the roller has a rotary movement upon its studs, and the cage carrying all of the rollers also is adapted for a rotative movement upon the sleeve R^2, which acts as a guide therefor and also steadies the upper end of the shaft B. These rollers are disposed at any desired angle, preferably, as shown in Fig. 1, at an angle of sixteen degrees from the perpendicular, and the tracks R′ and disk P are each provided with beveled faces disposed at such an angle for the purpose of securing the proper contact between the parts. It will also be noticed that the outer edge T′ of the roller T is suitably beveled and adapted to ride against a similar wall R^3 in the track or way R to prevent an outward movement of the roller from the track. The rollers may be retained in position by any desired means—for instance, a spacing collar T^2, adapted to coöperate with a jam-nut V′, bearing against a nut V^2, which in turn bears in contact with the washer V^3. It will be understood that the outer end of the stud U is suitably threaded for the application of these nuts, while the portion beneath the spacing-sleeve T^2 and the roller T is provided with a bearing-surface, and all of the parts of the head are suitably inclosed within a casing W, provided with a removable cover X, by means of which access can be obtained to the parts and the splashing of oil upon the other portions of the pump prevented. The hollow track in casting R is filled with oil, and as the rollers revolve the oil is carried up to the bearing-disk P, and the rapid rotation thereof throws the oil in a fine spray over all of the bearings, from which it is caught by the drum W and directed back into the track R′. This construction produces a self-lubricating anti-friction-bearing requiring the minimum of attention, with all of the parts so protected as to prevent the entrance of grit or sand into the several parts.

It will be obvious that changes may be made in the details of construction and configuration of the several parts without departing from the spirit of the invention as defined by the appended claims.

Having described the invention, what is claimed is—

1. A runner for a centrifugal pump comprising a body portion to be secured to a shaft having a longitudinally-disposed outwardly-inclined annular opening with an outer wall concave throughout its length and an inner wall convex at its upper portion and concave at its lower portion, partitions disposed within said opening, and an inwardly-inclined open funnel portion of diameter substantially equal to that of the runner proper and extended from the body at the lower end of said partitions therein; substantially as specified.

2. In a centrifugal pump, the combination with a pipe, of a hub secured therein and provided with spiral blades upon its periphery, a driving-shaft passing through said hub, a roller-bearing between said shaft and hub, means carried by said shaft for producing a centrifugal movement of the body of liquid, a ring connecting the lower portion of said blades, and means for detachably securing said ring to said pipe; substantially as specified.

3. In a centrifugal pump, the combination with a pipe, of a hub secured therein and provided with spiral blades upon its periphery, a driving-shaft passing through said hub, a roller-bearing between said shaft and hub, means carried by said shaft for produc-

ing a centrifugal movement of the body of liquid, a ring at the lower portion of said blades, means for securing said ring to said pipe, a cap secured to said shaft above said hub and overlapping the upper end thereof; substantially as specified.

4. A guide for a centrifugal pump comprising a cylindrical hub having upon its outer periphery a series of spirally-disposed blades, and an exteriorly-threaded ring connecting the lower portions of said blades; substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

ALDEN T. AMES.
SAMUEL M. FULTON.

Witnesses:
JOHN QUIGG,
RAY GOWER.