M. T. CHAPMAN.

PUMP.

APPLICATION FILED FEB. 19, 1914.

1,167,047.

Patented Jan. 4, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

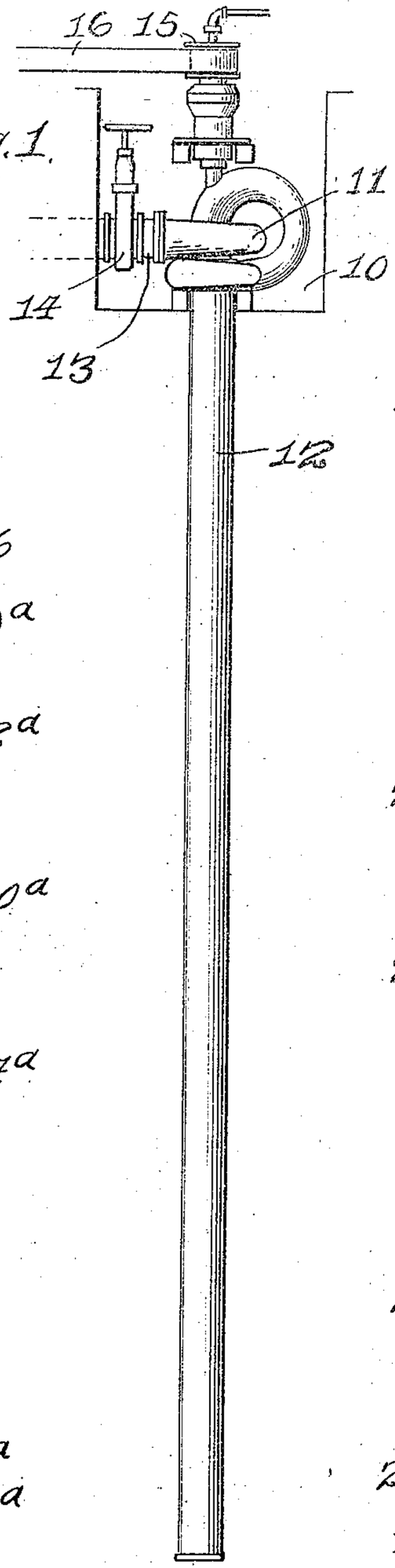


Fig. 7.

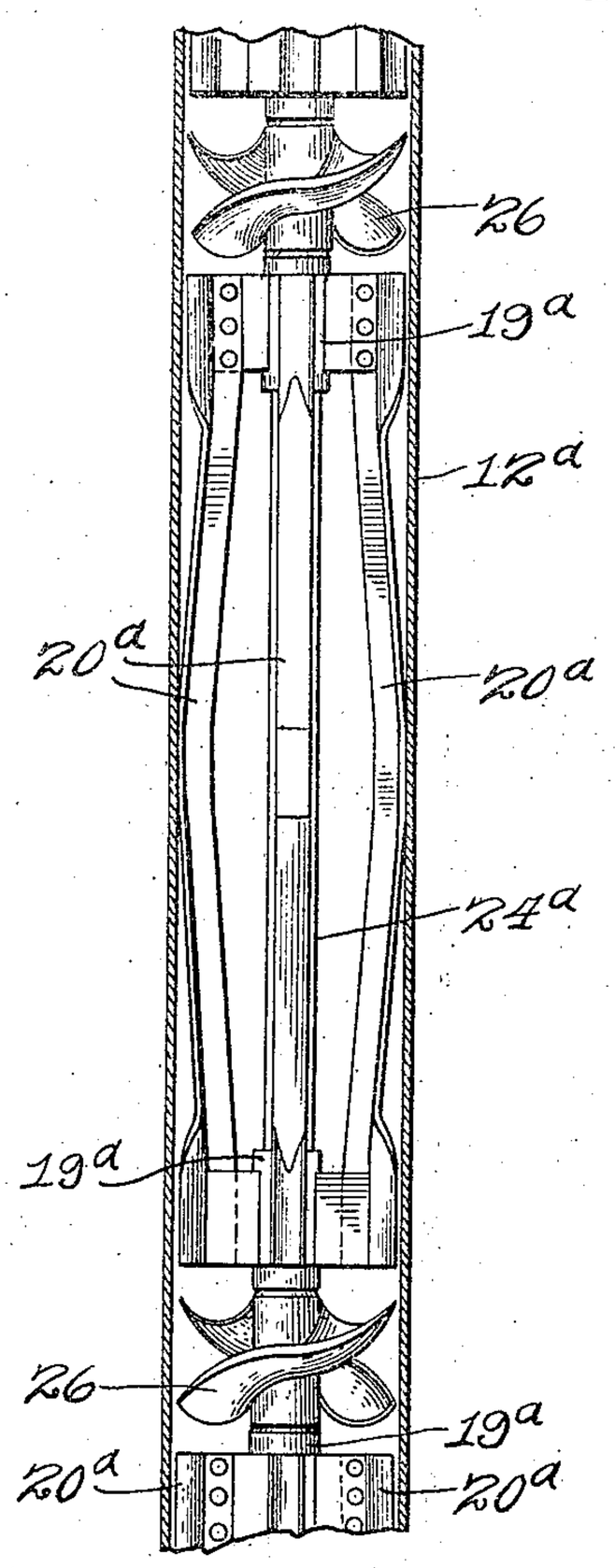
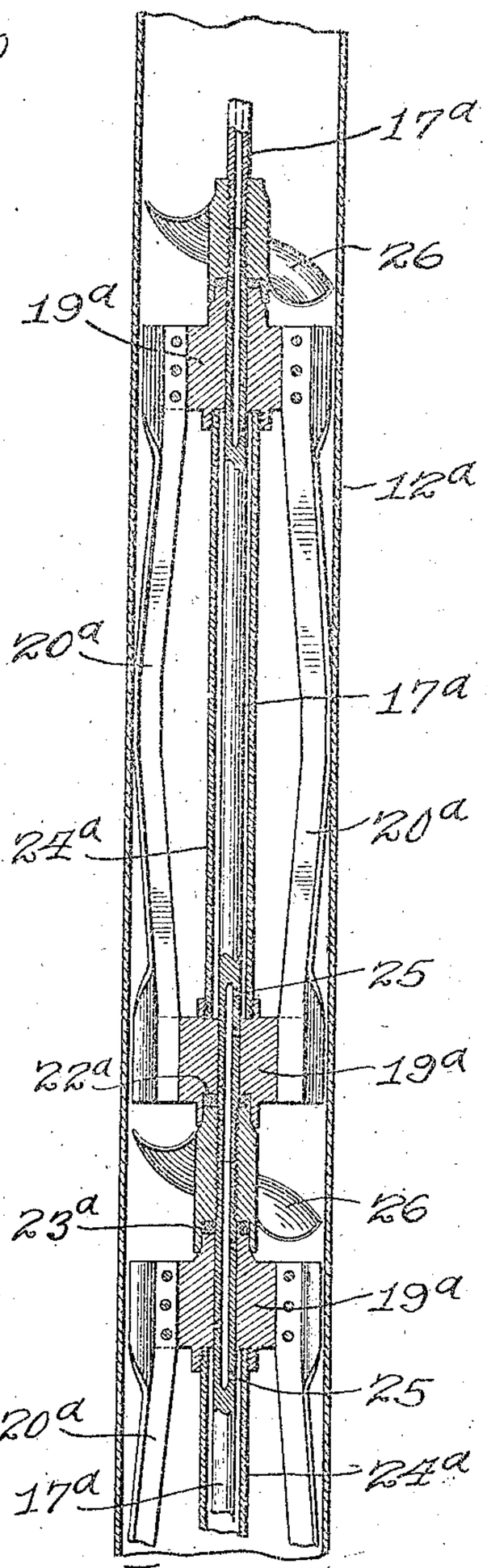


Fig. 8.



Witnesses:
L. B. Graham
W. A. Turner.

Inventor:
Matthew T. Chapman
By Adams & Jackson
Att'ys.

M. T. CHAPMAN.

PUMP.

APPLICATION FILED FEB. 19, 1914.

1,167,047.

Patented Jan. 4, 1916.

2 SHEETS—SHEET 2.

Fig. 2.

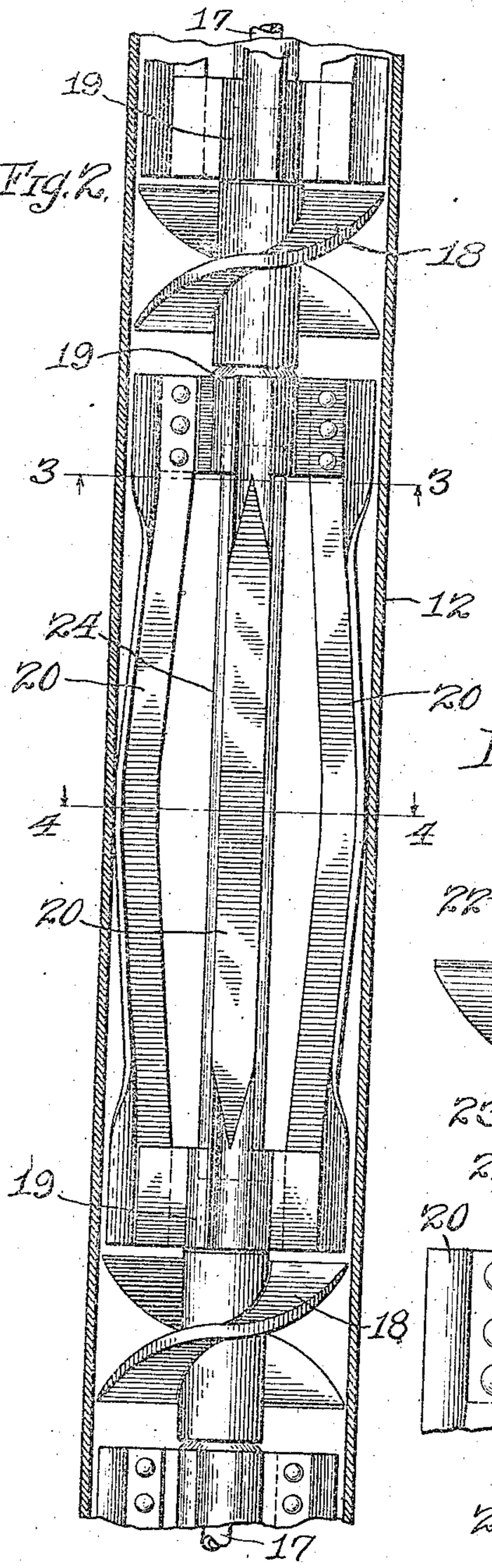


Fig. 6.

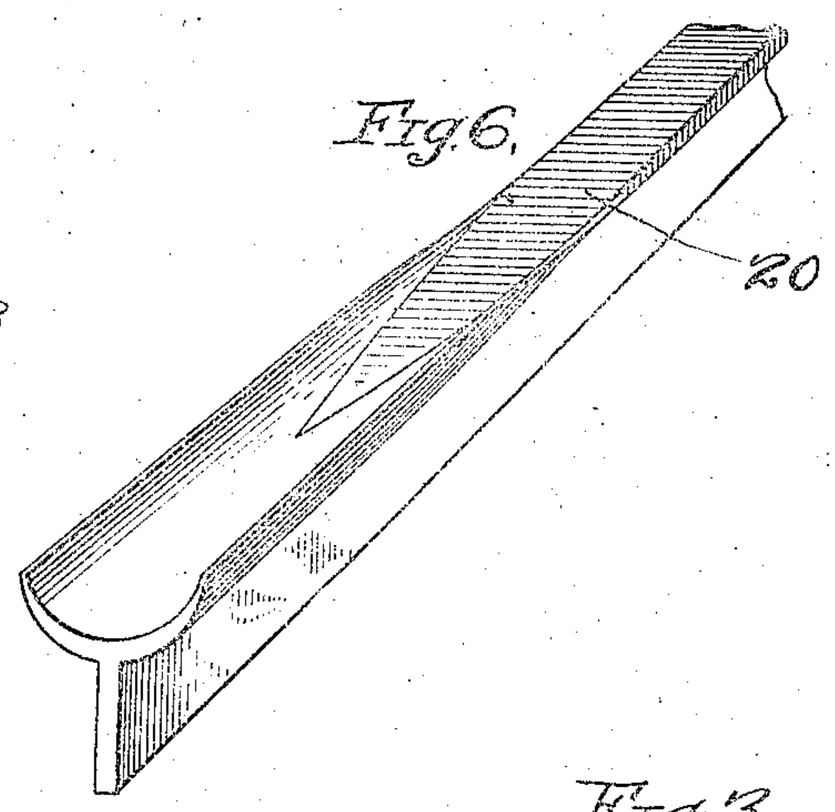


Fig. 3.

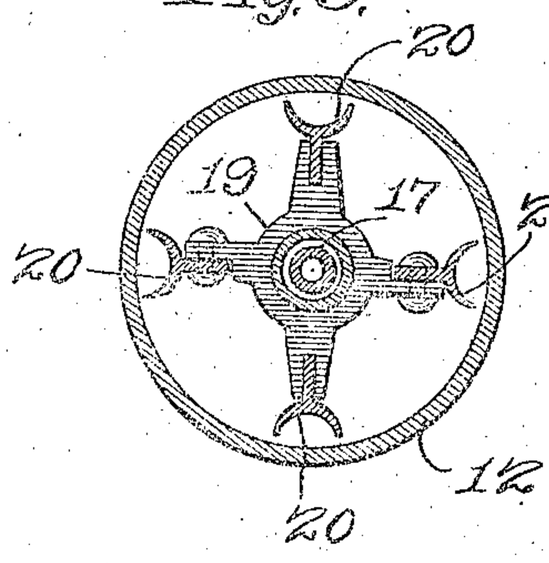


Fig. 5.

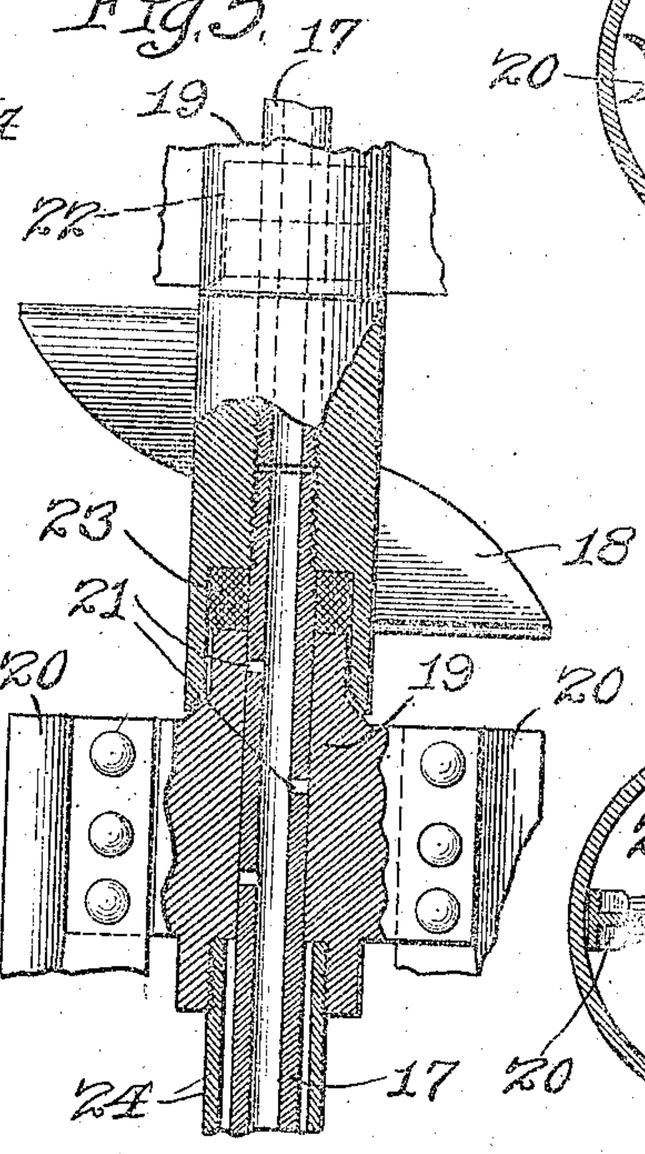
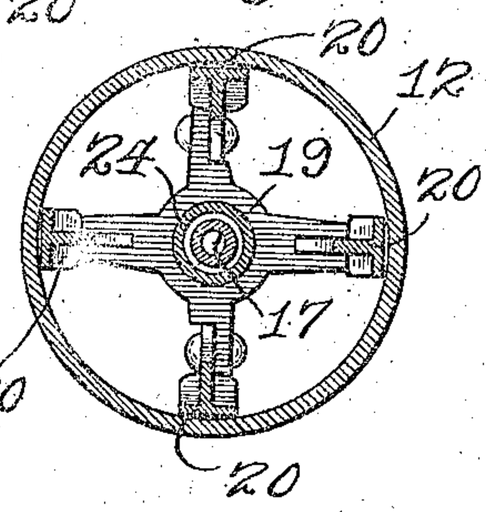


Fig. 4.



Witnesses:
L. B. Graham
W. A. Turner.

Inventor:
Mathew T. Chapman
By Jones & Jackson
Att'ys.

UNITED STATES PATENT OFFICE.

MATTHEW T. CHAPMAN, OF AURORA, ILLINOIS, ASSIGNOR TO THE AMERICAN WELL WORKS, OF AURORA, ILLINOIS, A CORPORATION OF ILLINOIS.

PUMP.

1,167,047. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed February 19, 1914. Serial No. 819,697.

To all whom it may concern:

Be it known that I, MATTHEW T. CHAPMAN, a citizen of the United States, and a resident of Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Pumps, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to pumps, and particularly to that class of pumps involving the use of a pipe or casing with a plurality of runners or propellers located therein at intervals throughout its length, together with means for rotating such propellers, reliance being placed upon the lifting power of the propellers rather than upon the centrifugal action of such propellers.

In the use of centrifugal pumps driven at very high speeds for pumping water containing a large amount of sand or grit, the solid particles pumped are thrown so forcibly into contact with the pump casings that the metal is subject to abnormal wear immediately above the runners, making necessary special reinforcement at those points. In the use of a propeller pump of the type referred to as distinguished from the centrifugal pump, the water is not thrown so strongly outward, with the result that the life of the parts is very materially prolonged.

It is one of the objects of my invention to provide an improved form of runner or propeller, by the use of which the effect of the centrifugal force in throwing the sand and grit against the casing of the pump shall be minimized.

The production of an efficient durable pump of the type referred to is of very considerable importance, for the reason that a greater quantity of water can be raised with such a pump than can be raised by the use of any other form of pump yet developed capable of being inserted in a small bore. Pumps of the type referred to can be made to operate effectively in a bored well four inches in diameter or probably less. On the other hand, it has not been found commercially practicable to use a centrifugal pump adapted to operate in a bore of less than ten, twelve, or fourteen inches diameter. Inasmuch as the rotary pump of the type referred to is more cheaply produced than the form of reciprocating pump operating a great length of pump rods for raising water from great depths, it will be seen that this improved form of pump meets a very well-recognized demand.

It is another object of my invention to provide oiling means for lubricating the shaft bearings of a pump of this type.

Heretofore inefficient lubricating means have been provided, with a result that the pumps have been of very short life and unsatisfactory in operation. It is, of course, highly desirable that the pump shall be capable of removal without the withdrawal of the pump casing or well tube in which it works, and for this reason it has been deemed impractical to carry oil to the pump bearings from the outside of the pipe. By my invention I have provided an effective lubricating means by which the bearings throughout the length of the pump casing can be properly lubricated by means of heavy grease, oil, water, or other lubricant, as desired, without in any way detracting from the ease with which the pump can be withdrawn. So far as I am aware, this has never been accomplished heretofore.

It is another object of my invention to improve pumps of this type in sundry details hereinafter pointed out.

The preferred means by which I have accomplished these objects are shown in the accompanying drawings and are hereinafter specifically described.

That which I believe to be new is set forth in the claims.

In the drawings, Figure 1 is a view of a pump embodying my improvements; Fig. 2 is a central vertical section through a portion of the casing of my improved pump showing two of the runners or propellers mounted therein and the portion of the pump between such runners; Fig. 3 is a cross section taken on line 3—3 of Fig. 2; Fig. 4 is a cross section taken on line 4—4 of Fig. 2; Fig. 5 is an enlarged detail, showing a central vertical section through one of the bearings of the pump shaft; Fig. 6 is an enlarged detail showing one end of one of the spring T-shaped ribs which extend from one to another of the bearings throughout the length of the pump casing; Fig. 7 is a central vertical section through a portion of my improved pump similar to that shown in Fig. 2, but showing a modification thereof; and Fig. 8 is a central vertical section through the working parts of such a section

of the modified construction as that shown in Fig. 7.

Referring to the drawings, 10 indicates the well pit having mounted therein a centrifugal pumping element 11 mounted at the upper end of the pump casing 12, which in the present instance is the well tube itself.

13 indicates a discharge pipe leading from the pump 11 provided with a valve 14 therein to close the pipe.

15 indicates a pulley mounted on the upper end of the pump shaft adapted to be driven by a belt 16 from any suitable source of power.

Inasmuch as the parts so far described may be of any well-known description and form no part of my present invention in and of themselves, it is believed to be unnecessary to describe them further herein.

17 indicates the pump shaft upon which the pulley 15 is mounted at its upper end and upon which a plurality of runners or propellers 18 are mounted at suitable intervals as desired throughout the length of the pump casing 12 below the pumping element 11. As will be readily understood, the runners or propellers 18 serve to raise the water to the upper end of the pump casing 12 where, in the construction illustrated, the water is acted upon by the centrifugal pumping element 11 for the purpose of further lifting the water for use in a water works system of any desired type. It will be understood that in many installations of my improved pumping device, no centrifugal pumping element 11 will be required, and the presence or absence of such an element is entirely immaterial in the matter of the present invention.

As best shown in Fig. 5, the pump shaft 17 is formed of short sections secured together by being screwed into the ends of the hub portions of the runners 18. Both above and below each of the runners 18 the shaft 17 is provided with bearings 19, which in the construction shown are in the form of spiders. As best shown in Fig. 2, each of the spiders 19 below one of the runners 18 has secured to it two T-shaped bars 20, the lower ends of which are slidably mounted in suitable slots in the spider 19 next below it. Each of the spiders 19 just above the runners 18 is provided with two similar T-shaped bars 20 extending upward therefrom, their upper ends being slidably mounted in suitable slots in the spider next above it. Each of the T-shaped bars or ribs 20 is preferably formed of spring material, having its central portion bowed outward slightly relative to the shaft, whereby the ribs are adapted to grip the well tube 20 and hold the bearings 19 against rotation therein, at the same time being adapted to permit of the withdrawal of the bearings with the shaft whenever it is desired to withdraw the pump for any reason.

The ribs or bars 20 have a function in addition to that of holding the bearings against rotation. The effect of rotating the runners 18 rapidly in the pipe 12 is to cause the water adjacent to the runners to rotate rapidly in the pipe, and the rotation of such runners has little effect other than a corresponding rotation of the water unless the water be held against rotation immediately adjacent to the runners. With the bars 20 extending into close proximity to the upper ends of the runners 18, the water is held against rotation as just above described and is caused to rise up the pipe 12 from one runner 18 to the next above it. As best shown in Figs. 3 and 6, the ends of the bars 20 are curved outward in order to better intercept the rotary motion of the water.

As best shown in Fig. 5, each section of the shaft 17 is bored out at its center whereby oil or other lubricant is adapted to be supplied through said shaft to the bearings 19, the shaft being provided with oil ports 21 leading from the bore of the pipe to the faces of the bearings. As will be readily understood, the bearing faces of the parts 19 are to be formed integral with the main portions thereof, as illustrated, or are to be formed therein in any suitable manner, being formed of any suitable material to adapt them for use with such lubricant as it is desired to use.

As best shown in Fig. 5, the lower end of each of the bearings 19 located adjacent to the upper ends of the runners 18 are cored out to receive packing members 22 of felt or any other suitable material which serve to keep the sand and grit carried by the water being pumped away from the face of the bearing. Likewise, the lower end of each of the hubs of the runners 18 is cored out to receive a similar packing member 23 to keep the sand and grit out of the bearing 19 below the runner. As shown in this figure, the lower ends of the cored out recesses just described in connection with the bearings 19 and the hubs of the runners 18 are formed flaring whereby centrifugal force tends to throw outward any sand or grit which finds its way to the mouth of such recesses. 24 indicates a plurality of pipes embracing the shaft 17 between each of the adjacent runners 18, said pipes being screw-threaded at their ends for connection with said bearings.

In Figs. 7 and 8, which show a modification of the construction hereinbefore described, corresponding parts are indicated by the same reference characters, but with the addition of an exponent "a." In the construction there illustrated the several sections of shaft 17^a are not bored from end to end for supplying oil to the bearings, but

are bored only a short distance at each end, an oil port 25 being provided leading from the central bore of said shaft to the interior of the pipe sections 24ª. By this means a larger supply of oil or grease can be maintained for lubricating purposes and the expense of boring the sections of pipe beyond the end portions thereof is saved. In the construction shown in said Figs. 7 and 8, I have illustrated an improved runner or propeller 26, the blades of which are curved upward at their outer edges so as to turn the water upward and to decrease the centrifugal effect of such runners upon the water and the sand and grit carried thereby. In this way the wear upon the pump casing is very materially lessened and the expense and difficulty of maintaining the pump in good condition are correspondingly decreased.

By the use of my improvements, a pump is provided which is capable of operating efficiently in a well of a small bore for pumping therefrom from a great depth a very large amount of water. By reason of my improved oiling system, the pump is capable of operating without undue wear and the life of the pump is not unduly limited by reason of excessive wear in the bearings.

In the use of pumps of this type, it is very frequently desired to drive the pump by an electric motor. As is well known, in many types of electric motor it is not feasible to attempt to vary the speed of rotation of the armature, it being desirable to run the motor at all times under load conditions at a certain constant predetermined speed. In installing a pump of the type just described, it is very often not known in advance just what the constant capacity of the well will prove to be, and it sometimes happens that the capacity of the pump at the predetermined desired speed of the motor is greater than the capacity of the well. In such a case, in the use of my improved pump as above described, the propellers or runners 18 and 26 may be removed from the line of shaft and other propellers or runners substituted therefor, the new runners being of such a height as to make the capacity of the pump conform to the capacity of the well at the predetermined desired speed of the motor.

By reason of the shaft and other working parts of the pump being made of short sections secured together at their ends, the pump is able very readily to adapt itself to any slight irregularities in the bore of the well. This feature is of considerable importance in view of its being difficult or impossible to bore a well absolutely straight. The adjustability of the bearings relative to each other in the line of pipe 12 is increased very materially by reason of the engagement of the T-bars 20 with the pipe at a point between their ends, permitting the structure comprising the two connected bearings pivoting in the pipe.

While I have illustrated in the drawings the use of two bearings for the shaft 17 between each two adjacent runners, said two bearings being connected together to constitute in effect a single bearing structure, it will be understood that I do not limit myself to that particular construction except as hereinafter specifically claimed, inasmuch as any appropriate bearings may be used.

That which I claim as my invention, and desire to secure by Letters Patent, is,—

1. In a pump, the combination of a pipe, a shaft therein, a plurality of runners mounted on said shaft at intervals therealong adapted to rotate therewith, and a plurality of bearings between said runners for said shaft mounted in said pipe, lubricating passages being provided through the casing surrounding the shaft between the runners and through that part of the shaft passing through the runners for the purpose of conducting lubricant to the bearings.

2. In a pump, the combination of a pump casing for conducting water out of a well, a shaft, pump runners mounted on said shaft, bearings for said shaft, and a casing surrounding the shaft for conducting lubricant to the shaft bearings, those parts of the shaft passing through the bearings being provided with openings therethrough communicating with the casing on the exterior of the shaft at opposite sides of the bearings.

3. In a pump, the combination of a pump casing for conducting water out of a well, a shaft, pump runners mounted on said shaft, bearings for said shaft, and means for conducting lubricant to the bearings, comprising a casing for conducting the lubricant about the shaft for a portion of its length, and an opening or openings through the shaft for conducting the lubricant the remainder of the distance.

4. In a pump, the combination of a pump casing for conducting water out of a well, a shaft, pump runners mounted on said shaft, bearings for said shaft, and means for conducting lubricant to the bearings, comprising longitudinally-extending openings through the shaft at the bearings, and a casing about said shaft with which said openings communicate at opposite sides of the bearings for conducting the lubricant the remainder of the distance.

5. In a pump, the combination of a pipe, a shaft therein, a plurality of runners mounted on said shaft, bearings for said shaft mounted in said pipe, casings surrounding said shaft between said runners, and means for conducting a lubricant supply from the casing above each runner to the casing below said runner, comprising a longitudinal passage extending through the

runner communicating with the interior of said casings.

6. In a pump, the combination of a pipe, a shaft therein comprising a plurality of sections, a plurality of runners mounted on said shaft at the joints between said sections, bearings for each of said sections of shaft mounted in said pipe, a casing surrounding each section of shaft between said bearings, and means for conducting oil from one of the bearings adjacent to each of said runners to the bearing on the opposite side thereof, comprising longitudinal passages through the ends of said sections of shaft communicating with the interior of said casings.

7. In a pump, the combination of a pipe, a shaft therein comprising a plurality of sections, a plurality of runners mounted on said shaft at the joints between said sections, bearings for each of said sections of shaft mounted in said pipe, a casing surrounding each section of shaft and connected to the bearings at its ends, yielding means extending from one to the other of the bearings for each shaft section mounted thereon adapted to hold said bearings against rotation in said pipe, and means for conducting oil from one of the bearings adjacent to each of said runners to the bearing on the opposite side thereof, comprising longitudinal passages through the ends of said sections of shaft communicating with the interior of said casings.

8. In a pump, the combination of a pipe, a shaft therein, a plurality of bearings for said shaft mounted in said pipe, a plurality of runners mounted on said shaft at intervals therealong adapted to rotate therewith, and a plurality of bars extending from one to another of said bearings adapted to engage the inner face of said pipe and to hold said bearings against rotation therein, said bars being also adapted to resist the tendency of the water to rotate in the pipe due to the action of the runners.

9. In a pump, the combination of a pipe, a shaft therein, a plurality of bearings for said shaft mounted in said pipe, a plurality of runners mounted on said shaft at intervals therealong adapted to rotate therewith, and a plurality of bars mounted on one of said bearings and engaging another of said bearings adapted to engage the inner face of said pipe and to hold said bearings against rotation therein, said bars being also adapted to resist the tendency of the water to rotate in the pipe due to the action of the runners.

10. In a pump, the combination of a pipe, a shaft therein, a plurality of bearings for said shaft mounted in said pipe, a plurality of runners mounted on said shaft at intervals therealong adapted to rotate therewith, and a plurality of bars formed of spring material and bowed outward between their ends mounted on one of said bearings and engaging another of said bearings adapted to frictionally engage the inner face of said pipe and to hold said bearings against rotation therein, said bars being also adapted to resist the tendency of the water to rotate in the pipe due to the action of the runners.

11. In a pump, the combination of a pipe, a shaft therein, a plurality of bearings for said shaft mounted in said pipe, a plurality of runners mounted on said shaft at intervals therealong adapted to rotate therewith, and a plurality of angular bars extending from one to another of said bearings adapted to engage the inner face of said pipe and to hold said bearings against rotation therein, said bars being also adapted to resist the tendency of the water to rotate in the pipe due to the action of the runners.

12. In a pump, the combination of a pipe, a shaft therein, a plurality of bearings for said shaft mounted in said pipe, a plurality of runners mounted on said shaft at intervals therealong adapted to rotate therewith, and a plurality of T-bars extending with their head portions outermost from one to another of said bearings adapted to engage the inner face of said pipe and to hold said bearings against rotation therein, said bars being also adapted to resist the tendency of the water to rotate in the pipe due to the action of the runners, the head portions of said T-shaped bars being curved outward at each end in order to further counteract the whirling tendency of the water.

13. In a pump, the combination of a pipe, a shaft therein, a runner mounted on said shaft and adapted to rotate therewith, and bearings for said shaft mounted in said pipe one at each side of said runner, the joint between each of said bearings and said runner comprising a recess in one of said members into which the other member projects into contact with a packing therein, said recesses being flared outward at their ends whereby the rotation of the runner tends through the medium of centrifugal force to prevent sand or grit from working into said joint.

MATTHEW T. CHAPMAN.

Witnesses:
JOHN B. SPERRY,
R. D. MAHAFFEY.