No. 887,658. PATENTED MAY 12, 1908.

F. W. KROGH.

CONSTRUCTION OF CENTRIFUGAL PUMPS.

APPLICATION FILED FEB. 3, 1906.

2 SHEETS—SHEET 1.

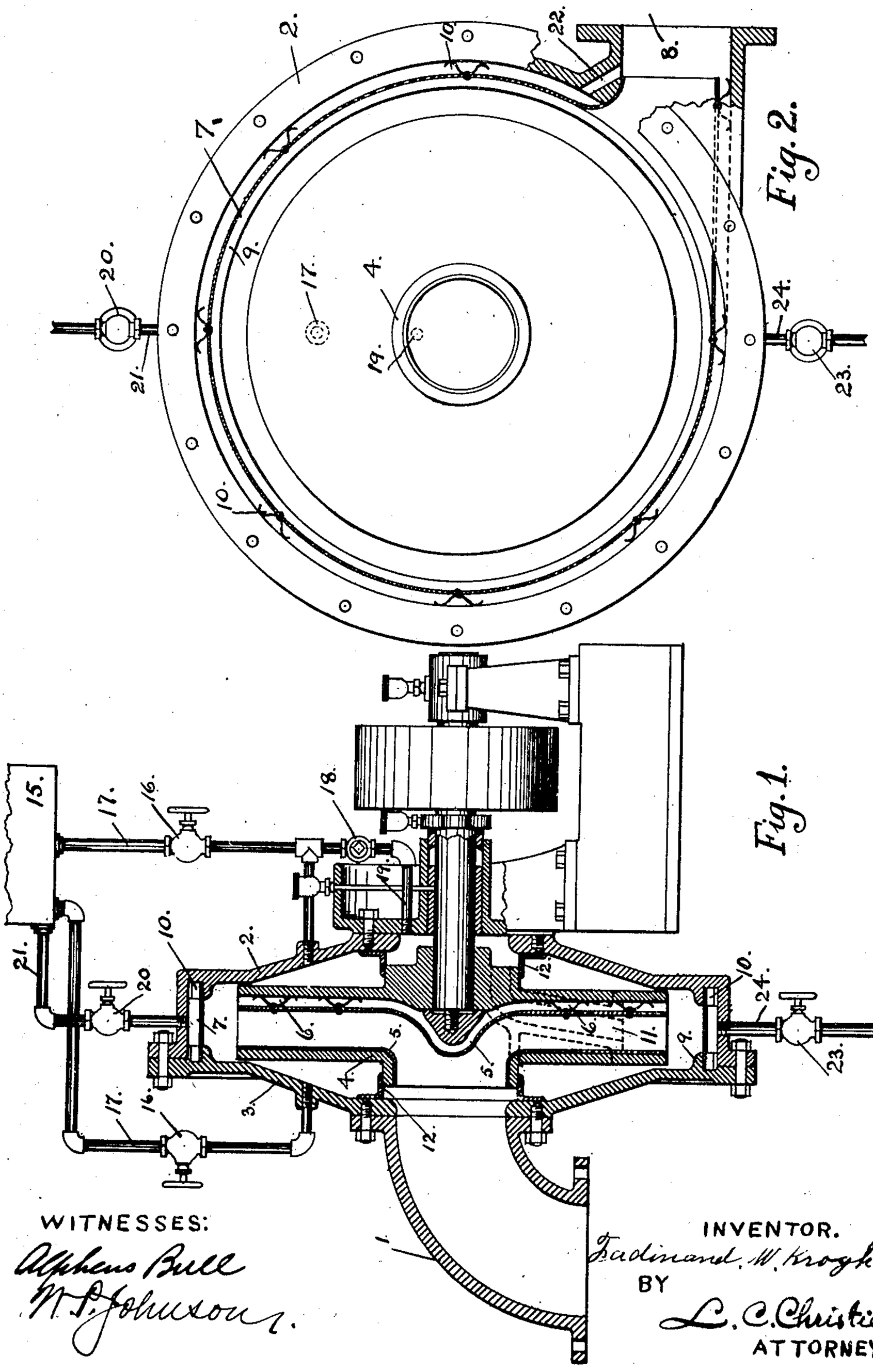

Fig. 1.

Fig. 2.

WITNESSES:

Alpheus Bull

W. P. Johnson.

INVENTOR.

Ferdinand W. Krogh.

BY

L. C. Christie.

ATTORNEY.

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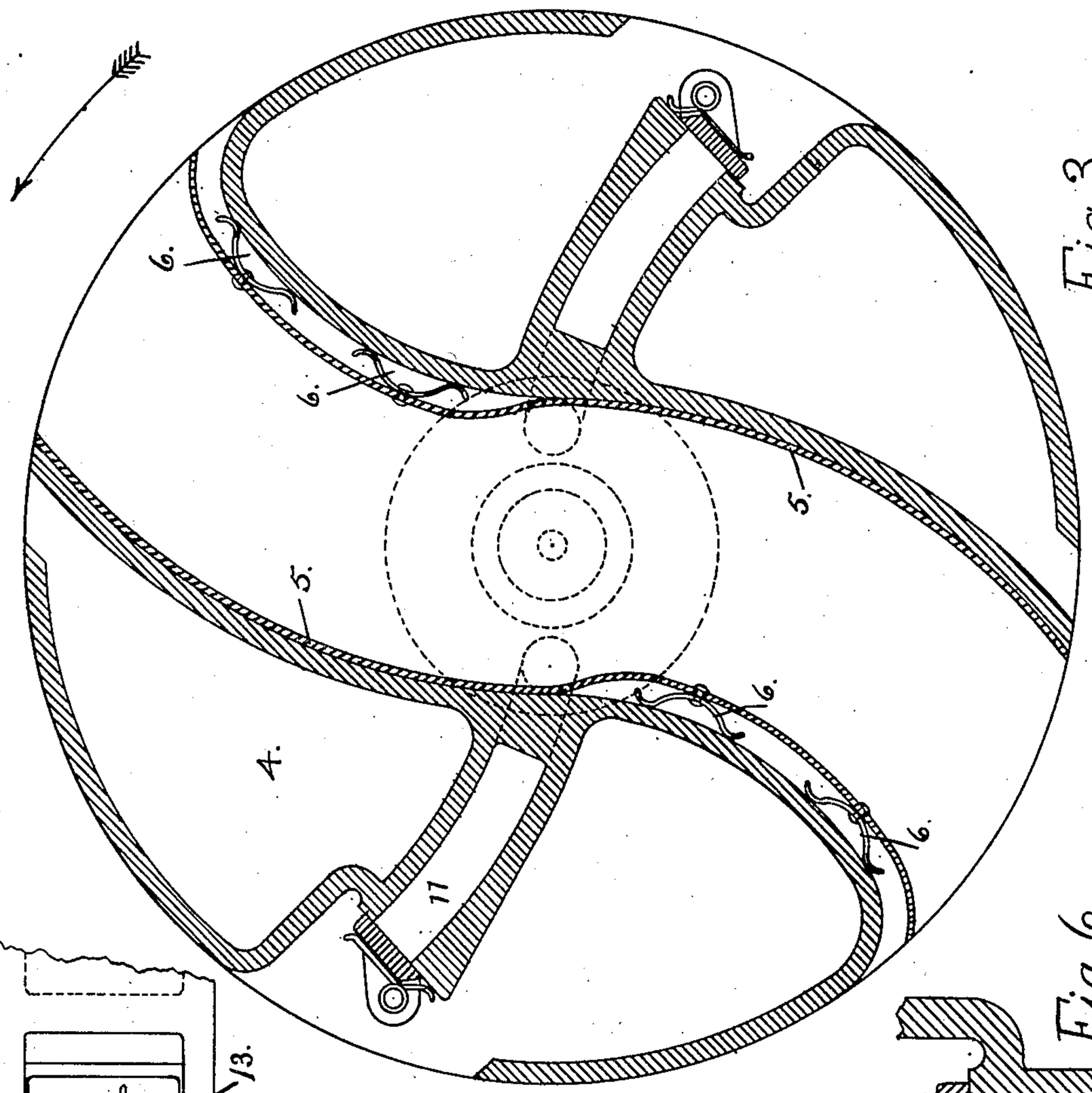

Fig. 3.

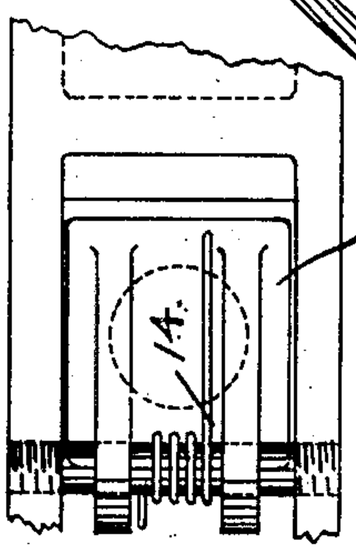

Fig. 5.

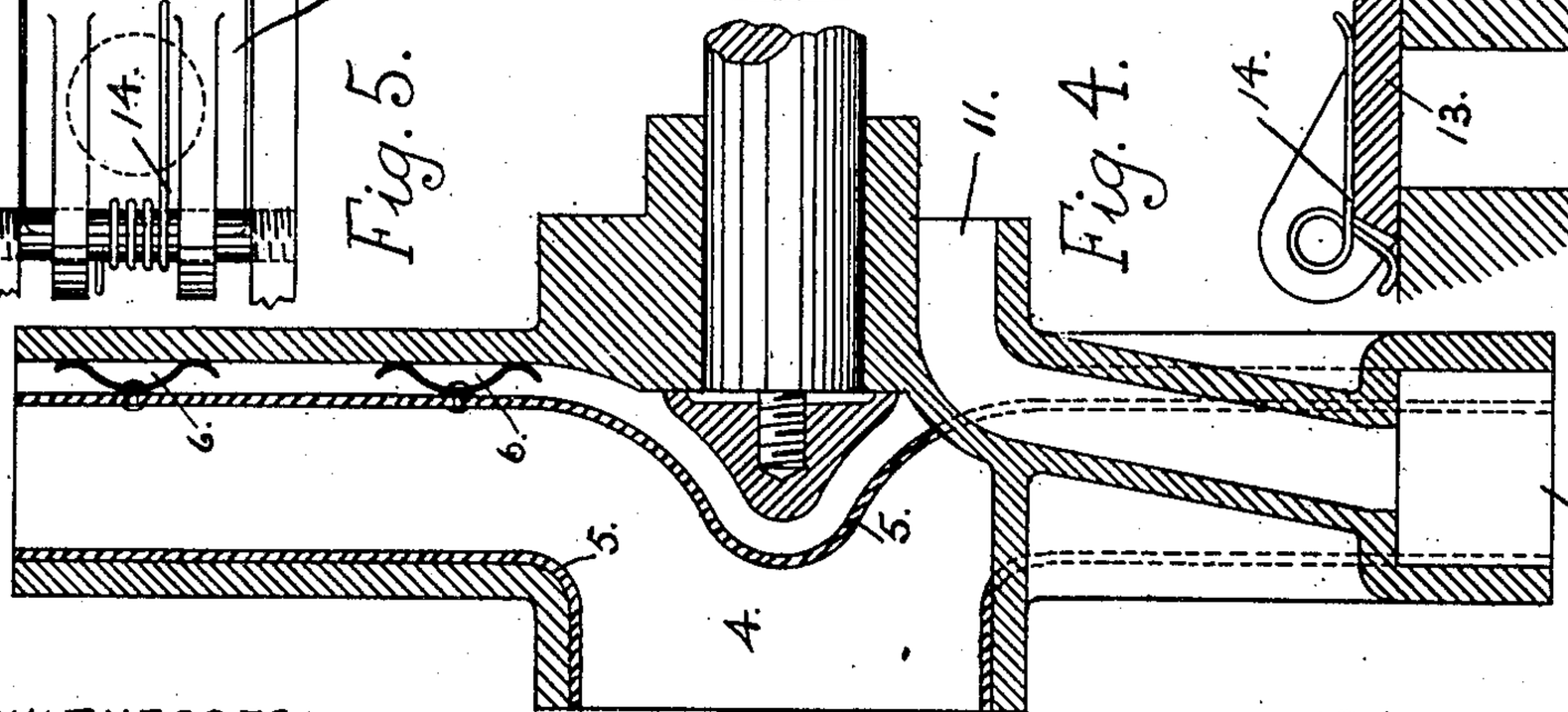

Fig. 4.

Fig. 6.

WITNESSES:

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ATTORNEY.

UNITED STATES PATENT OFFICE.

FERDINAND W. KROGH, OF SAN FRANCISCO, CALIFORNIA.

CONSTRUCTION OF CENTRIFUGAL PUMPS.

No. 887,658. Specification of Letters Patent. Patented May 12, 1908.

Application filed February 3, 1906. Serial No. 299,251.

To all whom it may concern:

Be it known that I, FERDINAND W. KROGH, a citizen of the United States, residing at No. 2506 Sutter street, San Francisco, in the county of San Francisco and State of California, have invented certain new and useful improvements in the construction of centrifugal pumps in which the passage of stones, gravel, and other foreign material is prevented from injuring impeller and walls of pump and the running joints and shaft-bearing, as will hereinafter be described, and pointed out in the claims at the end of this specification.

My invention may be said to consist of new and novel introduction of parts together with the construction of pump for the embodiment of same and is particularly applicable in the class of pumps known as dredging pumps and where sand and gravel forms a large share of the substance pumped. I attain this object in the manner illustrated in accompanying drawings, in which

Figure 1 is a part sectional elevation of pump, also showing a section through the discharge passage of the impeller. Fig. 2, is a side elevation of the same having cover and suction elbow removed and showing discharge nozzle partly in section. Fig. 3, shows a sectional side elevation of impeller. Fig. 4, is the combined sectional elevation of same showing discharge passage and also the communication passage to back or shaft side of impeller. Fig. 5, is a plan view of valve closing this communication to back or shaft side of impeller and Fig. 6, is a sectional elevation of said valve.

Similar numbers refer to similar parts throughout the several views.

Fig. 1, being a sectional elevation of pump has its usual suction elbow 1, the body of pump chamber or casing 2 and the cover 3 for same, and the impeller 4 which latter is as will be seen lined with a suitable material as steel. This lining 5 which is applied in the entire discharge passage is fitted close against the side of impeller 4 on the suction side of same, whereas on the shaft side of said impeller 4, the lining 5, is clear of this side by cushioning means or springs 6, the object being that the impact or shock due to stones being carried in through the suction will be relieved and no injury done from this cause. Referring to Fig. 3, it is further seen, that the adjacent sides of discharge passage of impeller to that as shown in Fig. 1, has the lining partly close and partly clear to the extent of the space taken up by springs similarly applied, the object being to more effectually protect this part of the passage, which due to the direction of travel as indicated by arrow, will be subjected to harder wear and shocks. The springs 6, being attached by rivets or otherwise to lining 5, will always retain their position in relation to same and may be of any desired size, shape or number. The inside circumference of pump-chamber 2, is also lined as seen by lining 7. This lining goes nearly all around circumference and partly into discharge opening 8, as seen in Fig. 2. The lining 7 is held against the circular projecting rings 9 cast in one with pump chamber 2 and cover 3, by means of a series of springs 10 of similar size and shape as used for impeller 4. It is clear that this lining 7, forms an effective and postive projection against wear due to sand, gravel or other sharp cutting substances, and also prevents injury to pump chamber from impact of stones, which have been known to actually break through the pump chamber, due to their weight and the speed with which they travel. The springs 10, are attached to lining 7 by rivets, or other suitable means.

Referring to Fig. 3, it is seen that a direct passage 11 obtains from the circumferential portion of impeller 4 to the central water space underneath the angle rings 12, on the back or shaft side of said impeller 4; and this passage which may be more than one in number is automatically kept closed by valves 13 due to resilience of springs 14, the object of this innovation being that as the impeller 4 revolves, the valves 13 will be kept open due to the centrifugal force acting on same, whereas when the pump is stopped these valves 13 will automatically close, thus an effective passage for balancing impeller is maintained and at the same time can no sand or foreign material pass in and do injury to shaft bearing. It is further seen that a series of valve and pipe connections are carried from some source of clean water supply 15, the valves 16 and pipes 17 carrying water to both sides of the impeller will fill the double object of keeping spaces clean and for balancing the impeller, one valve being more open than the other as wanted, valve or cock 18 with pipe connection 19 will supply clean water to central space on back or shaft side of impeller, and as pump is running be drawn

out through communication passage 11 also keeping valve seat and valves clean, at the end of said communication passage 11, further will the valve 20 with communication pipe 21 supply water to the back of lining 7 for pump chamber or casing keeping this space clean and the channel 22 is provided as an exit on the one side of lining where it fits close for any sand or gravel tending to find lodgment. The valve 23 with pipe connection 24 is intended as a further drain and outlet for water supplied to back of lining 7.

Having thus described my invention what I claim and desire to obtain by Letters Patent is:—

1. In a centrifugal pump, the combination of an impeller having radiating water passages, a lining for the said passages, the lining being in part secured close against the body of the impeller and in part separated therefrom, and cushioning springs interposed between the frame of the impeller and the parts of the lining that are set away therefrom.

2. In a centrifugal pump, the combination of an impeller having radiating passages, and linings for the opposite faces of the said passages, the lining on the forward side being set close against the face of the wall of the passage and the lining on the opposite or rear side being set away from the wall of the passage, and cushioning springs set between the last said lining and the wall which it protects, substantially as set forth.

3. In a centrifugal pump, the combination of an impeller having a water inlet at its center and radiating passages extending outward therefrom, the inner ends of opposite passages uniting at the center of the impeller, linings for the front and rear walls of the said passages, each lining lying close against the front or forward wall of one passage and set away from the back or following wall of the opposite passage, and cushioning springs between the set-out portions of the lining and the rear or following walls of the passages of the impeller.

4. In a centrifugal pump, the combination of a casing, a rotary impeller mounted therein and provided with radiating discharge passages, and communicating passages from the back to the periphery of said impeller, and balancing valves for opening and closing said communicating passages.

5. In a centrifugal pump, the combination of a casing, a rotary impeller mounted therein and provided with radiating discharge passages, and communicating passages from the back to the periphery of said impeller, and automatically operated balancing valves for opening and closing said communicating passages.

6. In a centrifugal pump, the combination of a casing, an impeller mounted therein and provided with discharge passages and communicating passages extending from the back to the periphery thereof, valves controlling said communicating passages, and connections for supplying water to said communicating passages.

7. In a centrifugal pump, the combination with the casing and a cover therefor, of a pair of annular flanges,—one on the casing and one on the cover,—on the inside thereof, a lining arranged to extend around and rest on said flanges and springs interposed between the lining and the casing.

8. In a centrifugal pump a lining protected chamber or casing, springs attached to said lining, a drain valve and pipe connected to space formed by said lining and interior of casing and also a communication passage or channel 22 on opposite side of pump chamber.

9. In a centrifugal pump, the combination of an impeller, a casing inclosing the impeller and arranged to form a central space between it and the rear side of the impeller, a source of water supply connected with said space, and communicating passages in the impeller leading from said space to its periphery.

10. In a centrifugal pump, the combination of an impeller, a casing inclosing the impeller and arranged to form a central space between it and the rear side of the impeller, a source of water supply connected with said space, communicating passages in the impeller leading from said space to its periphery, and balancing valves controlling the said communicating passages at the outer ends thereof.

In testimony whereof, I have attached my signature to this specification in the presence of two subscribing witnesses.

FERDINAND W. KROGH.

Witnesses:

ALPHEUS BULL,

W. P. JOHNSON.