

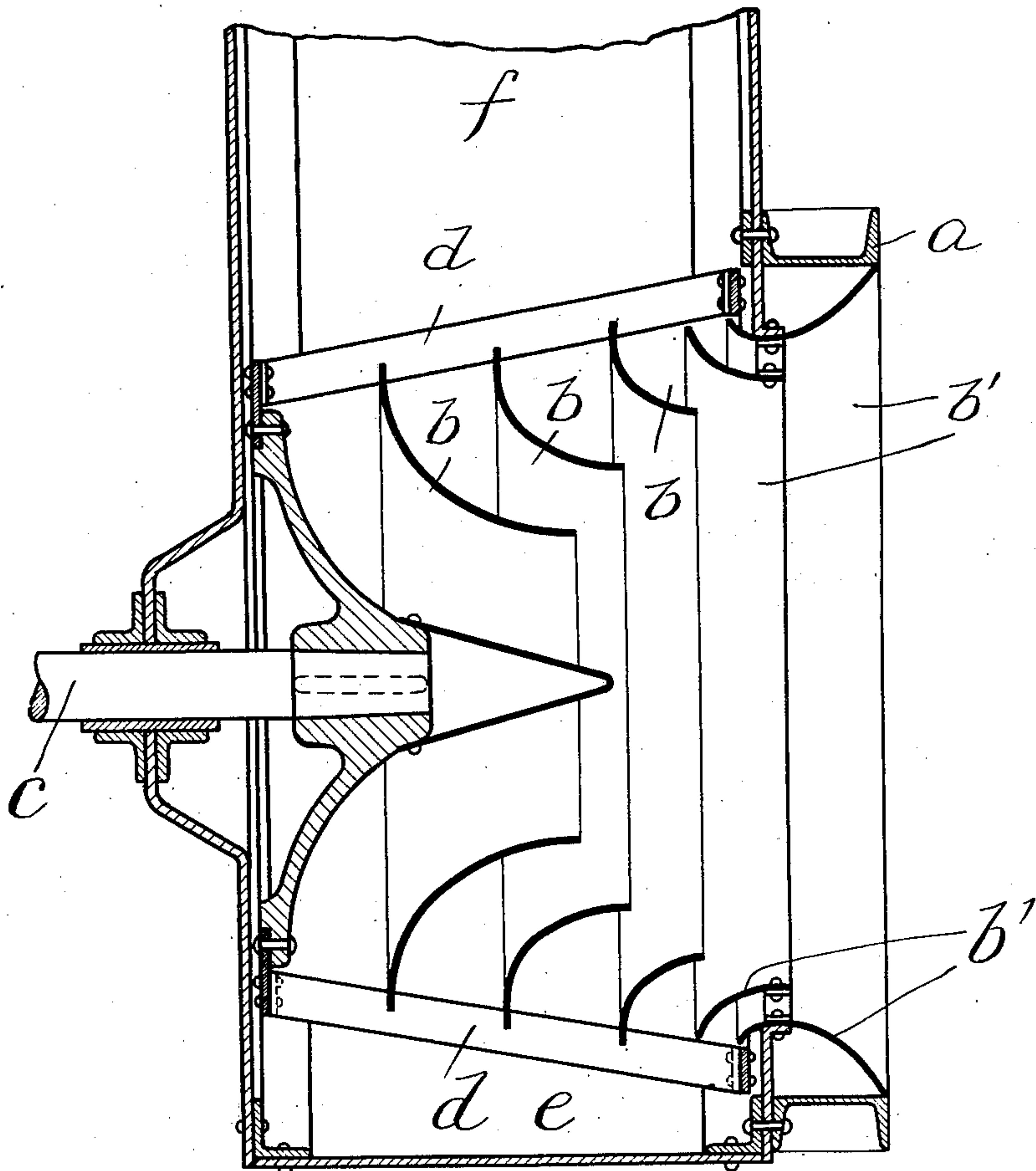
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O. KRELL.

CENTRIFUGAL PUMP WITH FUNNEL SHAPED GUIDE PIPES IN THE SUCTION SPACE BETWEEN THE SUCTION PIPE AND RING OF BLADES.

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CENTRIFUGAL PUMP WITH FUNNEL-SHAPED GUIDE-PIPES IN THE SUCTION-SPACE BETWEEN THE SUCTION-PIPE AND RING OF BLADES.

No. 879,476.

Specification of Letters Patent.

Patented Feb. 18, 1908.

Application filed October 25, 1906 Serial No. 340,564.

To all whom it may concern:

Be it known that I, OTTO KRELL, engineer, a subject of the King of Bavaria, and a resident of Charlottenburg, near Berlin, Germany, have invented a new and useful centrifugal pump with funnel-shaped guide-pipes in the suction-space between the suction-pipe and the ring of blades, of which the following is a specification.

The present invention relates to centrifugal pumps with funnel-shaped guide pipes in the suction space between the suction pipe and the ring of blades.

According to the present invention the outer diameter of the blade-wheel decreases as the distance from the suction pipe increases, so that the suction-effect of the blades near the suction pipe is greater than at the parts of the blades remote from the same.

If the cycle of actions or events taking place in the suction chamber of ordinary centrifugal pumps be studied, it will be found that the impact of the liquid on the blades is not uniform, the entire quantity of liquid not being uniformly distributed over the whole axial length of the blades. The strongest impact takes place at the part of the blade-wheel which is furthest removed from the suction pipe, and the greatest speed of flow of the liquid in the blades exists correspondingly at this place. The velocity of the current is diminished relatively to the lessening of the distance from the suction pipe, and under some circumstances it is in places reduced to less than zero, *i. e.* at these places the liquid which is already in the blade-wheel or in the pressure chamber flows backwards.

The non-uniform impact of the liquid against the blades has considerable disadvantages. Apart from only one part of the axial length of the blade being utilized, whirling movements or eddies are formed in the fluid which are detrimental to the efficiency of the pump. Moreover currents which are not at all uniform are also for the same reason caused in the casing of the pump and in the pressure conduit, or in the case of exhausters in the delivery pipe, which currents likewise occasion the formation of whirling or eddying and other disturbing motions in the fluid, and the efficiency of the plant is impaired. Similarly these phenomena are present in water pumps and fans but especially in such

as have long blades and a large suction chamber inside the blade rim. Hitherto the attempt has been made to avoid these defects by conducting the liquid or air in the suction chamber in guide pipes between the suction pipe and the blade rim, in which case the guide pipes were formed by funnel-shaped rotating surfaces. Nevertheless the irregularity of the impact on the blades inside the pipes is not sufficiently avoided by means of these inserted guide pipes, so that in spite of the guiding of the fluid, a return current of the medium propelled is to be observed near the suction pipe. But in accordance with the present invention an almost uniform velocity of the medium propelled can be obtained in the blades, and a uniform impact of the medium on the blades, when the action of the guide pipes is assisted by means adapted to bring the suction effect at the different parts of the blades into a definite relationship with the acceleration of the elements of fluid entering into the suction chamber.

One method is to design the blade-wheel with a diameter at each point corresponding to the acceleration of the elements of fluid arriving at that point, as the suction action is dependent on the outer diameter of the blade-wheel. The suction effect of the blade-wheel must be greatest near the suction pipe, as the particles of fluid must there be most quickly diverted out of their course. Consequently the diameter of the blade-wheel must be greatest near the suction chamber and decreases more and more as the distance from the suction pipe increases. A blade-wheel with its diameter reduced in this way towards one end is in itself valuable for making the motion of the fluid in the blades uniform.

In an application filed by me on October 23, 1906, Serial No. 284062, I have described a pump in which the fluid is guided by guide tubes having funnel shaped openings, arranged inside the suction chamber. But it has been found that by combining a blade wheel of the shape described above, with guide tubes arranged inside the suction chamber, a particularly uniform impact of the fluid against the blades and a correspondingly uniform velocity of the fluid flowing through the same is attained. The variation of the diameter of the blade-wheel also de-

pend on the other proportions of the pump in each case. Generally it will often suffice to allow the outside diameter of the blade-wheel to diminish from the mouth of the suction pipe onwards in the form of a rectilinear cone, as the accompanying drawing shows.

In order that the invention may be more clearly understood, reference is made to the accompanying drawing in which one form of centrifugal pump is shown in vertical section by way of example.

In the drawing *a* indicates the suction pipe communicating through the suction space with the pressure chamber *e*, the latter communicating with the delivery pipe *f*. A shaft *c* is mounted revolubly in the casing of the chamber *e* and carries the blades *d*, *d* from between which the fluid medium flows from the suction pipe *a* to the pressure space *e*. Funnel-shaped guide pipes *b* are fastened to the inner edges of the blades in such a manner that the channels are left between the same, and also funnel-shaped guides *b*¹ mounted at the end of the suction pipe *a* project into the suction space of the pump so that channels for guiding the fluid medium are formed. If the blades are everywhere of the same radial depth as in the form shown by way of example, the inner edges of the blades lie on a conical surface in the suction chamber, the result of which is that the effect of the outer cone is increased.

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

1. A centrifugal pump comprising in combination a pressure chamber, a suction pipe and a delivery pipe connected therewith, a shaft mounted revolubly in said pressure chamber, a blade-wheel on said shaft, the diameter of said wheel decreasing from the end near the suction pipe towards the other end, a plurality of guide pipes attached to said blade-wheel, substantially as and for the purpose set forth.

2. A centrifugal pump comprising in combination a pressure chamber, a suction pipe and a delivery pipe connected therewith, a shaft mounted revolubly in said pressure chamber, a blade-wheel on said shaft, the diameter of said wheel decreasing from the end near the suction pipe towards the other end, and a plurality of funnel-shaped guide pipes attached to said blade-wheel, substantially as and for the purpose set forth.

3. A centrifugal pump comprising in combination a pressure chamber, a suction pipe

and a delivery pipe connected therewith, a shaft mounted revolubly in said pressure chamber, a blade-wheel on said shaft, the outer surface of said blade-wheel forming a portion of a cone decreasing in diameter from the end near the suction pipe towards the other end, a plurality of funnel shaped guide pipes attached to said blade-wheel, substantially as and for the purpose set forth.

4. A centrifugal pump comprising in combination a pressure chamber, a suction pipe and a delivery pipe connected therewith, a shaft mounted revolubly in said pressure chamber, a blade-wheel on said shaft, the outer surface of said blade-wheel forming a portion of a cone decreasing in diameter from the end near the suction pipe towards the other end, said blade-wheel being provided with a plurality of blades of the same uniform radial depth whereby their inner edges lie on a conical surface, and a plurality of funnel-shaped guide pipes attached to said blade-wheel, substantially as and for the purpose set forth.

5. A centrifugal pump comprising in combination a pressure chamber, a suction pipe and a delivery pipe connected therewith, a shaft mounted revolubly on said pressure chamber, a blade-wheel on said shaft, the diameter of said wheel decreasing from the end near the suction pipe towards the other end, and a plurality of guide pipes attached to said blade-wheel, and a plurality of guide pipes attached to said suction pipe and projecting into said pressure chamber, substantially as and for the purpose set forth.

6. A centrifugal pump comprising in combination a pressure chamber, a suction pipe and a delivery pipe connected therewith, a shaft mounted revolubly on said pressure chamber, a blade-wheel on said shaft, the diameter of said wheel decreasing from the end near the suction pipe towards the other end, a plurality of funnel-shaped guide pipes attached to said blade-wheel, and a plurality of funnel-shaped guide pipes attached to said suction pipe and projecting into said pressure chamber, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of the two subscribing witnesses.

OTTO KRELL.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.