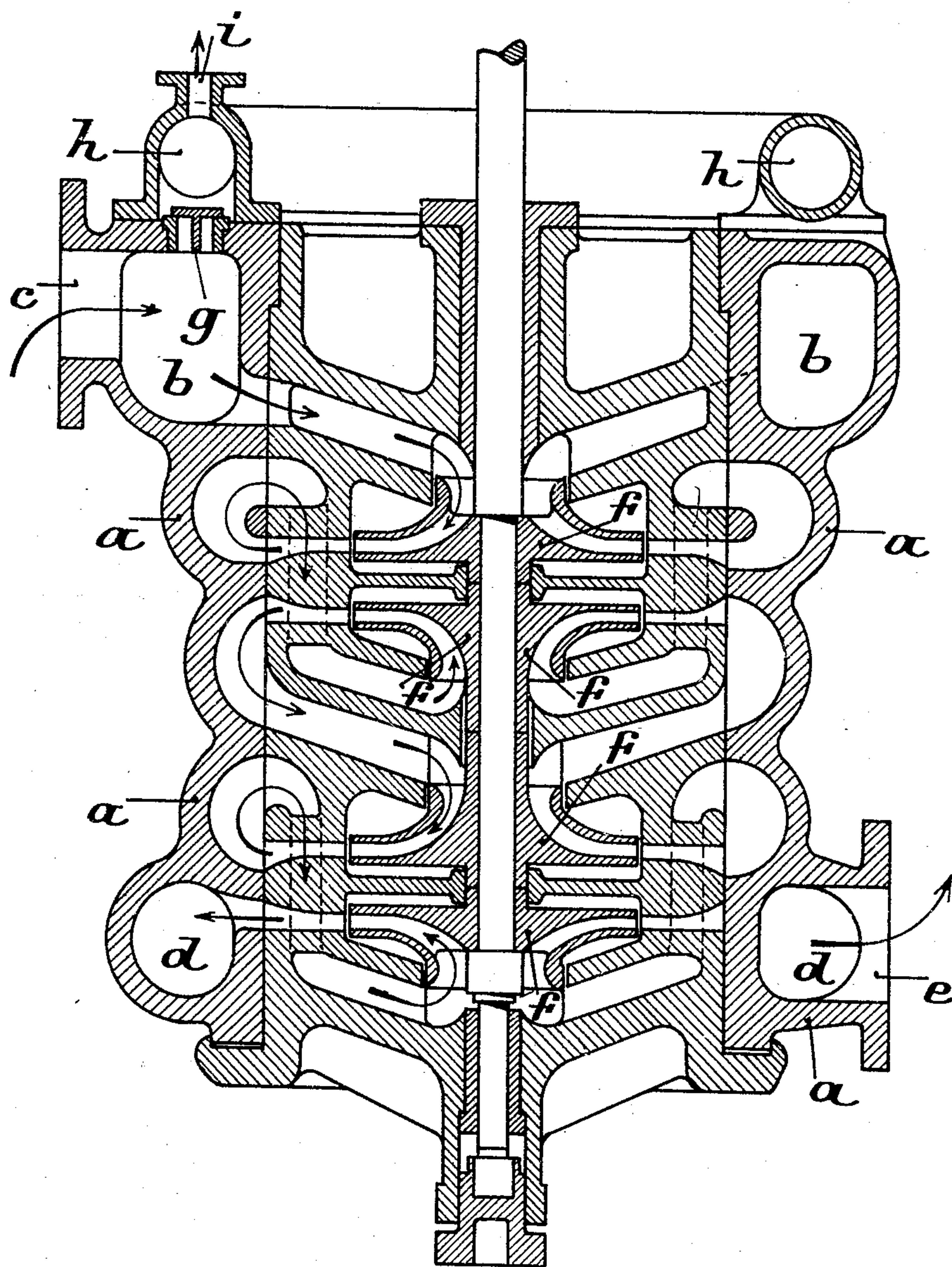


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T. REUTER.
CENTRIFUGAL PUMP.
APPLICATION FILED FEB. 1, 1902.

NO MODEL.



WITNESSES

E. C. Sample

Chas. H. Kern

INVENTOR
Theodor Reuter
By *Moscow & Darby*
ATTORNEYS

UNITED STATES PATENT OFFICE.

THEODOR REUTER, OF WINTERTHUR, SWITZERLAND, ASSIGNOR TO THE
FIRM OF GEBRUDER SULZER, OF WINTERTHUR, SWITZERLAND.

CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 771,271, dated October 4, 1904.

Application filed February 1, 1902. Serial No. 92,134. (No model.)

To all whom it may concern:

Be it known that I, THEODOR REUTER, engineer, a citizen of the Swiss Republic, residing at 1 Waldhofstrasse, Winterthur, Switzerland, have invented certain new and useful Improvements in Centrifugal Pumps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In using vertical centrifugal pumps for sinking shafts where the pump generally is so situated as not to be accessible it is important to avoid under all circumstances any disorder of the pump and that the pump after lifting and redipping the end of the suction-pipe may continue to perform its work without the necessity of employing special devices. It is difficult to remove the air from the pump or to prevent the air from entering the pump, and this is particularly the case with centrifugal pumps having a plurality of runners.

My present invention relates to a vertically-arranged centrifugal pump in which any air entering the intake-pipe during the continued rotation of the runners is removed before it can enter the pump proper.

My invention consists in providing the intake-chamber of the pump or an adjacent part of the intake-pipe with at least one check-valve opening outwardly and arranging the intake-chamber above the runners and the delivery-chamber below them.

In the accompanying drawing is shown as an example the multiple centrifugal pump in vertical section.

In the drawing reference-sign *f* designates the runners, which are arranged within the pump-casing *a* below the annular intake-chamber *b* and its pipe-union *c*, said runners being located above the delivery-chamber *d* and its pipe-union *e*, the intake-chamber *b* being provided with one or more check-valves *g*, opening outwardly. The liquid to be pumped enters the chamber *b* at the point indicated by *c* and is forwarded by the successive runners *f* and the guiding-channels into the delivery-chamber *d* and through the union of the pipe *e* into the delivery-main.

If the level of the water to be pumped sinks to such a degree that the end of the suction-pipe is no longer submerged in the liquid, the pump continues to forward the liquid somewhat farther—that is to say, the head of water in the intake-pipe is sucked upwardly a certain distance, thereby of course permitting the entry of air from below the intake-pipe. Thereupon the head of water contained in the upper part of the intake-pipe will break off and fall into the lower part of the intake-pipe, where it is held by a check-valve arranged in a well-known manner in the end of the suction-pipe, the air contained in the lower part of the intake-pipe escaping into the upper part of said pipe. Experiments have shown that during the last-mentioned operation of the device the rotating runners cannot hold the entire column of water contained in the delivery-main, but that a part of this water flows backwardly, which is due to the fact that the runners as long as they move the head of water in the delivery-main produce a higher pressure than if the head of water stands still. The flowing back of a part of this water is possible, notwithstanding the continued rotation of the runners, because the water can pass backwardly through the small distances left between the runners and the fixed guiding and intermediate pieces of the pump, so that the water does not have to pass through the interior of the runners themselves. The water returning from the delivery-main follows the intake-pipe more and more, thereby gradually compressing the air inclosed in the upper part of the intake-pipe, the compression of such air finally attaining such a degree as to lift the check-valve *g*, through which the air escapes. If the entire air escapes through this valve, said valve is again sucked on its seat, the seating thereof being noticeable by the noise it makes in seating. The head of water from the end of the suction-pipe to the runners is again reconstructed—that is, the suction-pipe is again filled with water—and the pump continues to work regularly if in the meantime the end of the suction-pipe is again immersed in the water. In other words, the head of water in the

delivery-main is in rest during the operation above described, and therefore the normal operation of the runners cannot be restored again before the suction-pipe is again immersed or dipped into the water. Without the arrangement of the intake-chamber above the runners and of the valve *g* as above explained the air will be forced into the pump and into the delivery-main.

10 If the pump is employed for forwarding a liquid which contains any considerable amount of air or if during the working of the pump air is sucked in, together with the liquid, in small quantities, such air will collect in the upper part of the intake-chamber. In order to prevent the air in such case from entering the runners, I may arrange above the intake-chamber *b* a second chamber *h*, connected in any suitable manner—as, for instance, by means of the pipe or union *i*—with an exhaust-pipe of an air-pump, an ejector, or the like, thereby during the working of the pump maintaining a vacuum in chamber *h*, which vacuum must be somewhat greater than the vacuum in the intake-chamber *b*. By the means above described any air collecting in chamber *h* will be exhausted before it can enter the runners. Of course a small quantity of water will be drawn off through the check-valve *g* along with the air; but this is unessential and does not interfere with the increased advantages secured by my invention.

Having now particularly described and as-

certained the nature of my said invention and the manner in which the same is to be performed, I declare that what I claim is— 35

1. In a centrifugal pump, a casing having an intake-chamber and a delivery-chamber, runners arranged within said casing between said chambers, and an outlet-valve communicating with the intake-chamber and operating to permit the escape of collected or accumulated air therefrom, as and for the purpose set forth. 40

2. In a centrifugal pump, a casing having an inlet and an outlet chamber and runners interposed between said chambers, in combination with an auxiliary chamber communicating with said intake-chamber, and valves for controlling said communication, as and for the purpose set forth. 50

3. In a vertical centrifugal pump, a casing, an inlet and an outlet chamber, runners arranged within said casing, said inlet-chamber being located above said runners, and said outlet-chamber arranged below said runners, and a valve-controlled passage communicating with said inlet-chamber to permit any air collected in said chamber to be withdrawn therefrom, as and for the purpose set forth. 60

In witness whereof I have hereunto set my hand in presence of two witnesses.

THEODOR REUTER.

Witnesses:

G. BOSSHARD,
F. BARLER.