G. E. INGRAM.

ADJUSTABLE THRUST COUNTERACTING MECHANISM FOR CENTRIFUGAL PUMPS.

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1,180,587. Patented Apr. 25, 1916.

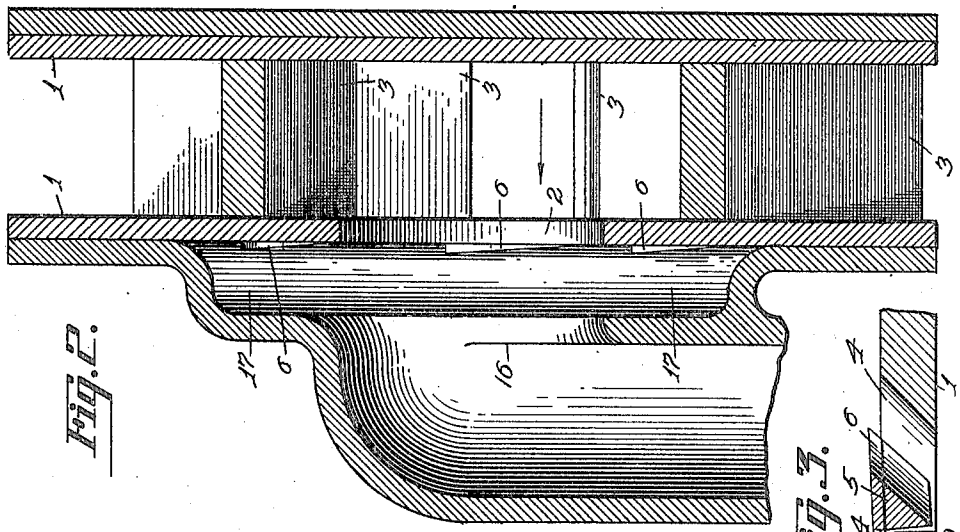


Fig. 2.

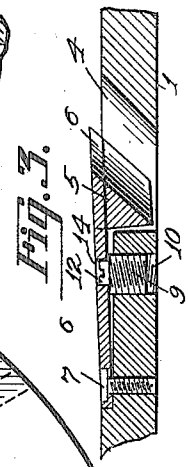


Fig. 3.



Fig. 1.

Witnesses

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# UNITED STATES PATENT OFFICE.

GEORGE E. INGRAM, OF FAIRMEAD, CALIFORNIA.

## ADJUSTABLE THRUST-COUNTERACTING MECHANISM FOR CENTRIFUGAL PUMPS.

1,180,587. Specification of Letters Patent. Patented Apr. 25, 1916.

Application filed October 17, 1914. Serial No. 867,677.

*To all whom it may concern:*

Be it known that I, GEORGE E. INGRAM, a citizen of the United States, residing in Fairmead, in the county of Madera and State of California, have invented a new and useful Improvement in Adjustable Thrust-Counteracting Mechanism for Centrifugal Pumps, of which the following is a specification.

My invention relates to an adjustable thrust counteracting mechanism for centrifugal pumps and the like, wherein a series of movable vanes are adjustably secured to the suction surface of the runner of a centrifugal pump and are arranged to be extended at an angle thereto; and the objects of my invention are, first, to provide improved means arranged to be detachably secured to the runner of a pump and adapted to be acted upon by the water on the suction side of the runner and to counteract the thrust; and second, to provide a series of adjustable vanes that may be secured to the suction side of the runner of a centrifugal pump and arranged to extend at an angle thereto, and at various distances therefrom. I accomplish these several features by means of the device disclosed in the drawings forming a part of the present specification, wherein like characters of reference are used to designate similar parts throughout the said specification and drawings, and in which—

Figure 1 is a side elevation of the suction side of the runner of a centrifugal pump, disclosing the adjustable vanes secured thereto, the internal vanes for throwing water to the periphery of the pump being disclosed in dotted lines. Fig. 2 is a vertical sectional view taken on line 2—2 of Fig. 1 of the drawings in the direction indicated by the arrows with the addition of a portion of the casing shown on the suction side of the runner. Fig. 3 is an enlarged detail sectional view taken on line 3—3 of Fig. 1 of the drawings in the direction indicated by the arrows, disclosing the manner in which the vanes are secured to the surface of the suction side of the runner and the means for extending the said vanes at an angle from the surface of the said runner.

The present state of the art discloses centrifugal pumps wherein the runners are provided with a series of inclined apertures, by means of which a portion of the liquid is forced through the said inclined runners and in so doing counteracts the thrust occasioned by the suction of the liquid being pumped. The efficiency of these inclined apertures, of course, remains fixed so that when the runner is rotating at a comparatively low rate of speed the efflux through the said inclined apertures has little or no effect on the runner.

I propose to provide adjustable means arranged to counteract the thrust of a centrifugal pump at different speeds, which means may be described as follows:

The numeral 1 is used to designate the runner of a centrifugal pump having the usual central opening 2 and the vanes 3, said vanes 3 being shown in dotted lines in Fig. 1 of the drawings.

Within the pockets between each two vanes is an inclined aperture 4, within which is mounted the end 5 of the vanes 6, said ends 5 having a concaved arcuate surface, said concaved arcuate surface being arranged to form the other half of the inclined aperture 4.

The inner end of each vane 6 is rigidly secured by means of a screw 7 to a recess in the surface of the runner 1 so that the outer surfaces of the vanes 6 will normally lie flush with the surface of the said runner 1.

A threaded stud 9 is rotatably secured within suitable threaded apertures 10 within one side of the runner 1, the head 12 of the said stud 9 being reduced so as to engage an aperture 14 within the flight 6, the diameter of the said aperture 14 being slightly greater than the diameter of the reduced portion 12 so that the flight 6 will rest upon a shoulder formed by the junction of the said reduced portion 12 and the stud 9.

Assuming the threaded apertures on the stud 9 to be right-handed, by turning the said stud 9 to the left it will be readily observed that the ends 5 of the vanes 6 will be projected beyond the surface of the runner 1 and at an angle thereto, as disclosed in Figs. 2 and 3 of the drawings.

The operation is as follows: The runner 1 is rotated in the direction indicated by the large curved arrow in Fig. 1 of the drawings. The resistance or suction occasioned by the water being raised through the suction pipe 16 will tend to thrust the runner 1 in the direction indicated by the arrow in Fig. 2 of the drawings. As the annular

chamber 17, which occurs between the suction side of the runner 1 and the suction pipe 16, becomes filled with water the inclined projecting vanes 6 will be acted upon by the water within the said channel 17 and the runner 1 will be forced in the opposite direction, thus counteracting the thrust of the water.

The thrust is further counteracted by the pressure of water from between the vanes 1 in the following manner: The water is forced under pressure through the inclined apertures 4, said pressure tending to act on the inclined surface of the ends 5 of the members 6 and thereby increase the inclination thereof which increased inclination will be acted upon by the water in the chamber 17 as hereinbefore described.

It is obvious that the proportion of the counteracting effect of the vanes to the suction will be in direct proportion to the inclination of the vanes and the speed at which the runner is rotating.

If it is found that the thrust is not entirely overcome, the counteracting force may be increased by turning all of the studs 9 to the left, which will extend the free ends of the vanes 6 farther beyond the surface of the runner 1, thereby increasing the inclination of the said vanes 6 to the surface of the said runner 1.

It is obvious from the foregoing that I have provided improved adjustable mechanism for counteracting the thrust occasioned by the suction or resistance of a liquid in a centrifugal pump.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is—

1. The combination with the runner of a centrifugal pump, of adjustable vanes secured to the suction side of the runner and at angles thereto and adapted to counteract the thrust on the said runner.

2. The combination with the runner of a centrifugal pump, of adjustable vanes secured to the suction side of the runner and at angles thereto and adapted to counteract the thrust on the said runner; and means adapted to change the angles of the said vanes.

3. The combination with the runner of a centrifugal pump, of adjustable vanes secured to the suction side of the runner and at angles thereto and adapted to counteract the thrust on the said runner; and suitable threaded studs secured within one side of the runner and adapted to change the angles of the said vanes.

In witness whereof, I have hereunto set my signature in the presence of two subscribing witnesses.

GEORGE E. INGRAM.

Witnesses:
M. C. KENTON,
J. F. NELSON.

**Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."**