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B. THOENS.

JET CONDENSER AND CENTRIFUGAL VACUUM PUMP.

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Fig. 1.

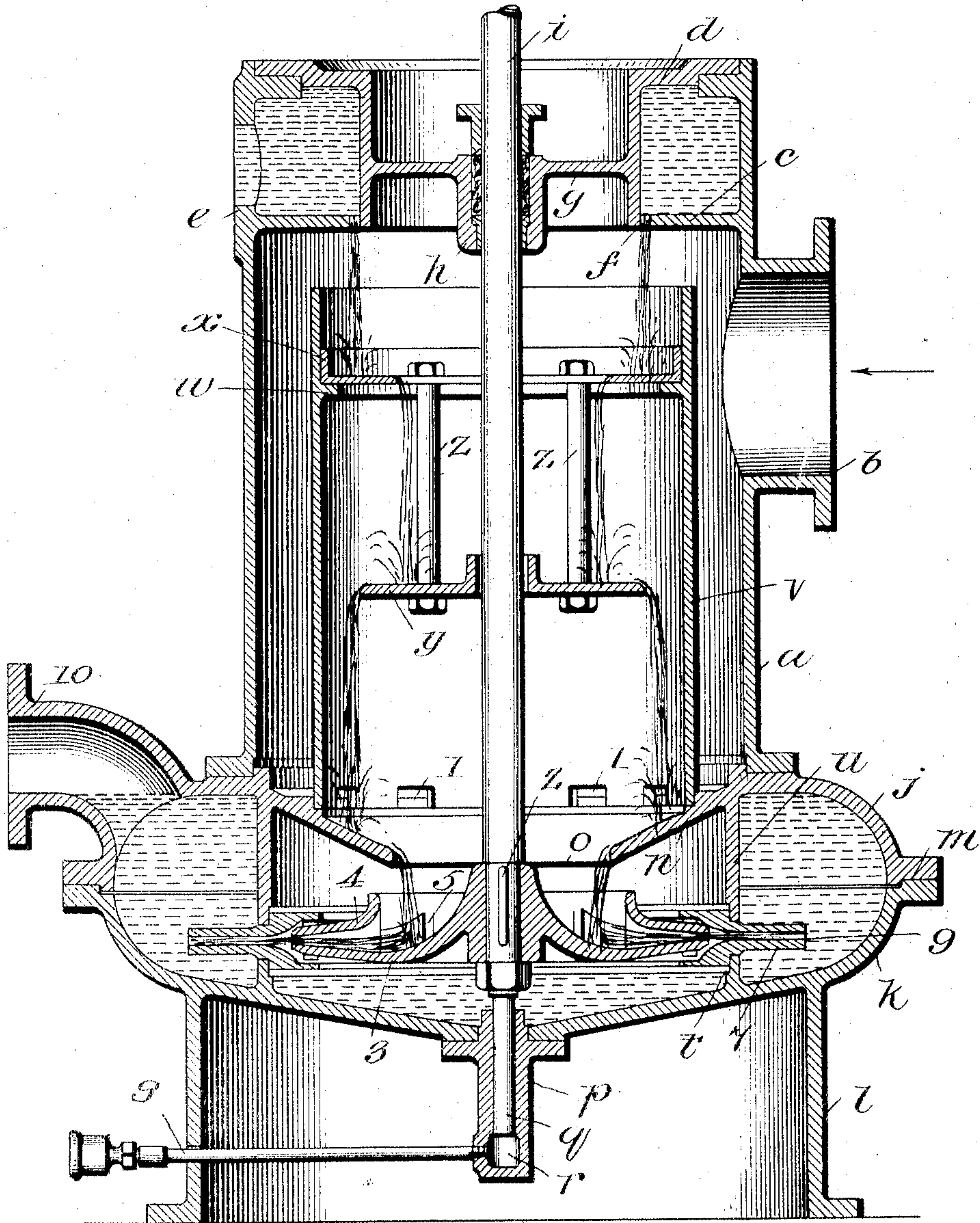
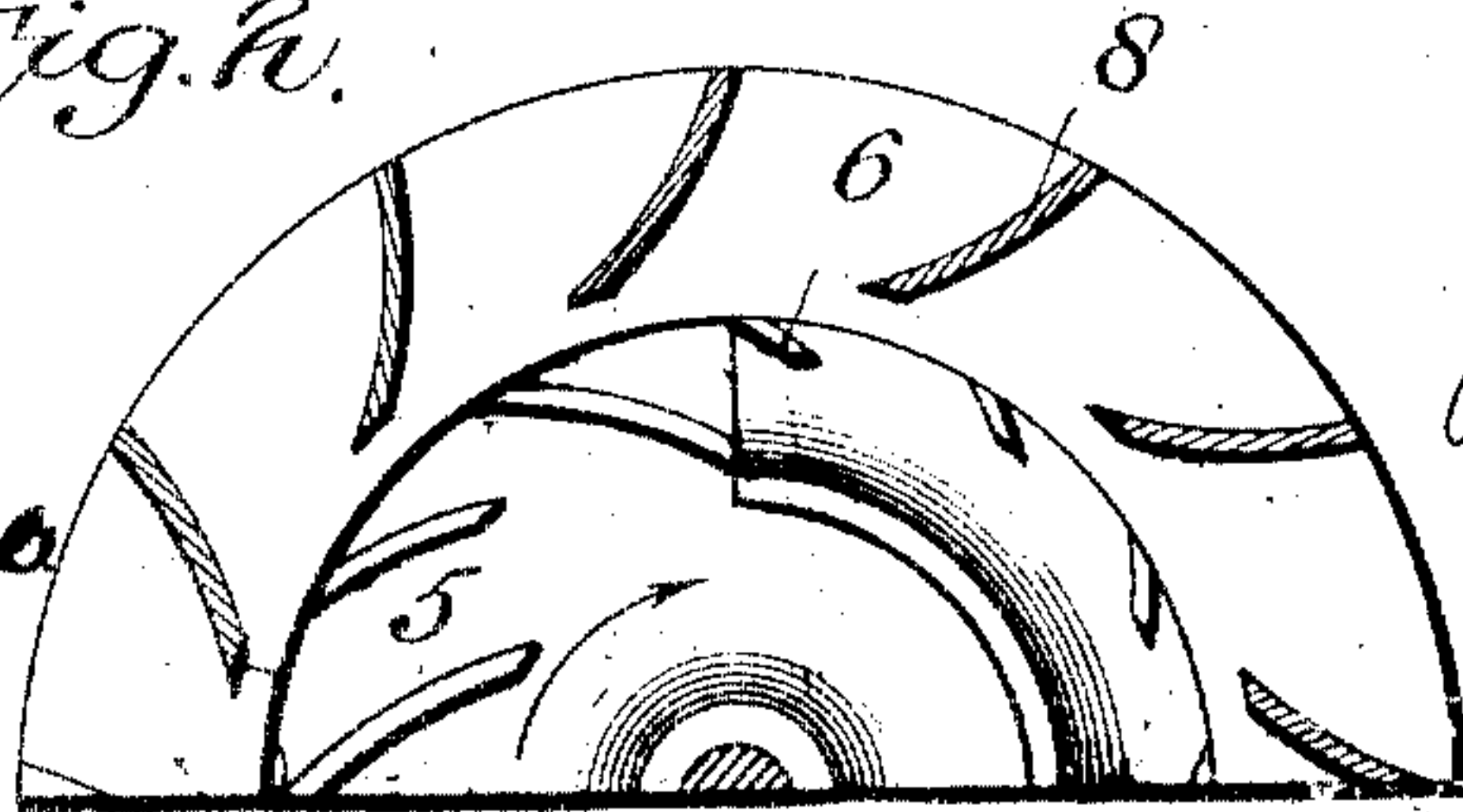


Fig. 2.



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# UNITED STATES PATENT OFFICE.

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## JET-CONDENSER AND CENTRIFUGAL VACUUM-PUMP.

No. 864,811.

Specification of Letters Patent.

Patented Sept. 3, 1907.

Application filed March 20, 1906. Serial No. 251,085.

To all whom it may concern:

Be it known that I, BURCHARD THOENS, a subject of the German Emperor, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Jet-Condensers and Centrifugal Vacuum-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.

My invention relates to improvements in jet condensers and centrifugal vacuum pumps, and its object is to produce a device whereby the steam and air from evaporators, vacuum pans, steam turbines, condensing engines, etc., may be quickly and economically removed, condensed, and discharged.

My invention consists in the construction and combinations of parts hereinafter described and claimed.

In the accompanying drawings:—Figure 1 is a vertical section of my improved jet condenser and centrifugal vacuum pump. Fig. 2 is a cross section of the pump wheel and its adjacent diffusion ring.

*a* represents a vessel, preferably cylindrical in shape, which forms the body of the condenser and is connected by a pipe *b* with the vacuum pan evaporator or engine. The top of the cylinder is partially closed by a casting *c*, forming a right angle with the body of the condenser *a*, and a casting *d* is suspended therein in proximity thereto so as to form an annular chamber into which water is delivered through the opening *e*. The part *c* of the casting is perforated as shown at *f*, either in the form of an annular opening or numerous small openings, which may be made adjustable if desired. The top of the cylinder inside of the part *d* is closed by the horizontal partition *g* which is provided with a bearing *h* in which is mounted the shaft *i* carrying the pump wheel, which shaft passes through an ordinary stuffing box in the bearing *h*. This shaft *i* is revolved by a pulley or any suitable means (not shown). The body *a* of the condenser rests upon the casting *j*, which in turn rests upon a similar shaped casting *k* supported in any suitable manner, as by the cylinder *l*. The castings *j* and *k* are similar in shape and fit together as shown at *m* and form a receptacle for the water, condensed steam, and entrained air.

The casting *j* is provided with a downwardly extending portion *n* with a central opening as shown at *o* for the passage of the water and gases. The bottom of the casting *k* is closed except for an opening for the reception of the bearing *p* in which the lower reduced end *q* of the shaft *i* rests. Below the end *q* the opening in the bearing *b* is enlarged as shown at *r* for the reception of lubricating material or fluid, which is forced in through

the pipe *s*, which pipe is screw-threaded into the bottom of the bearing *p*. The casting *k* is provided with an upwardly projecting ring *t*, and the casting *j* is provided with a downwardly projecting ring *u*; both rings are arranged opposite each other, but not quite meeting, leaving an annular opening for the reception of the stationary portion of the pump wheel called diffusion ring, which will be hereinafter described.

Within the cylinder *a* and resting upon the portion *n* of the casting *j* is a second cylinder *v* open at both ends. This cylinder *v* receives the water showered down from the annular chamber in the top of the condenser and delivers it upon the portion *n* of the casting *j*, which in turn delivers it into the pump wheel.

The cylinder *v* is provided with an inwardly projecting portion *w* which supports an annular right angled partition *x* open at the center as shown. The inner edge of this partition extends considerably nearer the center of the condenser than the inner edge of the partition *c*, so that the water which drips down from the annular chamber in the top of the condenser is forced to pass towards the center of the condenser.

Below the partition *x* is arranged a circular partition *y* loosely encircling the shaft *i*. This is supported by means of bolts *z* fastened to the partition *x*. This partition does not extend out to the cylinder *v*, but a space is left between said partition and said cylinder for the passage of the water, which is therefore forced to travel in a zigzag course through the cylinder *v*. The main part of the steam and air coming in through the pipe *b* passes up over the top of the cylinder *v* and down through said cylinder, but this cylinder is provided with a series of holes *1*, arranged near the bottom thereof so that any excess of steam or any water condensed within the cylinder *a* may pass down into the pump wheel. The pump wheel is mounted on the shaft *i* by means of the spline or feather *2*. It consists of a disk *3* extending up to the shaft *i*, and a disk *4* fixed to the disk *3* but annular in shape so that the water may pass downwardly through the center thereof. The disk *4* is separated from the disk *3* by means of curved ribs *5*, between which the water passes outwardly. On the top of the disk *4* and on the bottom of the disk *3* of the pump wheel are arranged curved blades *6* for the purpose of aiding the circulation, and to prevent any water from flowing back into the condenser. Owing to the peculiar shape of the parts *3* and *4*, a funnel shaped annular passage is formed through which the water passes, which funnel shaped passage terminates in an annular discharge slot, which slot is located within the stationary rings *7*. These rings exactly fill the space between the partitions *t* and *u*, and consist of two plates of similar shape, separated by oppo-



site curved vanes 8, the object of which is to stop the rotary motion of the water and force it out through the slot 9 in the stationary part coöperating with the pump wheel, into the annular chamber between the castings 5 *j* and *k*.

10 represents a discharge pipe for the condensing water and condensed steam and air drawn from the evaporator, vacuum pan or engine.

The operation is as follows:—The shaft *i* is set in motion and water supplied through the pipe *c*. This water flows over the annular spray plates *x* and *y*, and the steam and air from the evaporator, vacuum pan or engine enters through the pipe *b*, the steam being condensed and the air being carried along with and through the falling water, which travels in a zigzag course through the cylinder *v*. The condensing water, condensed steam and air are then delivered downward through the opening *o* into the pump wheel, which, as it revolves, discharges the water between the curved vanes 5 and through the annular slot 9 of the diffusion ring 7 and the air is drawn through the space between the revolving pump wheel and the stationary pump casing or diffusion ring into the annular chamber between the castings *j* and *k*, the water, air, etc., passing out through the pipe 10.

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

1. In a combined jet condenser and centrifugal vacuum pump, the combination of a receptacle for the liquid, a diffusion ring delivering into said receptacle and provided with a flaring inner mouth, and a pump wheel journaled within said diffusion ring, said pump wheel consisting of two parts joined by vanes, said parts being each provided with vanes on their outside edges, the outer edge of said pump wheel entering the flaring mouth on the inner part of the diffusion ring, substantially as described.

2. In a combined jet condenser and centrifugal vacuum pump, the combination of castings forming an annular receptacle for the liquid, a diffusion ring delivering into said receptacle and composed of two plates united by curved vanes, said plates flaring so as to form an enlarged mouth directed towards the interior of the condenser, and a horizontal pump wheel mounted inside of said receptacle and consisting of two parts joined together by vanes, said parts being each provided with curved vanes on their outside edges, and the upper part being provided with an annular opening, the outside edge of said pump wheel entering the flaring mouth of said diffusion ring, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

BURCHARD THOENS.

Witnesses:

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