R. C. PARSONS.

CENTRIFUGAL PUMP, AIR FAN, TURBINE, AND THE LIKE.

APPLICATION FILED MAR. 8, 1911.

998,300. Patented July 18, 1911.

2 SHEETS—SHEET 1.

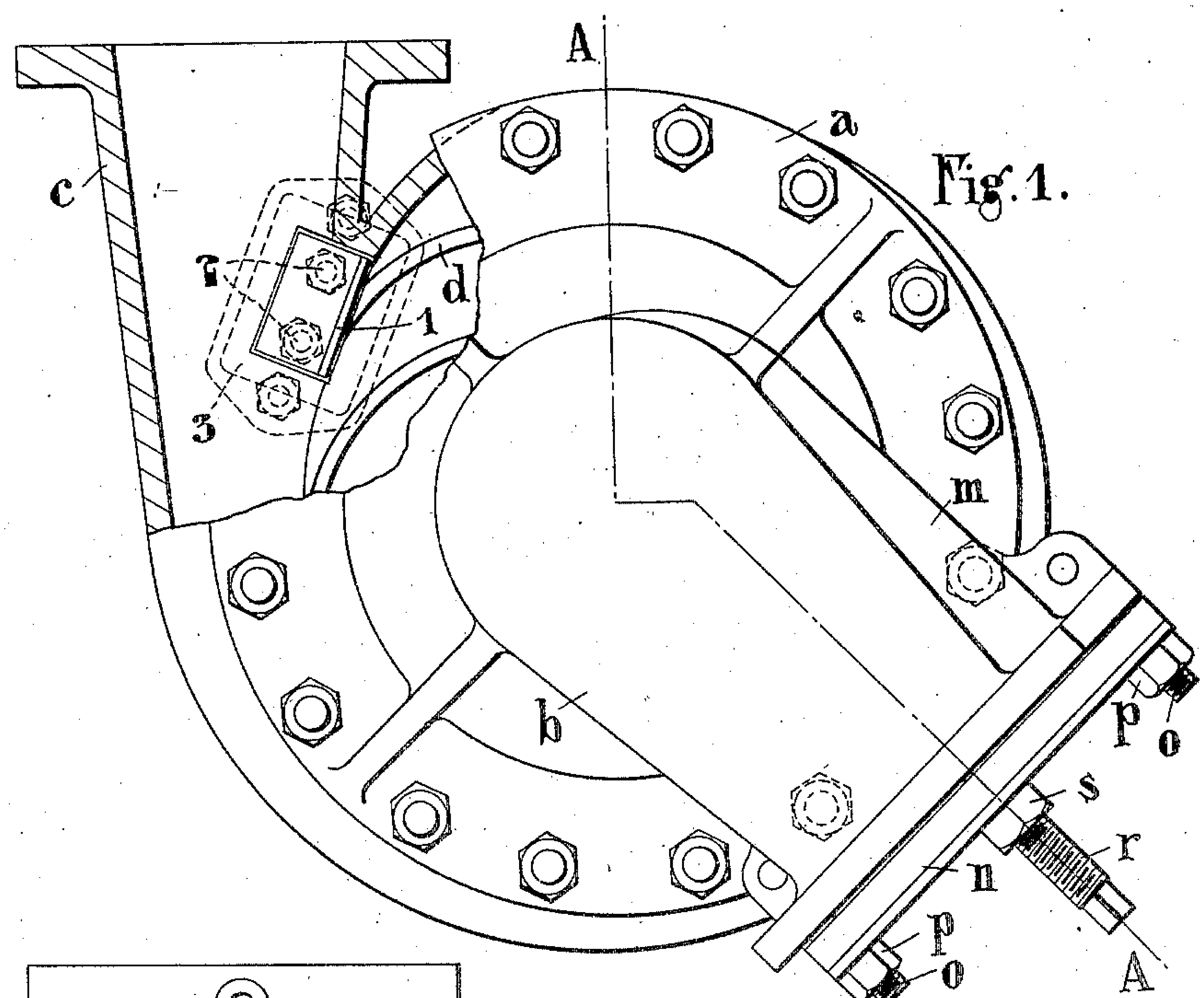


Fig. 1.

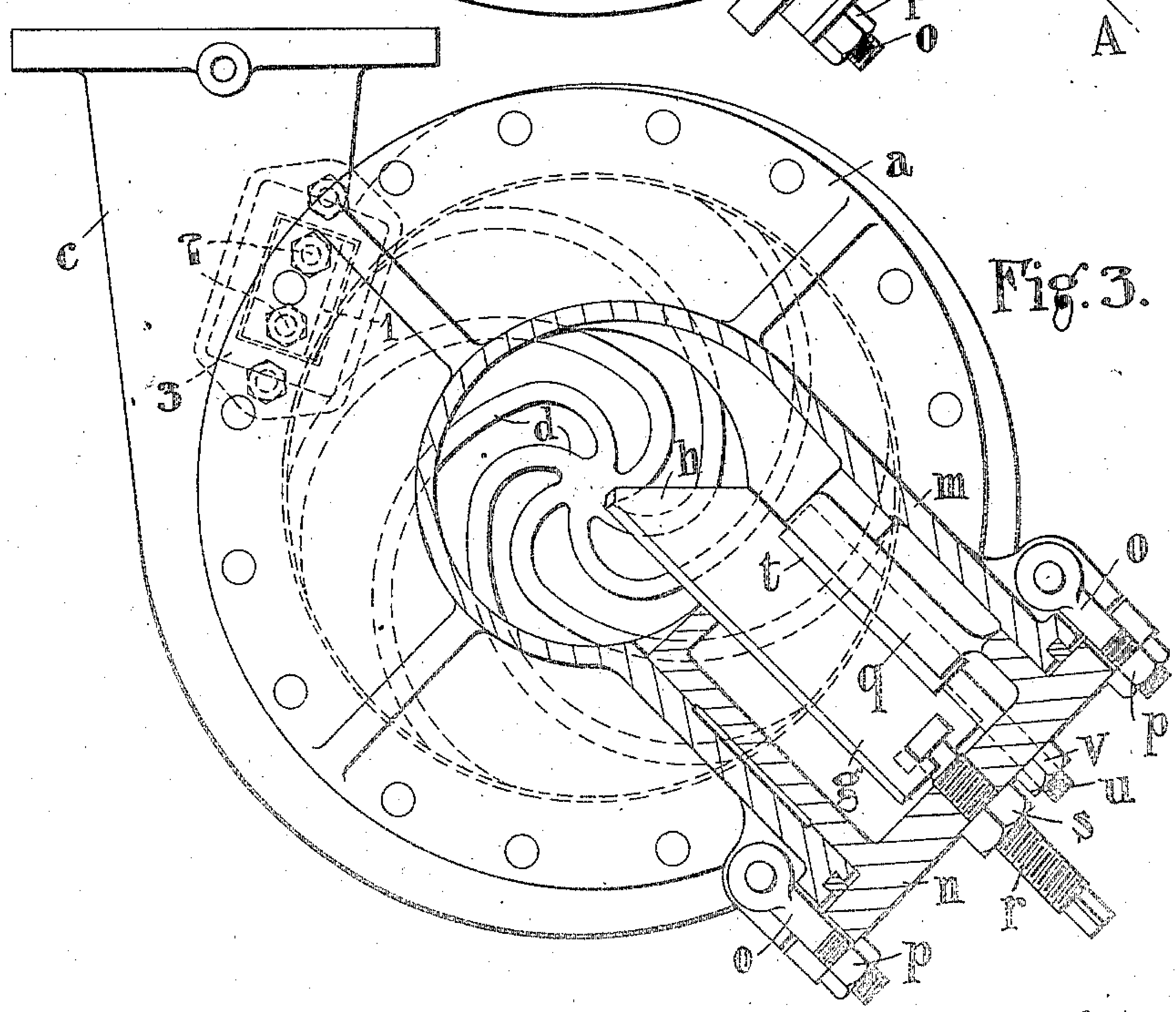


Fig. 3.

Witnesses:
Thomas M. Smith
Elizabeth A. Sheldrake

Inventor.
Richard Clere Parsons,
By J. Walter Douglass
Attorney.

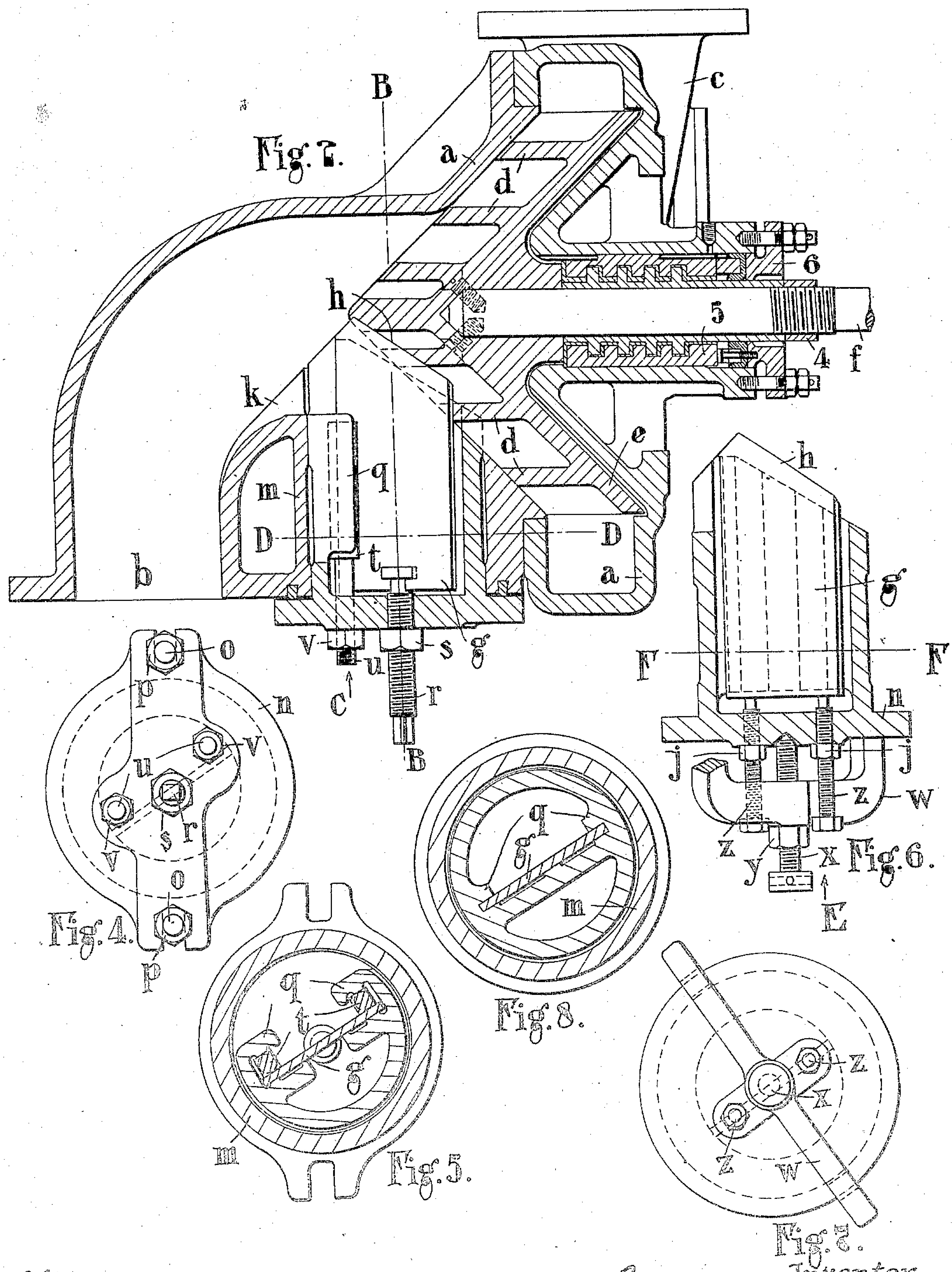
R. C. PARSONS.

CENTRIFUGAL PUMP, AIR FAN, TURBINE, AND THE LIKE.

APPLICATION FILED MAR. 8, 1911.

998,300. Patented July 18, 1911.

2 SHEETS—SHEET 2.



Witnesses:
Thomas M. Smith
Elisabeth A. Sheldrake.

Inventor.
Richard Clive Parsons

By J. Walter Douglass.
Attorney.

UNITED STATES PATENT OFFICE.

RICHARD CLERE PARSONS, OF LONDON, ENGLAND.

CENTRIFUGAL PUMP, AIR-FAN, TURBINE, AND THE LIKE.

998,300. Specification of Letters Patent. **Patented July 18, 1911.**

Application filed March 8, 1911. Serial No. 613,184.

To all whom it may concern:

Be it known that I, RICHARD CLERE PARSONS, a subject of the King of Great Britain and Ireland, and residing at 39 Victoria street, London, S. W., England, have invented certain new and useful Improvements in and Relating to Centrifugal Pumps, Air-Fans, Turbines, and the Like, of which the following is a specification.

This invention relates to improvements in centrifugal pumps, air fans, turbines and the like. When such pumps are used to deal with fluids in which fibrous or solid matter is present, the operation of the pump is seriously impaired by the presence of such material, this trouble frequently arising for instance in the pumping of sewage. In the endeavor to overcome this difficulty, a screen has been employed in the inlet to the pump for the purpose of excluding such solid and fibrous matter. Such a screen however soon becomes choked and its cleansing is a matter of considerable trouble, and in some cases is impracticable.

The object of the present invention is to overcome this difficulty.

The invention consists for this purpose in a centrifugal pump, turbine, air fan or the like in which one or more rotating blades coöperate with one or more fixed plates to divide up any solid or fibrous matter entering the pump.

The invention also consists in the improved pump hereinafter described.

Referring now to the accompanying drawings, Figure 1 is an outside elevation of a pump according to the present invention. Fig. 2 is a sectional view of the pump on the line A—A of Fig. 1. Fig. 3 is a sectional view of the pump on the line B—B of Fig. 2. Fig. 4 is a plan looking at the shearing plate carrier in the direction of the arrow C shown in Fig. 2. Fig. 5 is a sectional plan on the line D—D of the shearing plate carrier in Fig. 2. Fig. 6 shows another method of holding the shearing plate, while Figs. 7 and 8 are plans looking in the direction of arrow E in Fig. 6, Fig. 8 being a sectional plan on the line F—F.

One method of carrying the invention into effect is shown as applied for example to a centrifugal pump illustrated in Figs. 1 to 3 and having a casing *a*, of the usual form with suction and delivery pipes, *b* and *c* respectively.

For the purpose of the invention blades, *d*, are attached on one side only to a circular plate or shrouding, *e*, carried by the pump driving shaft, *f*, while the edges of the blades adjacent to the inlet, *b*, of the pump are so formed that their surface of revolution is entirely or partly that of a cone having the shaft, *f*, as axis.

A plate, *g* hereinafter known as the shearing plate, is held in position by any suitable means and has an edge in a line situated in a plane passing through the axis of this cone. It will be seen therefore that the plate edge *h*, must lie in a straight line and being in contact or nearly in contact with the edges of the blades *d*, forms therewith pairs of cutting edges.

In order to prevent any fibrous or other material lodging against the shearing plate, *g*, the side of the plate facing the direction of inward flow to the pump is provided with an inclined web, *k* attached to the inlet pipe, *b*, and projecting radially up to substantially the center thereof. By this means solid or fibrous material is prevented from lodging against the plate, *g*, and is passed into the pump.

The shearing plate, *g* is fixed in such a position that its plane does not pass through the axis of the cone, but is some distance therefrom so that the edges of the rotating blades, *d*, in rubbing against the shearing plate *g* may always maintain a sharp cutting edge, *h*, thereon. Furthermore, the shearing plate is arranged and mounted in such a manner that it can be moved forward toward the conical edges of the rotating blades when desired in order to compensate for any wear that may take place. One convenient way of effecting this is illustrated in Figs. 2, 3, 4 and 5, in which the pump casing, *a* is formed with a cylindrical casting, *m*, between the pump inlet pipe, *b*, and the main part of the casing. The open end of the casting, *m*, is closed by a cover plate, *n*, held in position by eye-bolts, *o*, and nuts, *p*, the cover plate carrying suitable guides, *q*, which project into the pump casing for the purpose of supporting the shearing plate, *g*. The position of the shearing plate is adjusted by means of a screw threaded bolt, *r*, having a locking nut, *s*, and passing through the cover plate to engage at the other end with a suitable slot in the shearing plate, *g*. In order to hold the plate, *g*, rigidly in position, wedges, *t*, are placed between the plate and the guides, *a*.

and arranged to be adjusted from the outside of the pump casing by their attachment to screw threaded bolts, *u*, having locking nuts, *v*. The method of adjusting the plate, *g*, it will be seen is quite immaterial and any other means can be adopted for effecting the adjustment, such as that shown in Figs. 6, 7 and 8 which correspond to Figs. 2, 4 and 5. In the latter construction however, the cover plate, *n*, is clamped over the opening of the casting *m*, by means of a clamping piece, *w*, engaging under the flange on the casting, *m*, and secured in position by screwing the bolt *x*, which passes through the clamping piece and abuts against the cover plate, a jamb nut *y*, being preferably used as shown. The plate, *g*, is as before carried in guides, *q*, and its position is adjusted by means of the screw threaded bolt, *z*, passing through the cover plate, *n*, and having jamb nuts, *j*.

It will be seen that owing to the curvature of the rotating blades, *d*, each blade will only contact with the shearing plate, *g*, at one point at any given instance and that this point of contact will move along the cutting edge, *h*, of the plate, as the blades, *d* are rotated. By this relative motion between the rotating blades and the shearing plate, *g*, any solid or fibrous matter which is unable to enter the rotating blades, *d*, is either pushed forward or cut into pieces of such dimensions as will allow it to pass through the pump. In order to insure that no solid or fibrous matter shall become fixed in the passage between the rotating blades, *d*, or any other orifices of the pump or the like, the inlet passage in the vicinity of the shearing plate, *g*, is arranged to be of smaller dimensions than that in any other part of the pump, the passages of flow diverging therefrom to the delivery of the pump. In this way any solid or fibrous matter which is unable to pass into the rotating blades, *d*, is cut and re-cut if necessary into portions that are of dimensions small enough to pass easily through any other passage of the pump or the like.

The shearing plate *g* in some cases may extend throughout the whole radial dimensions of the rotating blades *d*, or may be arranged to terminate at any less radial distance. In the latter case a suitable groove of spiral or other form with square edges is provided in the pump casing beyond the end of the shearing plate, *g*, so as to facilitate the passage of the solid or fibrous matter after passing the cutting edge.

Generally, the junction of the walls of the volute or spiral chamber with the wall of the delivery pipe is continued as near the blade outlet edges as possible for the purpose of providing a volute continuous from the blade outlet edge. It is preferable, however, to form the above continuation by means of a suitably formed removable plate 1, purposely made less strong than the blades, *d*, and attached to the pump casing *a*, in any suitable manner, such as by bolts, 2, passing through a removable cover, 3. Thus it will be seen that should any hard substance become accidentally fixed between the impeller blades *d*, and the plate 1, the latter will break first, thereby preventing injury to the impeller, and allowing the pump to operate as before, the broken plate 1, being subsequently replaced by a new one. In some cases means are also provided for adjusting the rotating blades, *d*, longitudinally so as to provide for wear of the blade edges in place of or in addition to the adjustment of the shearing plate, *g*, itself. Such means are shown by way of example in Fig. 2, in which the pump driving shaft *f* is provided with thrust collars formed on a sleeve 4, screwed on the shaft, the collars engaging in corresponding grooves in a bearing 5, surrounding the shaft. The bearing 5 is placed within the pump stuffing box which is closed by the usual type of gland, 6, and thus on altering the longitudinal position of the sleeve, 4, on the shaft, *f*, the adjustment of the impeller *d*, is effected.

This invention it will be seen is applicable equally to all types of centrifugal pumps, whether simple or multi-stage, and also to turbines, or fans and similar apparatus, and further can be modified in any structural details without in any way departing from the spirit of the invention.

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

1. In combination in a centrifugal pump or the like having rotating blades, cutting means acting in conjunction with said blades to divide up any solid matter entering the pump.

2. In combination in a centrifugal pump or the like having rotating blades, one or more plates coöperating with said blades for the purpose of dividing up any solid matter entering the pump.

3. In combination in a centrifugal pump or the like, having rotating blades, one or more plates adjustable with respect to the rotating blades and coöperating therewith for the purpose of dividing up any solid or fibrous matter entering the pump.

4. In combination in a centrifugal pump or the like having rotating blades, one or more plates coöperating with the said blades for the purpose of dividing up any solid matter entering the pump and means for altering the relative position of the plate or plates and the rotating blades.

5. In combination in a centrifugal pump or the like having rotating blades, one or more plates coöperating with the rotating blades for the purpose of dividing up any

solid matter entering the pump and means for adjusting the position of the said plate or plates with respect to the said blades to allow for wear thereof.

6. In combination in a centrifugal pump or the like having a bladed impeller, means acting in conjunction with said impeller to divide up any solid matter entering the pump and means for adjusting the position of the impeller with respect to the said dividing means.

7. In combination in a centrifugal pump or the like having a bladed impeller, one or more plates acting in conjunction with said impeller to divide up any solid matter entering the pump and means for adjusting the position of the impeller with respect to the said plate or plates.

8. In combination with a centrifugal pump or the like having rotating blades and a volute chamber surrounding the same, means acting to reduce the size of any solid matter which would not otherwise be capable of passing through the pump, and a replaceable plate forming a continuation of the volute chamber toward the rotating blades whereby should any material accidentally become fixed between the said blades and plate, the latter will break first and prevent damage to the blades.

9. In combination in a centrifugal pump or the like having rotating blades, one or more plates coöperating with the said blades for the purpose of dividing up any solid matter entering the pump, a volute chamber surrounding the rotating blades and a replaceable plate forming a continuation of the said chamber near the rotating blades, whereby should any material accidentally become fixed between the said blades and the replaceable plate, the latter will break first and prevent damage to the blades.

10. A centrifugal or like pump comprising in combination a casing, a bladed impeller within said casing and a volute chamber surrounding said impeller, suction and delivery pipes leading to and from said casing respectively and means placed within the suction pipe and acting in conjunction with the bladed impeller to divide up any solid matter entering the pump.

11. A centrifugal or like pump comprising in combination a casing, a bladed impeller therein said casing also forming a volute chamber which surrounds the impeller, suction and delivery pipes leading to and from said casing respectively and one or more plates placed within the suction pipe and coöperating with the impeller to divide up any solid matter entering the pump.

12. A centrifugal or like pump comprising in combination a casing, a bladed impeller therein said casing also forming a volute chamber which surrounds the impeller suction and delivery pipes leading to and from said casing respectively and one or more plates placed within the suction pipe and coöperating with the impeller to divide up any solid matter entering the pump, and means for altering the relative position of the said plate or plates and the impeller.

13. A centrifugal or like pump comprising in combination a casing, a bladed impeller therein, said casing also forming a volute chamber which surrounds the impeller, suction and delivery pipes leading to and from said casing respectively and one or more plates placed within the suction pipe and coöperating with the impeller to divide up any solid matter entering the pump, means for altering the position of the said plate or plates relatively to the impeller, and means for adjusting the position of the bladed impeller from the exterior of the pump casing.

14. A centrifugal or like pump comprising in combination a casing, a bladed impeller within said casing, said casing also forming a volute chamber which surrounds said impeller, suction and delivery pipes leading to and from said casing respectively, one or more plates placed within the suction pipe and coöperating with the impeller to divide up any solid matter entering the pump, means for altering the relative position of the said plate or plates from the exterior of the pump casing and means for altering the axial position of the impeller, a replaceable plate forming a continuation of the junction between the volute chamber and the delivery pipe, said plate being of less strength than the pump impeller whereby on any material becoming fixed between said impeller and the replaceable plate the latter will break first and prevent damage to the impeller.

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

RICHARD CLERE PARSONS.

Witnesses:

MATTHEW ATKINSON ADAM,

P. R. OUTHWAITE.