3 Sheets--Sheet 1.

G. GREINDL.
Rotary Pumps.

No. 152,904. Patented July 14, 1874.

FIG. 3.

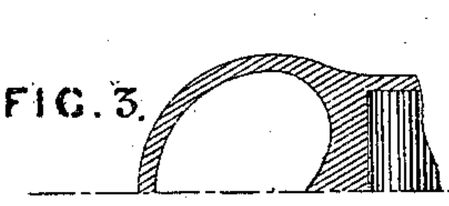

FIG. 4.

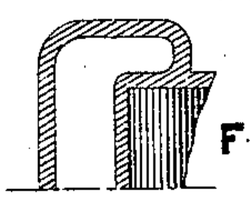

FIG. 1.

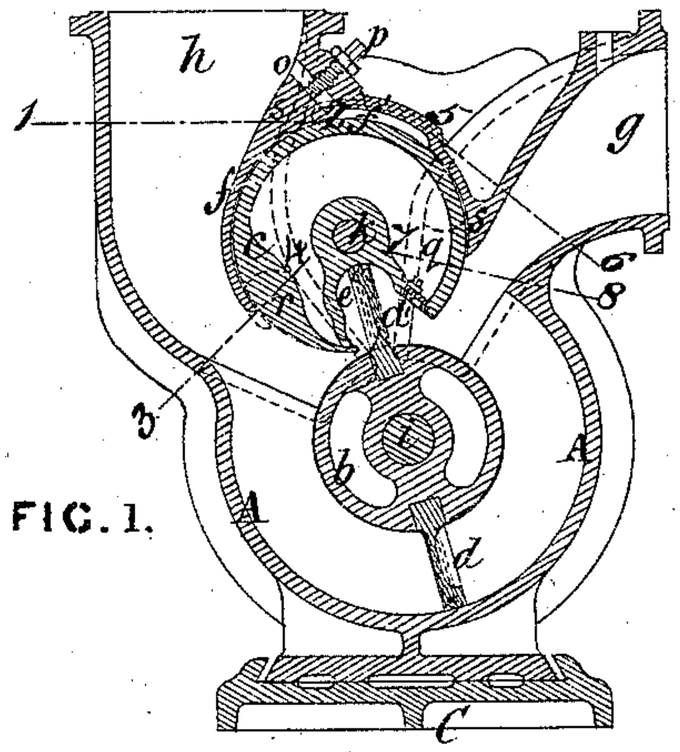

FIG. 5.

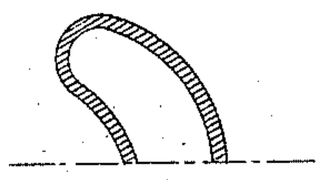

FIG. 6.

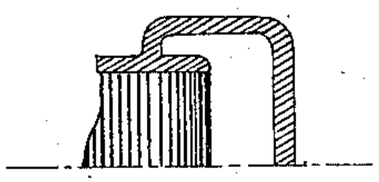

FIG. 2.

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Rotary Pumps.

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FIG. 8.

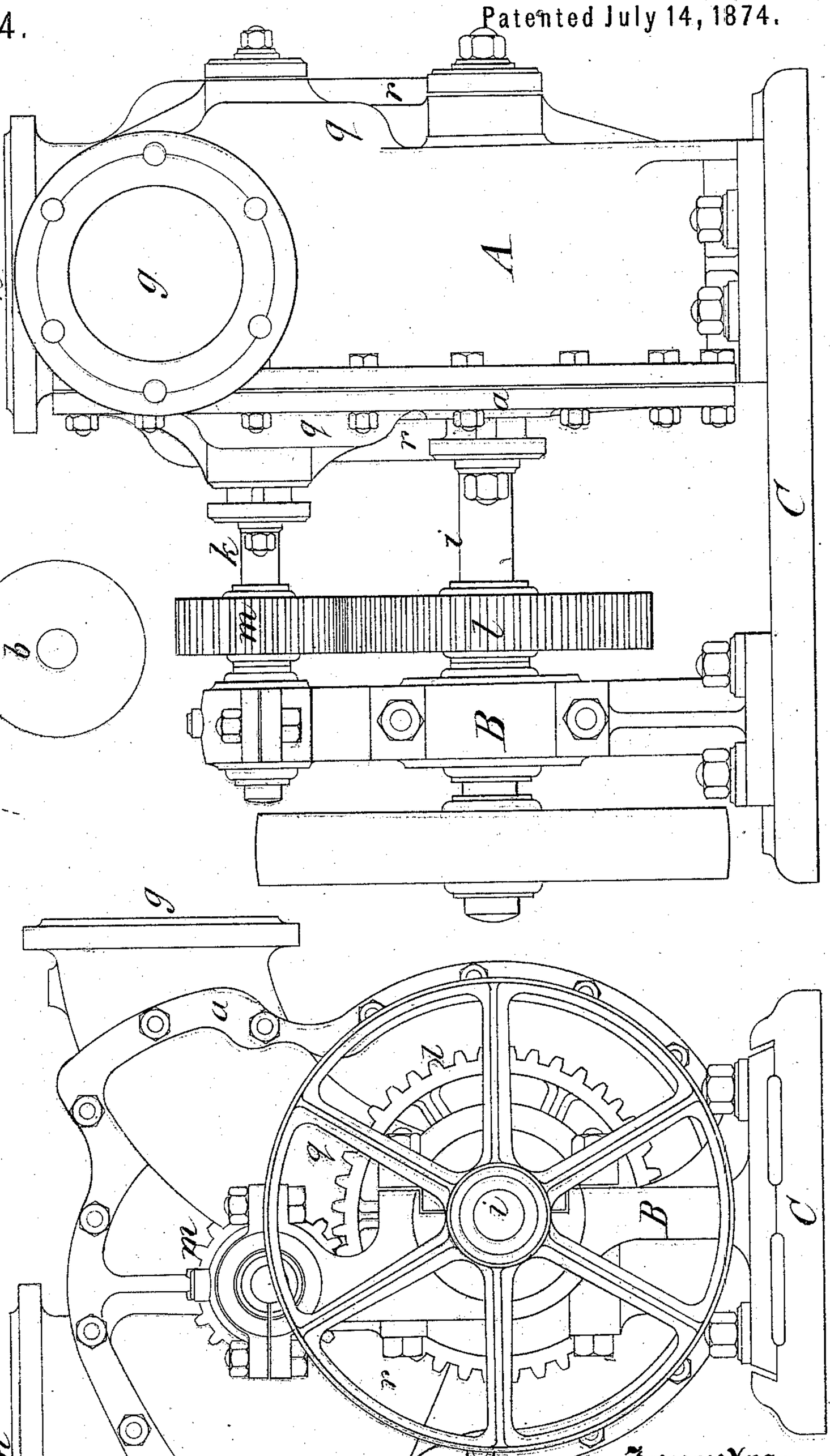

FIG. 9.

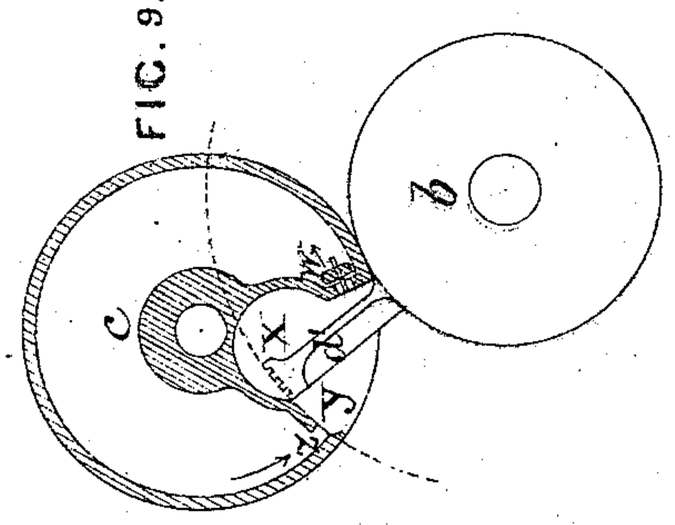

FIG. 7.

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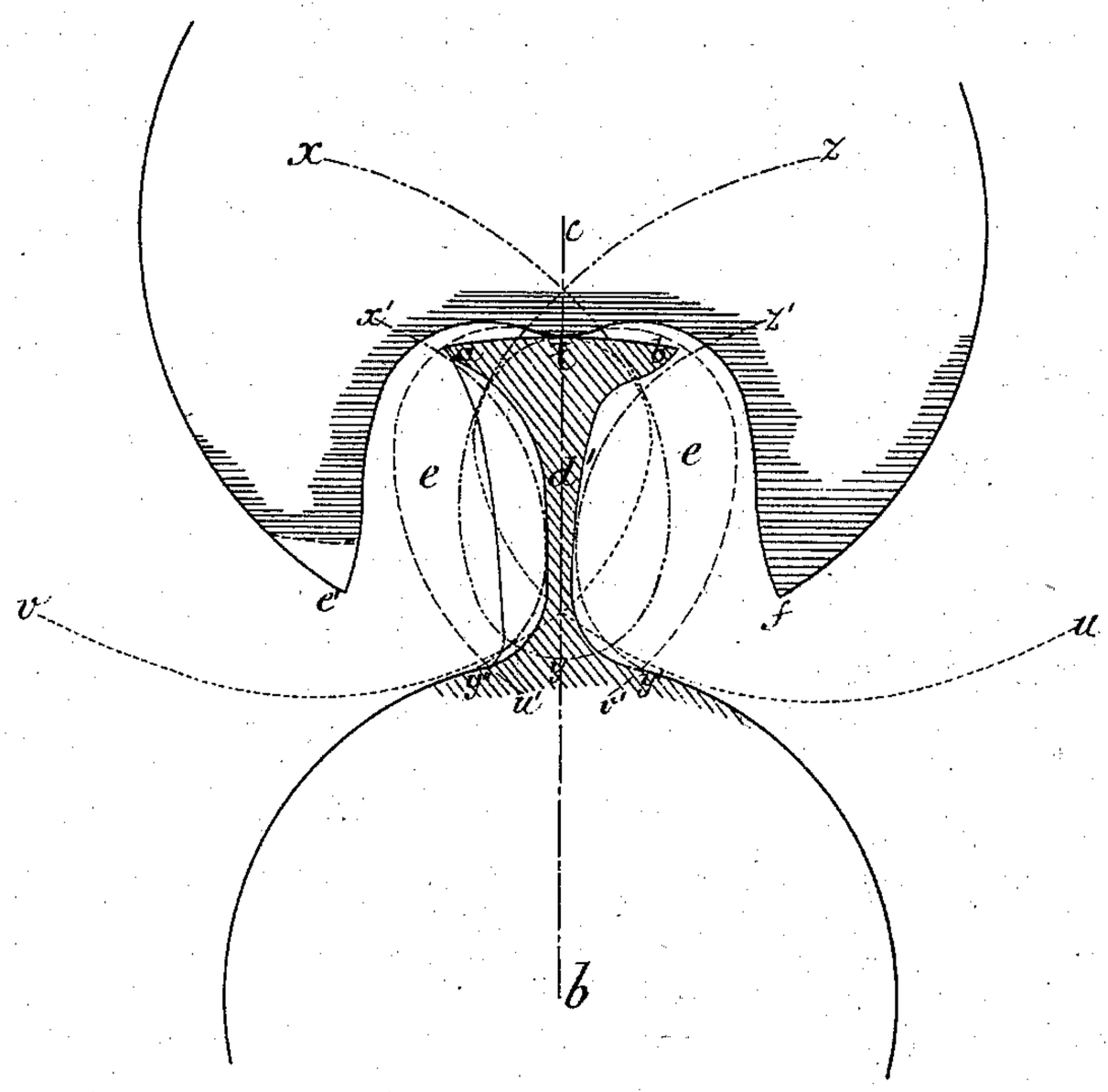
Rotary Pumps.

No. 152,904. Patented July 14, 1874.

FIG. 10.



Witnesses:

Arnold Hörmann.

Wm. C. Gray

Inventor,

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Thomas L. Stetson,

New York City.

UNITED STATES PATENT OFFICE.

GUSTAVE GREINDL, OF BRUSSELS, KINGDOM OF BELGIUM.

IMPROVEMENT IN ROTARY PUMPS.

Specification forming part of Letters Patent No. **152,904**, dated July 14, 1874; application filed May 12, 1874.

To all whom it may concern:

Be it known that I, Baron GUSTAVE GREINDL, of Brussels, in the Kingdom of Belgium, have invented a Rotary Machine for Pumping and other purposes, of which the following is a specification:

The main object of my invention is to produce a cheap and efficient rotary machine for pumping and other purposes, capable of being readily fixed and of working with little friction, by the combination and arrangement, within a box or casing, A, of two rotating drums or cylinders, *b c*, connected or geared together so that wings or blades *d d'* carried by the one drum or cylinder *b*, alternately enter a channel or recess, *e*, formed in the other cylinder, *c*, the latter cylinder being partially surrounded by a stop-partition, *f*, a recessed part, (or parts,) *f'*, of which can be put in communication with the outlet, as shown in the sectional elevation, Fig. 1, of the accompanying drawings. The apparatus is illustrated more in detail in the vertical section, Fig. 2, (taken at right angles to Fig. 1,) in the sectional views of the enlargements Figs. 3 and 4, (taken respectively in lines 1–2 and 3–4 of Fig. 1,) in the sectional views of the section Figs. 5 and 6, (taken respectively in the lines 5–6 and 7–8 of Fig. 1,) and in the elevations Figs. 7 and 8.

The sections of the escape and suction indicated in the drawings are respectively equivalent.

A box or casing, A, is closed by a cover, *a*, and provided with a flanged inlet, *g*, and with a similarly flanged outlet, *h*. The box or casing and its cover form the body of the machine, and are traversed by two steel shafts or axles, *i* and *k*, turning with slight friction in stuffing-boxes (of gun-metal or bronze) in the cover *a* and standard B, bolted to a foundation-plate, *c*, as shown. On the shaft or axle *i* is keyed a rotating drum or cylinder, *b*, fitting truly within the body of the machine and carrying, diametrically opposed to each other, two wings or blades, *d d'*, each having a surface equal to the sectional area of the annular space between the box or casing A and the drum or cylinder *b*. The wings *d d'* are grooved and packed to prevent passage of liquid between their edges and the body, and to compensate for any wear which may arise from working with sandy or gritty water. On the shaft or axle *k* is fixed another drum or cylinder, *c*, which turns, without end play, within the body, and at its periphery touches the periphery of the drum or cylinder *b*. The shafts or axles *i* and *k* carry outside the body or casing two toothed wheels, *l m*, whose relation to each other is as two is to one, so that in turning the two wings of the cylinder *b* alternately enter an epicycloidal channel or recess, *e*, formed in the cylinder *c*, as shown. A stop-partition, *f*, in the upper part of the interior of the body prevents direct communication between the inlet and exit passages. This partition is recessed at *f'*, over the whole length of the drum or cylinder *c*, in a position to counteract the pressure against the exposed part of said drum or cylinder *c* of the column of fluid to be forced out. This recess can be put in communication with the outlet *h* by the passage *o*, which can be regulated by a cock or screw valve, *p*. Above and laterally the fluid enters the body of the machine by the enlargements *q*, and is forced back by the enlargements *r*, so that there is neither compression on the side of the forcing-back pipe, nor vacuum caused to the suction-pipe when the wing leaves the channel or recess of the upper cylinder *c*. This cylinder is contained in a part, *s*, bored and lined with gun metal, in which it turns, so that it only allows the wings or blades *d d'* to pass.

The machine is provided with inlet and outlet cocks.

When using the machine as a pump, on setting it in action, water or liquid is drawn into the body at a comparatively slow speed by the wings *d d'*, which by alternately entering the recess of the upper cylinder force the liquid to rise continuously, and without any sensible change of velocity, into the outlet and delivery main.

The liquid entering the channel *f'* and controlled by the stop-partition *f* counterbalances the back pressure in the outlet, so that the upper cylinder is kept in equilibrium.

In order to avoid any prejudicial compression, when there is a passage of liquid between X and Y, during the movement of the wing in the recess of the cylinder *c*, the said

recess can be furnished with a valve, W, opening from below upward, as shown in Fig. 9. The liquid, by pressure in the space X, will force the valve open so as to gain a free passage into the interior of the cylinder *c*, whence it will escape by the opening Z made in the opposite part of the cavity. This valve is only absolutely necessary for pumps of large volume.

For pumps of large size, and for those intended to lift water to a considerable height, in order to avoid too great a strain on the lower shaft or axle the two sides carry in the interior a cylindrical part, *t t'*, of a diameter a little greater than the cylinder *b*, and of a breadth about half that of the case. The contact of the upper cylinder takes place on the concave section formed on the two cylindrical parts. The wings are fixed on the cylinder *b* and bear on the whole of their peripheries. Contact, therefore, takes place over the whole concave surface of the two cylindrical parts in contact with the upper cylinder, and the escapes are rendered less sensible. In addition to this advantage the size of the apparatus is reduced, there being a saving in the casting of the case and of the cover of the spaces to receive the packing, and the diameter of the lower shaft can be considerably reduced.

In order to simplify the construction of the machine, and to give greater duration to its working, I, in some cases, construct it with the modified form of wing or blade *d d'* and recess *e*, shown to an enlarged scale in the theoretical diagram, Fig. 10.

In this arrangement the cylinder *c*, by revolving at twice the speed of the cylinder *b*, describes at the point *y* an epicycloid, *x y z*, serving as a normal line to the two epicycloids *x' y'' z' y'*. Owing to the difference between these latter curves and the strokes of the wing there can never be any pressure of fluid in the course or travel of the machine. The same end is accomplished by the inclination of the sides of the recess *e*, as shown. The extremity *t* of the wing *d'* describes the epicycloid *v t u*, normal of the curves *u' t* and *v' t*, and the space between these and the sides *e' t* and *t f*, of the recess *e*, permits free escape of the liquid without pressure.

Moreover, it will be evident that, as soon as the cylinder *c* leaves the periphery of the cylinder *b* at the point *f*, contact of the cylindrical part of the wing will take place with the cylindrical part of the bottom of the recess at *t*, and this surface of the wing at *t* will only leave it at the moment the point *e'* of the cylinder *c* renews its contact with the periphery of the cylinder *b*. It follows, therefore, that communication between the escape and feed can take place in no other manner.

It will be evident that by slightly modifying the construction of the apparatus it may be employed with a column of water, or as an air or exhaust-pump, or a compressor of gases, as a steam or water engine, as a hydraulic propeller for vessels, or as a fluid-meter.

I claim as my invention—

1. In combination with the box or casing A and drum or cylinder *c* the stop-partition *f*, recessed at *f'* and communicating with the outlet *h* by the passage *o*, regulated by a cock or valve, *p*, all as herein set forth and described, for the purpose specified.

2. The recess *e*, formed as described, with openings into the hollow cylinder *c*, and provided with a valve, W, as herein shown and set forth, for the purposes specified.

3. The wings or blades *d'*, and recess *e*, having the peculiar forms shown in and described with reference to Fig. 10, for the purposes specified.

BON. GUSTAVE GREINDL.

Witnesses:

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C. MORENEY.