H. A. PRINDLE.

CENTRIFUGAL PUMP.

APPLICATION FILED JULY 3, 1906.

928,327.

Patented July 20, 1909.

2 SHEETS—SHEET 1.

Fig. 2.

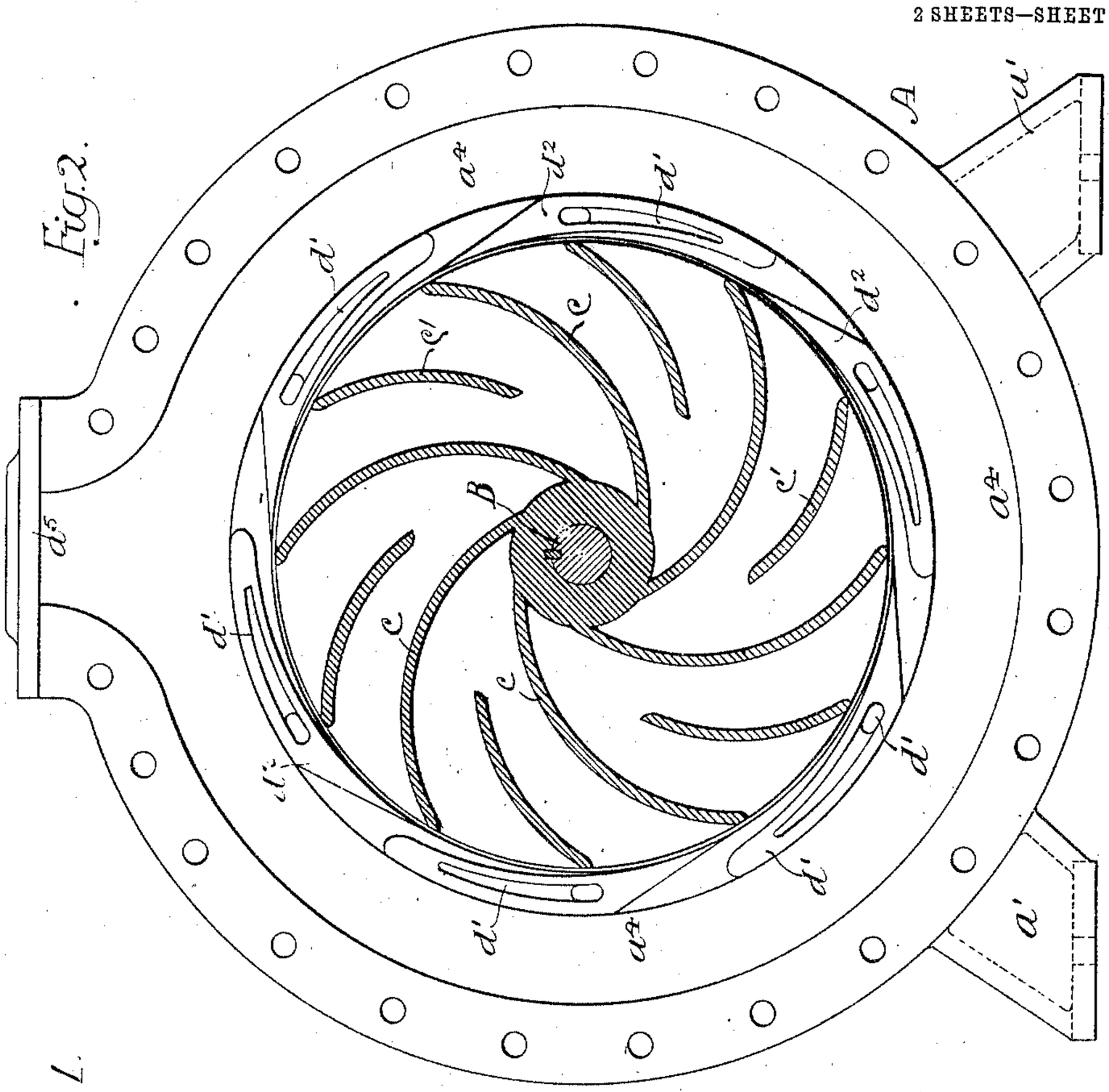
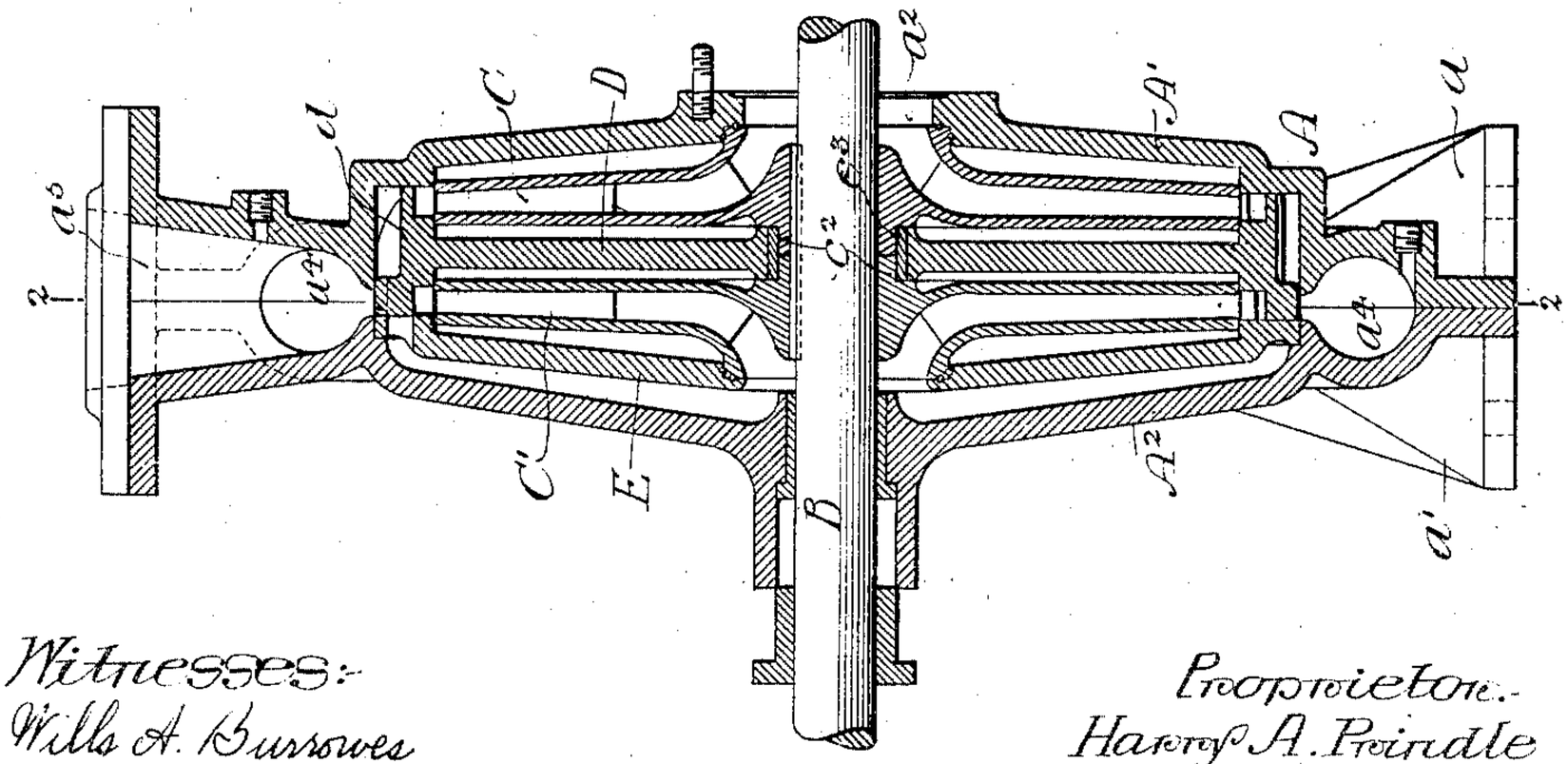


Fig. 1.



Witnesses:-

Wills A. Burrowes

Walter F. Pellinger

Proprietor.-

Harry A. Prindle

by his Attorneys.

Howson & Howson

H. A. PRINDLE.

CENTRIFUGAL PUMP.

APPLICATION FILED JULY 3, 1906.

928,327. **Patented July 20, 1909.**

2 SHEETS—SHEET 2.

Fig. 3.

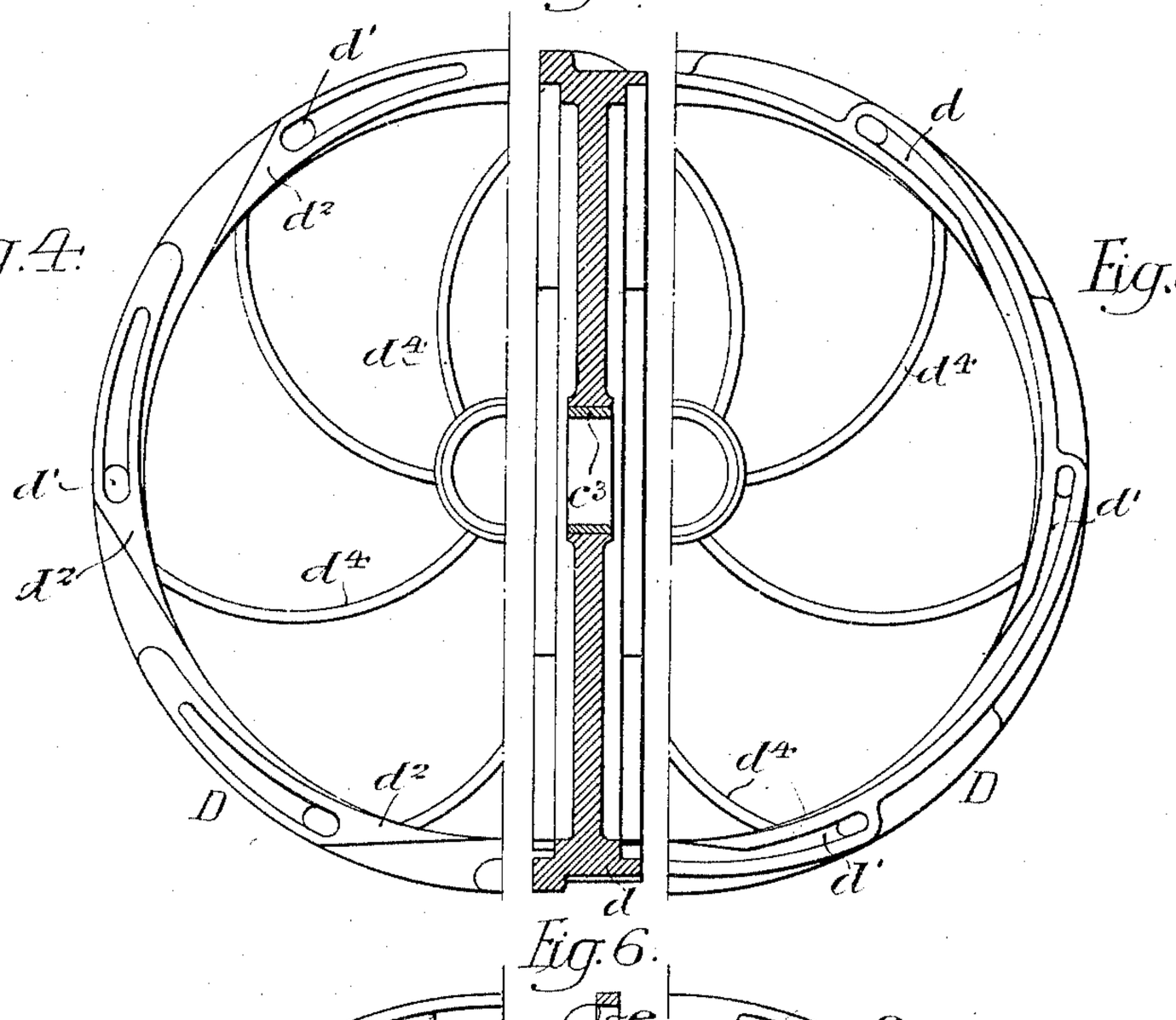


Fig. 4.

Fig. 5.

Fig. 6.

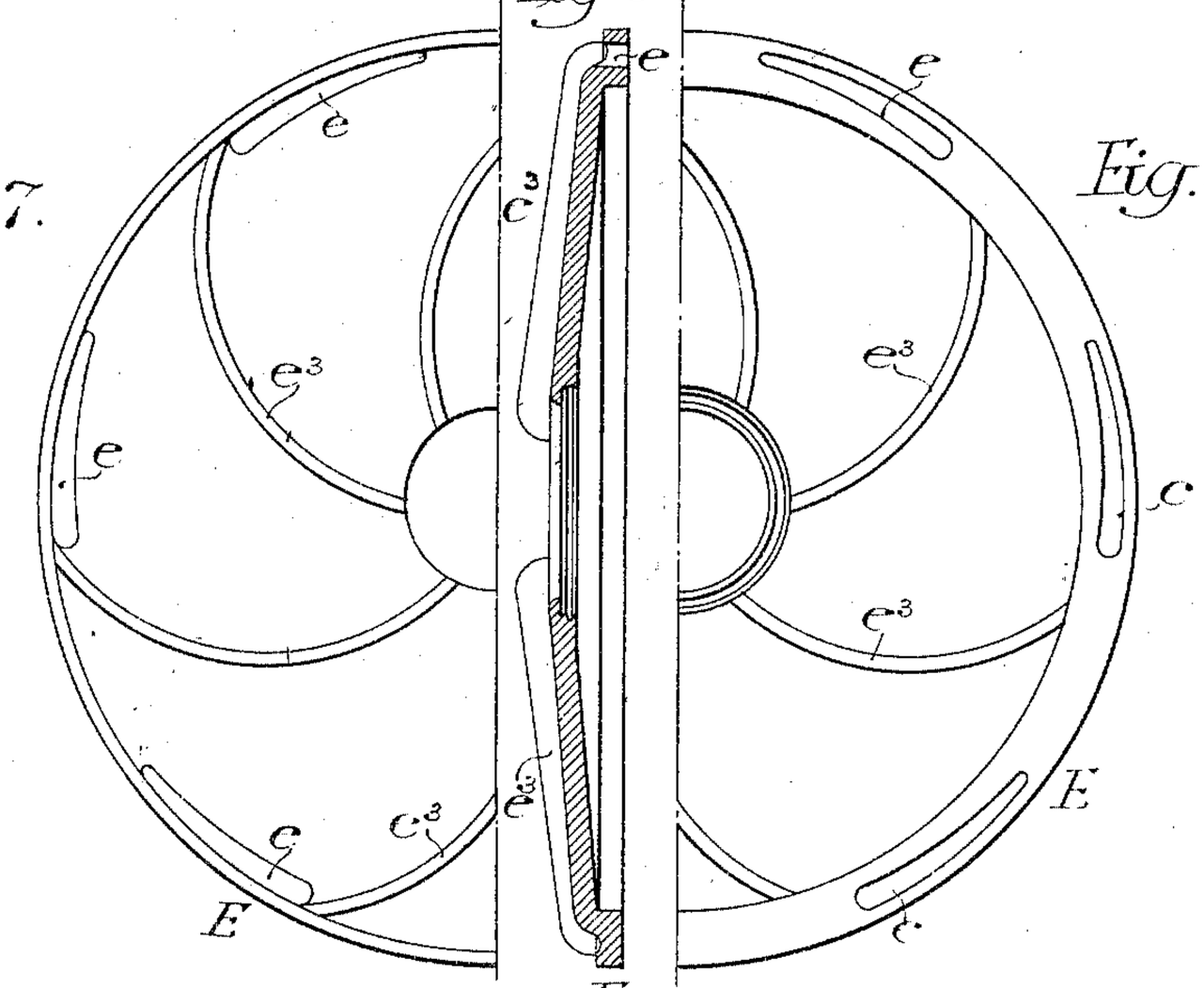


Fig. 7.

Fig. 8.

Witnesses:
Wills A. Burrowes
Walter F. Pellinger

Proprietor.-
Harvey A. Prindle.
by his Attorneys.
Howson & Howson

UNITED STATES PATENT OFFICE.

HARRY A. PRINDLE, OF PHILADELPHIA, PENNSYLVANIA.

CENTRIFUGAL PUMP.

No. 928,327. Specification of Letters Patent. Patented July 20, 1909.

Application filed July 3, 1906. Serial No. 324,595.

To all whom it may concern:

Be it known that I, HARRY A. PRINDLE, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Centrifugal Pumps, of which the following is a specification.

One object of my invention is to provide a pump of the turbine type primarily constructed so that its efficiency shall be relatively high and which at the same time shall be relatively inexpensive to manufacture, as well as have its parts so arranged that its interior is readily accessible.

I further desire to so arrange the various parts of the pump that under operating conditions the pressure of fluid exerted upon its movable elements shall be balanced; that is, so distributed that there shall be practically no end thrust in either direction upon the driving shaft.

A further object of the invention is to provide certain improvements in the detail construction of a pump having the above characteristics by which I am enabled to secure a higher efficiency of operation than would otherwise be the case.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which:—

Figure 1, is a vertical section of the preferred form of my improved pump; Fig. 2, is a vertical section taken on the line 2—2, Fig. 1, further illustrating its construction; Figs. 3, 4 and 5, are respectively a vertical section and fragmentary elevations of the two faces of the part I shall hereafter refer to as the "vane plate" and Figs. 6, 7 and 8 are respectively a vertical section and elevations of the two faces of the part I shall designate as the "preventer plate".

In the above drawings, A represents the pump casing which consists of two castings A′ and A² respectively provided with supporting feet a and a'. The first of these castings has at its center an inlet or opening a^2 through which extends the driving shaft B which is partially supported by a bearing formed in the casting A², as shown in Fig. 1; the other end of said shaft being supported in any desired way, either by a separate structure or by a suitable bearing formed in the conduit bolted to the face of the casting A′ and forming a continuation of the inlet a^2. The two castings A′ and A² together form the pump chamber proper, outside of which they unite to form an annular conduit a^4, preferably of a uniform cross sectional area, for the reception of liquid delivered from the chamber. Said conduit communicates with the outlet or discharge opening a^5, which it will be understood may be placed at any desired point on the pump casing.

Keyed to the shaft B within the chamber formed by the two castings A′ and A² are a pair of runners or movable elements C and C′, which may be described as consisting of two substantially parallel plates or disks between which extend the spirally formed vanes c and c'. The space or spaces between the disks of the runner C open on that side of the runner adjacent to and in communication with the inlet opening a^2, while the runner C′, though of substantially the same construction, has its central opening on its face most distant from the runner C.

It will be understood that the two castings A′ and A² are bolted or clamped together in such a manner as to clamp within them two plates D and E, the first of which extends betwen the runners C and C′, there being portions c^2 on both of these extending toward each other and carrying a sleeve c^3 fitted into a suitable opening in the plate D. Said plate, as shown in Figs. 3, 4 and 5, is widened or thickened at its periphery d, and through this part extend channels d' for conducting the liquid discharged by the runner C to suitable openings e in the periphery of the preventer plate E, from whence said liquid is conducted inwardly toward the shaft, though the space between the preventer plate E and the shell of the casting A² and to the inlet of the runner C′.

It is to be noted that the channels d' are formed through guide vanes d^2 which, in the present instance, are cast integral with the vane or diversion plate D, but may, as described and claimed in my application for U. S. Patent, No. 324,594, filed July 3, 1906, be removed therefrom and adjustable. It is further to be noted that the channels d' do not extend through these guide vanes d^2 in lines parallel to the shaft B, but extend in the direction of helical lines formed on the surface of a cylinder having said shaft as its axis, so as to change the direction of fluid gradually and oppose its flow as little as possible. The openings or channels e in the periphery of the preventer plate E are preferably elongated so as to freely receive the fluid delivered through the chan-

nels d' and conduct it toward the inlet of the runner C'.

Under operating conditions fluid enters or is driven into the casing A through the inlet a^2, from whence after passing into the interior of the runner C it is discharged from the periphery of said runner into the channels d'. It will be seen that such fluid has a rotary motion and inasmuch as said channels are particularly designed to receive said liquid and gradually change its direction of flow from a rotary direction to a direction parallel to the shaft B, there is but little loss of energy due to eddies or friction with the parts of the pump.

Passing from the channels d' into and through the channels e, said fluid flows between the preventer plate E and the shell of the casting A^2, toward the shaft B and thence to the intake of the runner C'. From the periphery of this runner the fluid is discharged between the guide vanes d^2 of the plate D and thence through the annular spaces between the two castings A and A' into the discharge chamber a^4 and to the outlet a^5.

If desired, I may provide guide vanes d^4 on either one or both faces of the plate D, as shown in Figs. 3, 4 and 5, and similarly may provide vanes e^3 on either or both sides of the plate E. In the event of placing them on the plate D and on the face of the plate E adjacent to the runner C', they would serve the purpose of directing outwardly any liquid which may occupy the space between the runners of said plates, or at least tend to prevent rotation or movement of the liquid within such spaces. The vanes upon the outer face of the preventer plate E are arranged definitely with reference to the channels or openings e, so as to gradually change the direction of the inwardly flowing liquid and direct it toward the intake of the runner C'. It will be understood, however, that these vanes may, if desired, be omitted without departing from my invention.

I claim:—

1. The combination of a pump casing having a discharge chamber, a vane plate therein, a shaft extending through the casing, runners fixed to said shaft on opposite sides of the vane plate having their intake openings on their outer faces, said plate having on its periphery an enlarged portion formed with helically disposed passages for transferring liquid from one runner across the plane of the other, said enlarged portion being divided into a number of guide vanes having spaces between them for conducting fluid from the second runner to the discharge chamber, with a second plate between the second runner and the wall of the pump casing, there being a channel or channels between said plate and said casing connecting the channels of the vane plate with the intake of the second runner, substantially as described.

2. The combination of a pump casing having a pump chamber and a discharge chamber, a shaft extending through the casing, two runners fixed to the shaft having their intake openings on their outer faces, a fixed plate extending between the runners, and having passages in its periphery placed to transfer liquid from one runner across the plane of the other, a second plate, independent of the casing structure extending between the second runner and the wall of the pump casing, there being passages accessible by the removal of the second plate for conducting fluid from the periphery of the first runner to the intake of the second runner, and other passages for conducting fluid from the second runner to the discharge chamber, each of said runners consisting of two substantially parallel disks provided with helically disposed guide vanes between them, substantially as described.

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

HARRY A. PRINDLE.

Witnesses:
C. W. Fowler,
Paul A. Blair.