No. 797,706. PATENTED AUG. 22, 1905.

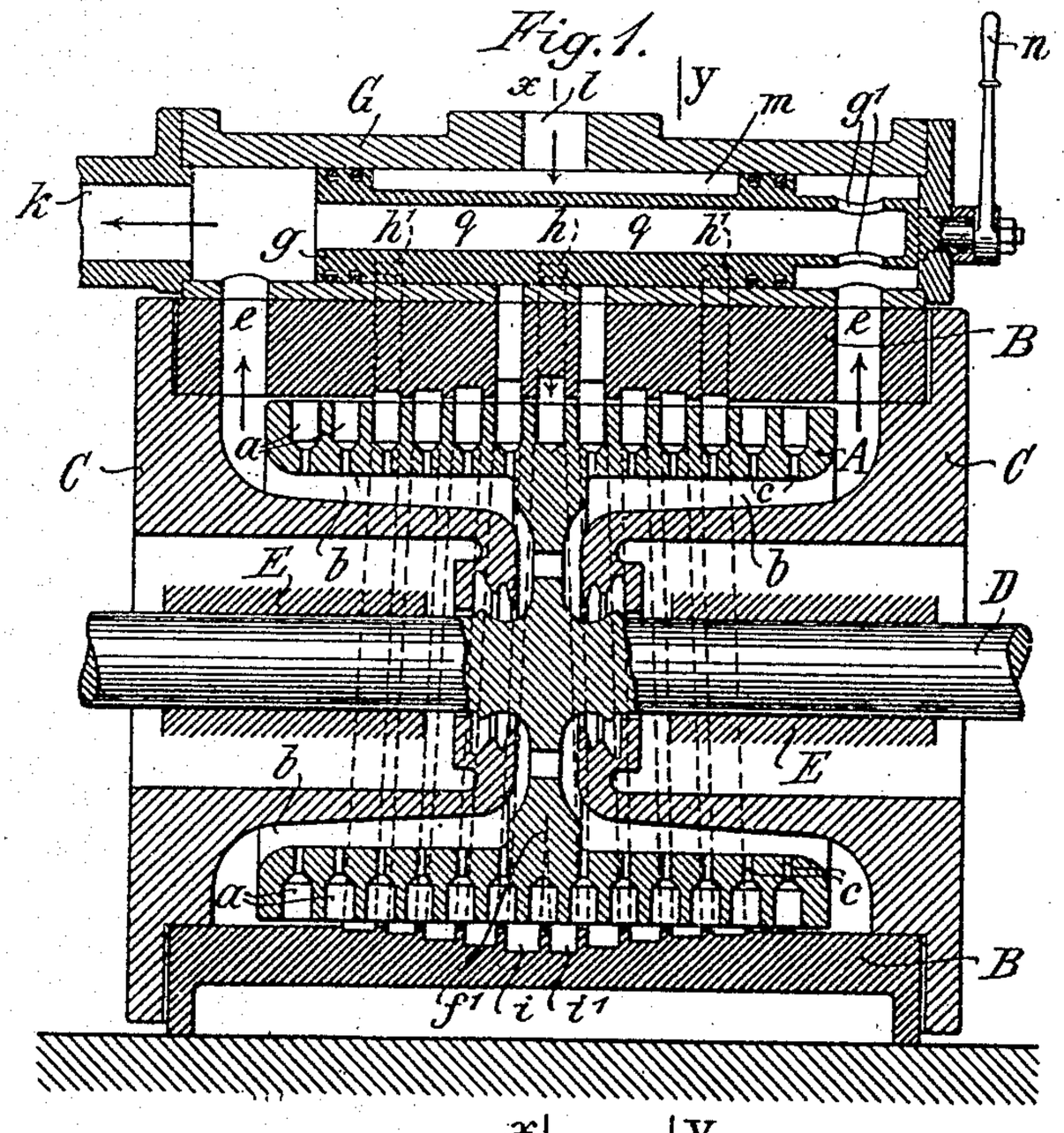
A. PATSCHKE.

ELASTIC FLUID TURBINE.

APPLICATION FILED APR. 5, 1904.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

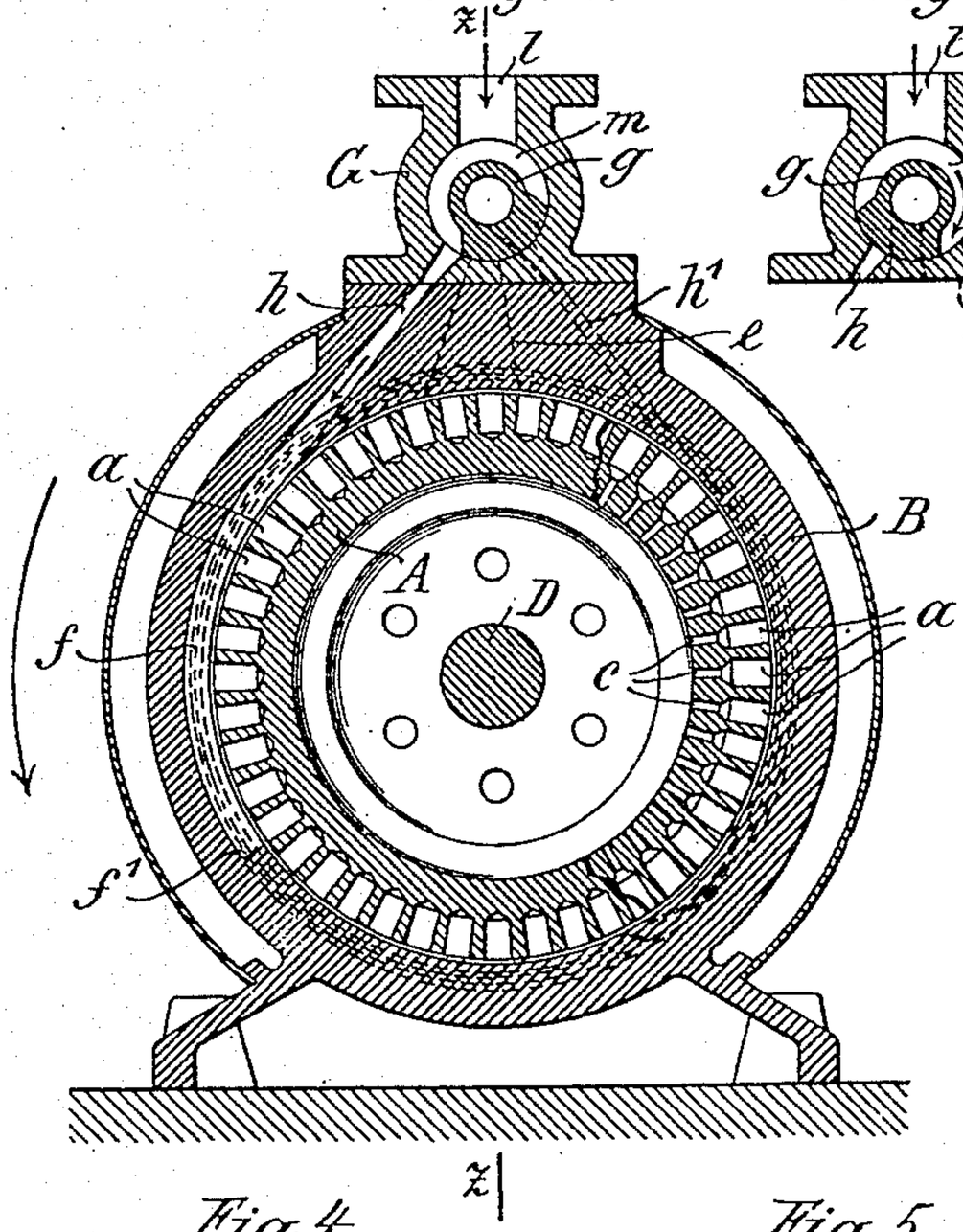


Fig. 3.

Fig. 4.

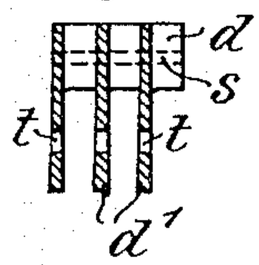
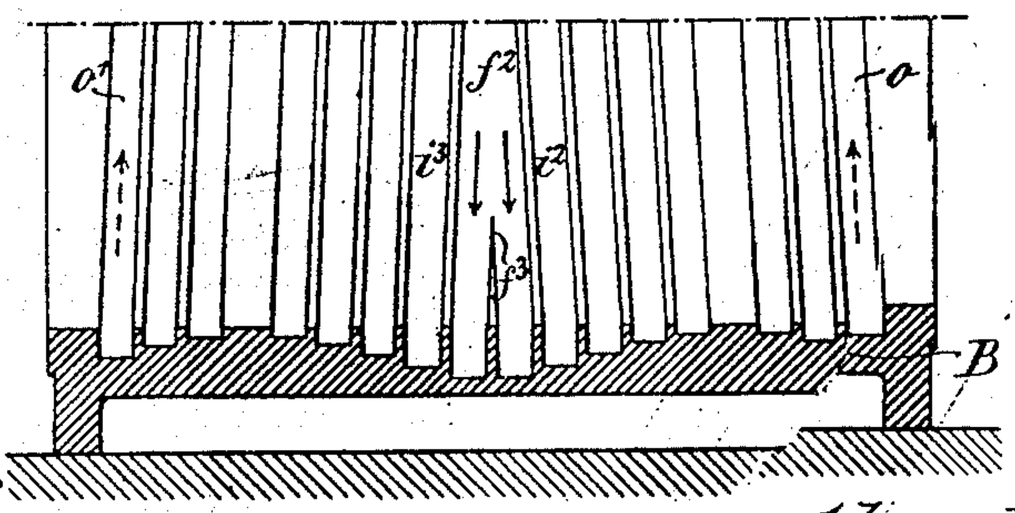


Fig. 5.

Fig. 6.



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UNITED STATES PATENT OFFICE.

ARTHUR PATSCHKE, OF MÜLHEIM-ON-THE-RUHR, GERMANY.

ELASTIC-FLUID TURBINE.

No. 797,706. Specification of Letters Patent. Patented Aug. 22, 1905.

Application filed April 5, 1904. Serial No. 201,750.

To all whom it may concern:

Be it known that I, ARTHUR PATSCHKE, a citizen of the Empire of Germany, residing at 106 Hingbergstrasse, Mülheim-on-the-Ruhr, Rhenish Prussia, Empire of Germany, have invented a new and useful Elastic-Fluid Turbine, of which the following is a specification.

This invention relates to an elastic-fluid turbine which is characterized by a cylindrical drum, one or several spiral grooves on the inside of a cylinder inclosing the drum, and by a valve-box with a distributing and reversing device. The cylindrical drum is provided on its external surface with a plurality of preferably radially disposed cavities, which may be cylindrical or ball-like or of any other shape and communicate by narrow holes with one or several annular spaces formed by the internal surfaces of the drum and of suitably-shaped covers and connected by channels or ports with the valve-box. The one or several spiral grooves on the inside of the cylinder communicate by one or several channels or ports with the valve-box, and a valve is disposed in this box and so arranged as to arbitrarily admit the elastic fluid in the one or other direction into the grooves for driving the drum in the corresponding direction. If it is desired to better utilize the surface of the drum, the latter may be provided also on its end faces and on its internal surface with a plurality of cavities, in which case the drum is preferably made hollow and the covers are provided on their internal even faces and on the cylindrical surfaces of their internal extensions with spiral grooves. The elastic fluid may be steam, compressed air or gas, or the like.

I will now proceed to describe my invention with reference to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section through an elastic-fluid turbine on the line $z\,z$ in Fig. 2. Fig. 2 is a vertical cross-section through the same on the line $x\,x$ in Fig. 1, a part of the drum, on the right hand, being a section through the line $y\,y$ in Fig. 1. Fig. 3 shows the valve-box in Fig. 2, the valve occupying its other extreme position. Fig. 4 is a longitudinal section through a part of a modified drum. Fig. 5 is a side view of the same. Fig. 6 is a vertical longitudinal section through the lower half of a modified cylinder.

Similar letters of reference refer to similar parts throughout the several views.

The revolving part of the turbine illustrated in Figs. 1 to 3 is a cylindrical drum A, which on its periphery is provided with a plurality of radially-placed cylindrical cavities $a\,a$. These cavities may be produced by a drilling-machine and terminate in narrow holes $c\,c$, passing through the drum-wall. The drum A is so inclosed by a cylinder B that it is just able to rotate freely, a very narrow clearance being left between them, which clearance is shown exaggeratedly in the drawings. The drum A is shown as made in one piece with a central disk and the shaft D. The two covers C C of the cylinder B extend into the drum A and leave two annular spaces $b\,b$, which by two ports $e\,e$ communicate with the valve-box G. The shaft D is mounted to turn in suitable bearings E E, which are merely indicated in Fig. 1, as their construction is immaterial for the present invention. The cavities $a\,a$ in the plane of the central disk are shown without holes $c\,c$; but where so preferred such holes may be provided, in which case they are placed at an incline to establish the communication between the cavities $a\,a$ and the annular spaces $b\,b$. On the inside of the cylinder B two oppositely-inclined spiral grooves $i\,i'$ are provided, which in the middle of the cylinder at a point f' in Figs. 1 and 2 merge in a single channel f, (similar to f^2 in Fig. 6,) communicating by a port h with the valve-box G. From the point f' the areas of the two spiral grooves i and i' decrease toward the two ends of the cylinder B, and the ends of these two spiral grooves communicate by two ports $h'\,h'$ with the valve-box G. A piston-valve g is mounted to turn in the valve-box G and is so cut out as to form a semi-annular space m within the valve-box. This space m permanently communicates with the inlet l and may be put into communication with either the one port h or the two ports $h'\,h'$ by turning the valve g with the aid of a hand-lever n. The valve g is made hollow and provided with two openings $g'\,g'$, so that the two chambers in the valve-box G on both ends of the valve g are thereby put into communication with each other.

The turbine described so far is operated in the following manner: Normally the valve g occupies such a position that it closes both the port h and the two ports $h'\,h'$. For starting the turbine in the direction of the arrow in Fig. 2 the valve g is by its hand-lever n brought into the one extreme position shown to open the port h. Then the elastic fluid admitted through the inlet l will pass through

the port h and the two opposite spiral grooves i and i'' and act tangentially upon the opposed parts of the walls of the cavities a a, whereby the drum A is put into rotation. The spent fluid escapes from the various cavities a a through the narrow holes c c into the annular spaces b b. From the left space b in Fig. 1 it passes through the left port e, the left chamber of the valve-box G, and the outlet k into the atmosphere or a condenser, as the case may be. The spent fluid in the right annular space b in Fig. 1 escapes through the right port e, the openings g' g', and the cavity of the valve g into the outlet k. For reversing the turbine the hand-lever n is so turned as to bring the valve g into its other extreme position, in which it closes the port h and opens the two ports h' h'. Then the elastic fluid will pass through the latter and the two spiral grooves i i'' and drive the drum A in the opposite direction. If so desired, two additional ports q q, Fig. 1, may be arranged on both sides of the port h for admitting a larger quantity of the fluid. The areas of the two spiral grooves i and i'' may be made constant throughout, or they may increase when counting from the point f' in the middle to the two cylinder ends, if so preferred, or the areas of these grooves may periodically decrease and increase. The sections of the spiral grooves are shown as rectangular; but they may also have other shapes. The cylindrical cavities a a may be shaped otherwise. They may taper inwardly, or they may be ball-like or similar to those between bent ladles of ordinary turbine-wheels, (somewhat like Fig. 5.) In order to increase the number of the cavities or to better utilize the surface of the drum, the latter may also be provided with cavities on its two end faces and on the interior surface. The drum A′ is made hollow and secured on a disk F by means of bolts r. The disk F is shown as made in one piece with the shaft D′; but it may of course be made separately and keyed upon the shaft. The cavities a' a' taper and communicate with the interior of the drum A′ by means of narrow holes c' c'. The cylinder B′ is provided on its inside with two opposite spiral grooves i^2 and i^3 in the middle and with two spiral grooves o and o' near the ends. (See also Fig. 6.) The two inner spiral grooves i^2 and i^3 merge at f^3 in the common groove f^2, which communicates by a port h^2 with the valve-box. (Not shown.) The two outer spiral grooves o and o' communicate by two ports p and p' with the valve-box. The areas of these four spiral grooves decrease from the ports to the groove ends. The two covers C′ C′ are provided on their internal even surfaces with two spiral grooves u u, which communicate with the two already-mentioned ports p and p'. The cylindrical surfaces of the inner extensions of the covers C′ C′ are provided with two spiral grooves v v', forming the continuations of the spiral grooves u u. The areas of these spiral grooves continually decrease from the ports p and p' to the groove ends. The two annular spaces formed by the interior of the drum A′, the disk F, and the end faces of the two covers C′ C′ communicate with two longitudinal channels e' e', to which tubes (not shown) are joined for leading off the spent fluid.

The manner in which this turbine is operated is substantially the same as before. The valve requires to be made so long that it can distribute the elastic fluid to all the ports p, h^2, and p'. Of course the two external spiral grooves o and o' in the cylinder B′ and the spiral grooves u v u v in the two covers C′ C′ and the two ports p and p' may be disposed for driving the drum A′ in the opposite direction, so that the turbine can be reversed at will. In this case the valve requires to be so arranged that in its one extreme position it opens the middle port h^2 and closes the two external ports p and p', while in its other extreme position the valve closes the middle port h^2 and opens the two external ports p and p'. The drum may also consist of a series of disks d' d', provided with crowns of ladles d d, as shown at Figs. 4 and 5, and the several disks may be united by means of bolts s s passing through the ladles. In this case the spaces between the several disks are put into communication with each other and with the spaces at the covers by means of holes t t.

The turbine may be varied in many respects without deviating from the spirit of my invention.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an elastic-fluid turbine of the class described, the combination with a cylindrical drum having in its periphery a plurality of radially-placed cavities which terminate in narrow holes through the drum-wall, of a cylinder inclosing said cylindrical drum and having a plurality of spiral grooves on its inside, a valve-box, a plurality of ports connecting the ends of said plurality of spiral grooves with said valve-box, two covers leaving annular spaces at the drum opposite to its narrow holes, two ports connecting said two annular spaces with said valve-box, and a distributing-valve in said valve-box.

2. In an elastic-fluid turbine of the class described, the combination with a rotating cylindrical drum having in its periphery a plurality of radially-placed cylindrical cavities which terminate in narrow holes through the drum-wall, said drum being secured on its shaft by means of a central disk so that it is open on both ends, of a cylinder inclosing said rotating cylindrical drum and having two oppositely-inclined spiral grooves on its inside, a valve-box, a port in said cylinder and connecting the internal ends of said two spiral grooves with said valve-box, two ports

in said cylinder and connecting the external ends of said two spiral grooves with said valve-box, a distributing-valve in said valve-box and adapted to simultaneously close said port and open said two ports or to open said port and close said two ports, means for actuating said distributing-valve, two covers extending into said rotating cylindrical drum and leaving two annular spaces, and two ports connecting said two annular spaces with the outlet.

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

ARTHUR PATSCHKE.

Witnesses:
WILLIAM ESSENWEIN,
PETER LIEBER.