

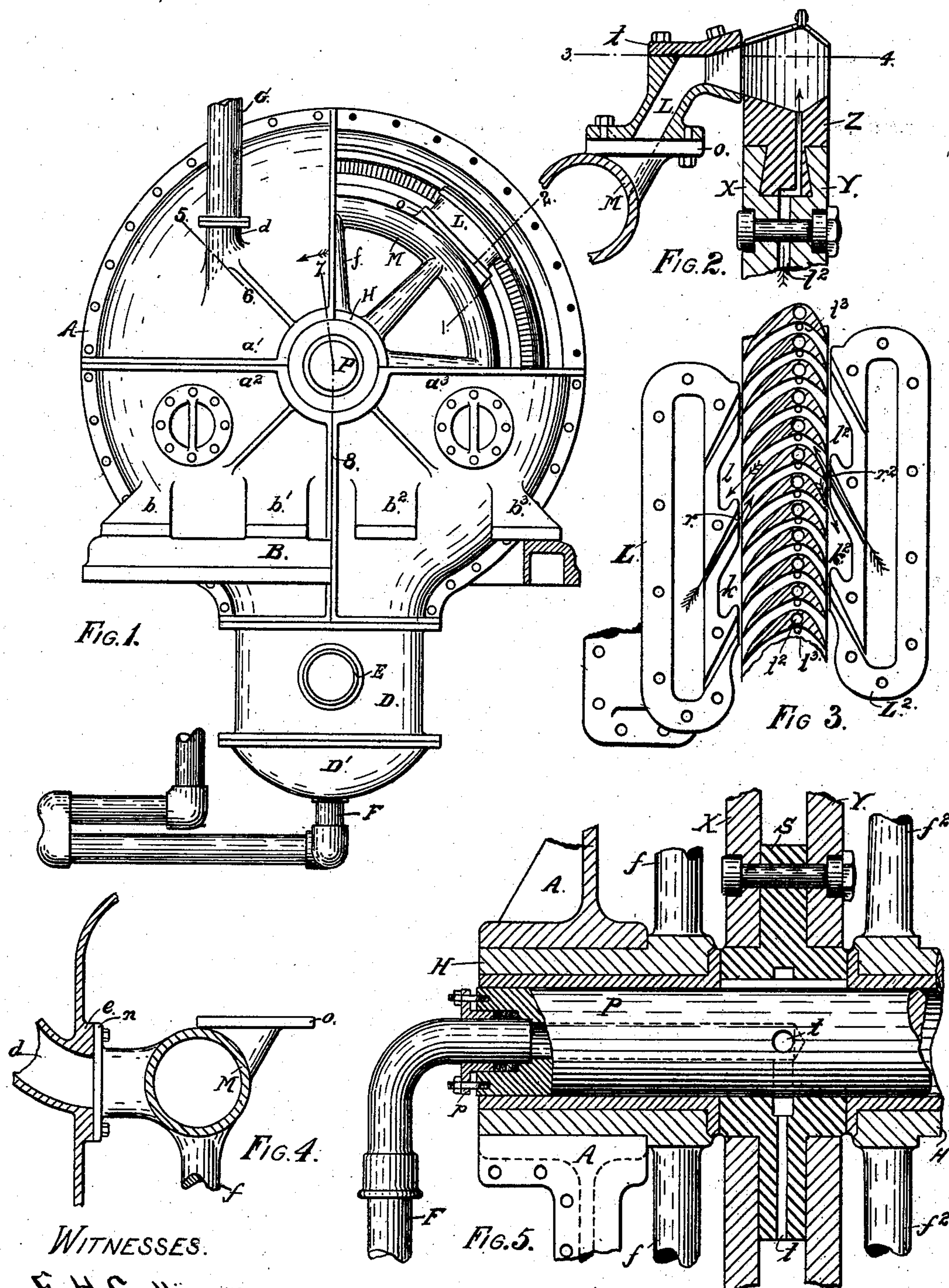
No. 700,314.

Patented May 20, 1902.

J. H. FEDELER.
STEAM TURBINE.

(Application filed Jan. 31, 1902.)

(No Model.)



WITNESSES.

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STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 700,314, dated May 20, 1902.

Application filed January 31, 1902. Serial No. 92,028. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. FEDELER, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Steam-Turbines, of which the following is a specification.

My invention relates to improvements in "turbines" and may be operated by steam or other expansible vapors or fluids.

The object of my invention is to provide a turbine in which the moving parts are reduced to a minimum and in which the molecular energy or steam discharged from an orifice is absorbed and transferred to a shaft more efficiently than heretofore.

My invention includes the novel combination of an outer casing, a turbine wheel fitted steam-tight therein and fastened to a main shaft, the aforementioned turbine wheel and shaft containing holes or grooves and openings to permit the circulation of cold water.

My invention furthermore includes the novel arrangement of nozzles placed opposite each other in such a manner that when the turbine wheel stands still the steam discharged will act upon buckets of wheel and then exhaust, but when the turbine wheel moves the steam discharged will collide with the steam emitted from nozzle opposite before exhausting, all of which will hereinafter be described.

In the accompanying drawings, which form a part of this specification, similar letters of reference indicate like parts throughout the several views.

Figure 1 is a general arrangement and front view of turbine with a section of casing removed. Fig. 2 is a section on line 1 2 of Fig. 1 with nozzle omitted on one side. Fig. 3 is a section of turbine wheel on line 3 4 of Fig. 2 and top view of nozzles on both sides with covers *l* removed to show relation of orifices to each other. Fig. 4 represents a section of casing at 5 6 of Fig. 1, showing connection of steam-pipes. Fig. 5 is a part section of steam-turbine on line 7 8 of Fig. 1 in direction of arrow.

It is understood that both sides of turbine are alike, with the exception of circulating-pipe F, referred to hereinafter.

The casing A, which constitutes the frame

of the turbine, is cast in a suitable number of sections *a' a² a³*, &c., which are bolted together and made steam-tight, and is provided with suitable lugs *b b' b² b³*, &c., bolted to base B, upon which it rests. The bottom of casing A includes a cylindrical water-drum D D', to which the exhaust-pipe E and water-circulating pipe F are affixed. The steam-pipe G is bolted to casing A, which has a lug *d* on the outside and *e* on the inside for these connections. The casing A is furthermore provided with a bearing H, which in this case is bolted thereto. The distributing-pipes M are supported on arms *f f²*, each also a part of bearing H, and have a number of openings with seats *n* to connect with steam-inlet at *e* and *o* to fasten nozzles L L² to.

The nozzles L and L² are constructed right and left handed and have several orifices *r* and *r²* for the discharge of steam and between which are grooves *k* and *k²* for the exhaust of the steam from an opposite orifice. The nozzles are so adjusted that one is somewhat in advance of the other. Between these nozzles rotates the turbine wheel and is of a suitable construction and provided with means so as to permit circulating water to cool a part or the whole thereof. The water-circulating pipe F, provided with a check-valve, is led into the center of shaft P through stuffing-box *p*. Shaft P is made hollow to the center of turbine wheel, and from thence radiate a number of holes *t*, communicating with the inside of turbine wheel.

The turbine wheel is keyed to shaft P and is built up of a hub S, two plates X and Y, and a rim Z. These parts are bolted together by a number of bolts. The rim Z has tooth-shaped grooves which form the buckets and a number of holes *t²* and *t³*, that communicate with the inside of turbine to permit the circulating water to cool a part or the whole of the buckets, as the case may require. The outside of rim Z is furthermore provided with a plate suitably fastened and has holes corresponding to those of the rim.

The turbine operates as follows: When the steam is turned into steam-pipes G on each side of casing, the steam passes through distributing-pipe M into nozzles L, out through orifices, and collides with buckets on rim Z. If now the wheel stands still, the steam passes

through the buckets into the exhausts. When the turbine wheel thus starts to turn, the steam advances with the rim and collides with steam from the opposite orifices adjusted
5 in advance of the other.

Referring to Fig. 3, it will be seen that the curve of buckets or the deepest part is somewhat on one side and on the side of which nozzle is in advance of the other. This arrangement is provided so as to permit the
10 steam to collide while it is moving in the direction of the turbine wheel. While this is taking place, the water by virtue of the rotation of the turbine wheel is forced out
15 through the openings t^2 t^3 , runs then into the water-drum D and into the circulating-pipe F, where it is cooled and sucked up into the wheel again, the wheel acting as a centrifugal pump, which facilitates this part of the
20 operation.

It is advantageous to use steam of high temperature and pressure in the steam-turbine; but when it is fully expanded its particles, by virtue of the expansion taking place in the
25 nozzles, have acquired such an enormous velocity that it is difficult to transfer its molecular energy to a turbine wheel of low speed. In my invention, however, the particles of steam are cooled as they strike the buckets,
30 and as water has more cohesion than vapor the kinetic energy of the steam will be taken up by the wheel more efficiently. It is thus evident that when the circulating water is used the exhaust must be connected to an
35 air-pump to form a complete vacuum in casing, so that no back pressure may be exerted on the front of buckets by atmosphere.

The turbine may also be used without cooling arrangement for steam, or the novel arrangement of nozzles may be applied in a
40 suitable number of circular rows from the axis out to the periphery or in combination with a water-turbine, all of which I include in the scope of my invention, and

45 I desire to secure by Letters Patent—

1. In combination with a water or steam turbine, the nozzles and exhaust-grooves al-

ternating and placed opposite each other around the periphery on each side of a turbine wheel.

2. The combination with a water or steam turbine, the casing, one or more turbine wheels with buckets fitted steam-tight therein, orifices of nozzles and exhausts alternating and placed opposite each other on both
55 sides of turbine wheel or wheels.

3. In combination with a water or steam turbine one or more turbine wheels having buckets extending radially and nozzles on each side adapted to discharge into the same
60 bucket or set of buckets.

4. In combination with a water or steam turbine, the nozzles and exhaust-grooves alternating and placed opposite each other around the periphery on each side of a turbine wheel, the nozzles adjusted to direct energy against parts of turbine wheel in such a manner that when the wheel is at a standstill the energy discharged will act independently against the wheel and exhaust but when
70 the wheel is turning at a given speed the energy discharged from opposite nozzles will collide and act componently against the wheel, substantially as described and for the purpose set forth.

5. In combination with a water or steam turbine the casing, one or more turbine wheels with buckets fitted steam-tight therein, orifices of nozzles and exhaust-grooves alternating and placed opposite each other on both
80 sides of turbine wheel or wheels in such a manner that the kinetic energy emitted from opposite nozzles will collide when wheel is turning but will exhaust when wheel is at a standstill as described and set forth in the foregoing specification.

Signed at Schenectady, in the county of Schenectady and State of New York, this 30th day of January, A. D. 1902.

JOHN H. FEDELER.

Witnesses:

E. H. CULLINGS,
EBAN R. CULLINGS.