C. W. DAKE.

TURBINE.

APPLICATION FILED APR. 13, 1912.

1,179,078. Patented Apr. 11, 1916.

Fig. 1.

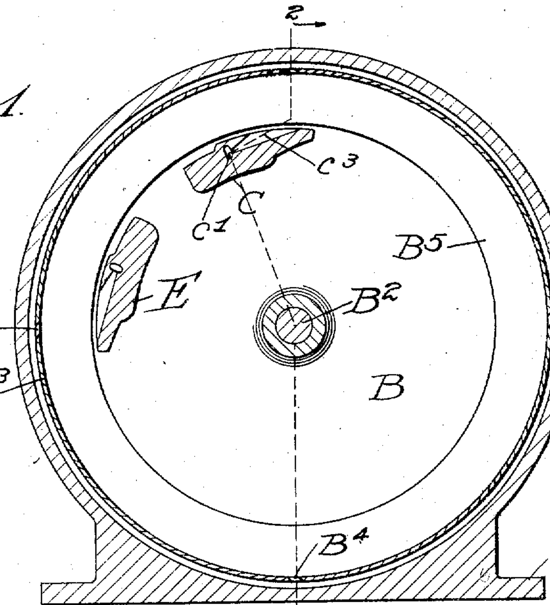


Fig. 2.

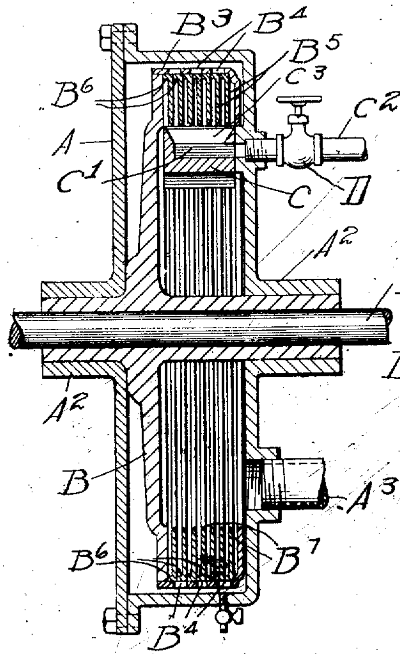
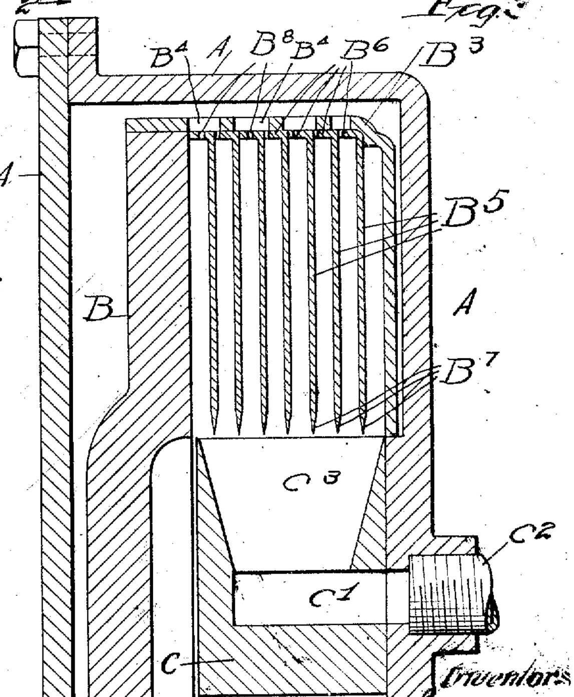


Fig. 3



Witnesses:

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UNITED STATES PATENT OFFICE.

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TURBINE.

1,179,078. Specification of Letters Patent. **Patented Apr. 11, 1916.**

Application filed April 13, 1912. Serial No. 690,594.

To all whom it may concern:

Be it known that I, Charles W. Dake, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Turbines, of which the following is a specification.

My invention relates to improvements in turbine, and is illustrated diagrammatically in one form in the accompanying drawing, wherein—

Figure 1 is a transverse section; Fig. 2 a longitudinal section along the line 2—2 of Fig. 1; Fig. 3, a detailed section on an enlarged scale along the line 2—2 of Fig. 1.

Like parts are indicated by like letters in the drawings.

The turbine case A is provided with the base A^1 which may be attached to any suitable foundation in any desired manner. The bearing sleeves A^2 A^2 are centrally disposed on opposite sides of the case A and the exhaust passage A^3 on one side thereof.

The disk B is mounted on the shaft B^2 which rotates in the sleeves A^2 A^2 and carries the annular cage B^3 which is provided with the passages B^4 B^4 inclined to the tangents at points along its periphery. The cage B^3 carries a plurality of flat annular pocket or channel disks B^5 B^5 each having the upwardly bent peripherally arranged flange B^6 to form pocket or channel bottoms and sharpened inner edges B^7 B^7. The pocket or channel disks are so arranged between the cage B^3 and the disk B that the annular flanges on the pocket disks operate as spacers and each flange presses against the adjacent disk. The flange B^6 B^6 are perforate at B^8 B^8 in opposition to the passages B^4 B^4.

The nozzle C is carried on the case A and is provided with the passage C^1 communicating with the supply pipe C^2 and discharging into the expanding delivery passage C^3 in opposition to the sharpened edges B^7 on the disks B^5 B^5 at an angle to the radius and sharply inclined to the tangent. By being sharply inclined to the tangent at the point where the stream of fluid or the line of its progress intersects the bottom of the pocket or channel, I mean only to indicate such a departure from parallelism with the radius as will be adequate and proper to induce the rotary motion of the rotor. This, of course, will differ according to design. The nozzle E, which is also supported by the casing A, is pointed in the opposite direction, but is in every other respect identical. It operates as a reversing nozzle. The supply pipe C^2, which leads to the nozzle C, is controlled by the valve D and the supply pipe which leads to the reversing nozzle E is controlled by a similar valve not shown.

It will be evident that while I have shown in my drawing an operative structure, many changes might be made in the size, shape and arrangement of the parts and in the way they are fastened together without departing materially from the spirit of my invention.

The use and operation of my invention are as follows: In starting the turbine steam is admitted through the supply pipe into the inclined expanding nozzle. As it discharges or passes through this nozzle the steam expands with an accompanying increase of velocity and is discharged into the pockets or channels between the disks. The steam is directed by the nozzle outwardly at an angle to a radius and tends to impinge upon the bottoms of the annular pockets or channels. The steam is arrested and deflected from its course by the bottoms of the pockets and banks up therein and thus the pressure of the steam in these pockets is materially increased. The inclination of the nozzle tends to cause the steam to assume a rotary or spiral motion about the axis of the rotor and the friction of the steam on the walls of the pockets causes it to carry the rotor with it. The increased pressure in the pockets adds materially to the friction of the steam and thus increases the rotational effect.

It is evident that the steam which enters the turbine at high velocity will gradually give up its velocity and impart it to the rotor and as the steam loses its velocity the centrifugal force acting upon it will decrease and thus permit its passage inwardly toward the discharge pipe. When it is desired to rotate the rotor in the opposite direction the steam is turned off from the first nozzle and turned on into the reversing nozzle and a similar result will then be had, the rotor moving in the opposite direction.

The pockets are perforated at their bottoms and the cage in which they are carried is perforated, the latter perforations for convenience being large enough to overlap and thus register with two perforations in the pocket bottoms so as to permit such water of condensation or other deposit as may be made from the fluid to escape. In the particular form which I have shown, this is important, because otherwise, under some circumstances at least, there would be a tendency of the pocket to fill with water, moisture or other substances and this might, and in some cases would, interfere with the action of the device. On the other hand, if the inlet is placed in the periphery of these pockets, their bottoms being on the inside, and if, as would be necessary in that case, the fluid should be discharged toward the axis of the rotor, such water or other deposit would be thrown out by centrifugal force.

I have illustrated and described my invention as used in connection with a turbine run by steam, but it will be quite evident that the entire apparatus is equally well adapted for use in connection with other motive fluids. Water might be used with the same result, or the hot products of combustion might be discharged from an explosion chamber, and in fact my device is particularly well adapted to use in connection with such an explosive turbine, owing to the simplicity the lack of angles and projections and the comparatively thin extended surfaces. The over-heating which, when any turbine is used in connection with burned gases, is present and disastrous, would here be of but small moment.

I thus by my arrangement provide a device in which the motive fluid is fed downwardly and toward the periphery of an annular flanged rotor wherein the elastic fluid is banked up and the pressure increased to increase the friction between the flanged rotor and the elastic fluid so as to insure that the rapidly moving current will impart its velocity to the rotor and will subsequently, as it loses its velocity, be returned back toward the axis of rotation and there discharged.

I have used the term "substantially closed" referring to the peripheral closure of the annular channels. This term I have used in view of the fact that the comparative small openings for the operation of the draining off the water are so small and the action so rapid that the escape of steam is negligible. The truth of the matter is that the steam which escapes, if at all, will be negligible and the ordinary path of the steam will be into the deep channels and thus out toward the center.

I claim:

1. In a turbine a rotor having an annular pocket in combination with means for delivering thereto through its inlet a stream of driving fluid along a line intersecting the bottom of the pocket at an angle to the radius and sharply inclined to the tangent of intersection, the bottom of said pocket perforated for the escape of the water of condensation.

2. In a turbine a rotor having an annular pocket in combination with means for delivering thereto through its inlet a stream of driving fluid along a line intersecting the bottom of the pocket at an angle to the radius and sharply inclined to the tangent of intersection and an inclosing case, the bottom of said pocket perforated for the escape of the water of condensation.

3. In a turbine a rotor having an annular pocket in combination with means for delivering thereto through its inlet a stream of driving fluid along a line interesecting the bottom of the pocket at an angle to the radius and sharply inclined to the tangent of intersection and an inclosing case provided with a fluid discharge opening leading from the pocket inlet, the bottom of said pocket perforated for the escape of the water of condensation.

4. In a turbine a rotor having an annular pocket in combination with means for delivering thereto through its inlet a stream of driving fluid along a line intersecting the bottom of the pocket at an angle to the radius and sharply inclined to the tangent of intersection and an inclosing case provided with a fluid discharge opening leading from the pocket inlet and an opening for the rotor driven part, the bottom of said pocket perforated for the escape of the water of condensation.

5. In a turbine a rotor having a series of annular pockets in combination with means for delivering thereto through their inlets a series of streams of driving fluid, one for each, along a line intersecting the bottom of the pockets at an angle to the radius and sharply inclined to the tangent of intersection, the bottoms of said pockets perforated for the escape of the water of condensation.

6. In a turbine a rotor having a series of annular pockets in combination with means for delivering thereto through their inlets a series of streams of driving fluid, one for each, along a line intersecting the bottoms of the pockets at an angle to the radius and sharply inclined to the tangent of intersection and an inclosing case, the bottoms of said pockets perforated for the escape of the water of condensation.

7. In a turbine a rotor having a series of annular pockets in combination with means for delivering thereto through their inlets a series of streams of driving fluid, one for each, along a line intersecting the bottoms of the pockets at an angle to the radius and sharply inclined to the tangent of intersection and an inclosing case provided with a

fluid discharge opening leading from the pocket inlets, the bottoms of said pockets perforated for the escape of the water of condensation.

8. In a turbine a rotor having a series of annular pockets in combination with means for delivering thereto through their inlets a series of streams of driving fluid, one for each, along a line intersecting the bottoms of the pockets at an angle to the radius and sharply inclined to the tangent of intersection and an inclosing case provided with a fluid discharge opening leading from the pocket inlets and an opening for the rotor driven part, the bottoms of said pockets perforated for the escape of the water of condensation.

9. In a turbine a rotor having a series of annular deep pockets with bottoms perforated for the escape of the water of condensation and sharp edged inlet walls in combination with means for delivering simultaneously to each pocket through its inlet a stream of driving fluid along a line intersecting the bottom at an angle to the radius and sharply inclined to the tangent of intersection, and an inclosing case provided with a fluid discharge opening leading from the pocket inlets and an opening for the rotor driven part.

10. In a turbine a rotor having a series of annular pockets with bottoms perforated for the escape of the water of condensation and sharp edged inlet walls in combination with means for delivering simultaneously to each pocket through its inlet a stream of driving fluid along a line intersecting the bottom at an angle to the radius and sharply inclined to the tangent of intersection, and an inclosing case provided with a fluid discharge opening leading from the pocket inlets and an opening for the rotor driven part.

11. In a turbine a rotor having a series of annular deep pockets with bottoms perforated for the escape of the water of condensation and sharp inlet walls in combination with means for delivering simultaneously to each pocket through its inlet a stream of driving fluid along a line intersecting the bottom at an angle to the radius and sharply inclined to the tangent of intersection, and an inclosing case provided with a fluid discharge opening leading from the pocket inlets and an opening for the rotor driven part.

12. In a turbine a rotor having a series of annular deep pockets with bottoms perforated for the escape of the water of condensation and sharp edged inlet walls in combination with means for delivering simultaneously to each pocket through its inlet a stream of driving fluid along a line intersecting the bottom at an angle to the radius and inclined to the tangent of intersection, and an inclosing case provided with a fluid discharge opening leading from the pocket inlets and an opening for the rotor driven part.

13. In a turbine a rotor having a series of annular deep pockets with bottoms perforated for the escape of the water of condensation in combination with means for delivering simultaneously to each pocket through its inlet a stream of driving fluid along a line intersecting the bottom at an angle to the radius and sharply inclined to the tangent of intersection, and an inclosing case provided with a fluid discharge opening leading from the pocket inlets and an opening for the rotor driven part.

14. A turbine comprising an annular channel, deep annular walls therefor, said channel being substantially peripherally closed, means for introducing a stream of driving fluid into said channel along a line inclined to the radius thereof and tangential to the bottom thereof.

15. A turbine comprising an annular channel, deep annular walls therefor, said channel being substantially peripherally closed, means for introducing a stream of driving fluid into said channel along a line inclined to the radius thereof and tangential to the bottom thereof and means for discharging said fluid therefrom inwardly toward the center of rotation.

16. A turbine comprising a series of annular channels substantially peripherally closed and inwardly opened, said channels being of relatively slight width compared to their depth and separated by thin annular walls, means for introducing a stream of driving fluid into said channels along the walls and in a direction inclined to the radius of the channel.

17. A turbine comprising an annular channel having laterally extended walls, said channel being substantially peripherally closed, means for discharging a motive fluid into said channel along the walls thereof in a direction inclined to the radius of the bottom wall of the channel and also to the tangent at the point of which the line of discharge intersects the bottom wall.

18. A turbine comprising an annular channel having laterally extended walls, said channel being substantially peripherally closed, means for discharging a motive fluid into said channel along the walls thereof in a direction inclined to the radius of the bottom wall of the channel and also to the tangent at the point at which the line of discharge intersects the bottom wall, the motive fluid being free to leave the channel in an inwardly direction toward the center of rotation.

19. A turbine having a rotor with an annular trough-like structure open inwardly and divided into a plurality of parallel

channels, and means for simultaneously introducing motive fluid into a plurality of said channels from the inside.

20. In a turbine, a rotor having an annular trough-like structure open inwardly, a ring within said structure dividing it into separate channels, a member inside of said structure, arranged to close a part of the open side thereof and constructed to form an expansion nozzle oblique to the radii of the rotor.

Signed at Chicago, Illinois, this 11th day of April 1912.

CHARLES W. DAKE.

Witnesses:
FRANCIS W. PARKER, Jr.,
MINNIE I. SUNDFAR.