(No Model.)

W. H. WILLEY.

IMPACT ROTARY STEAM MOTOR.

No. 530,375. Patented Dec. 4, 1894.

Fig. 1.

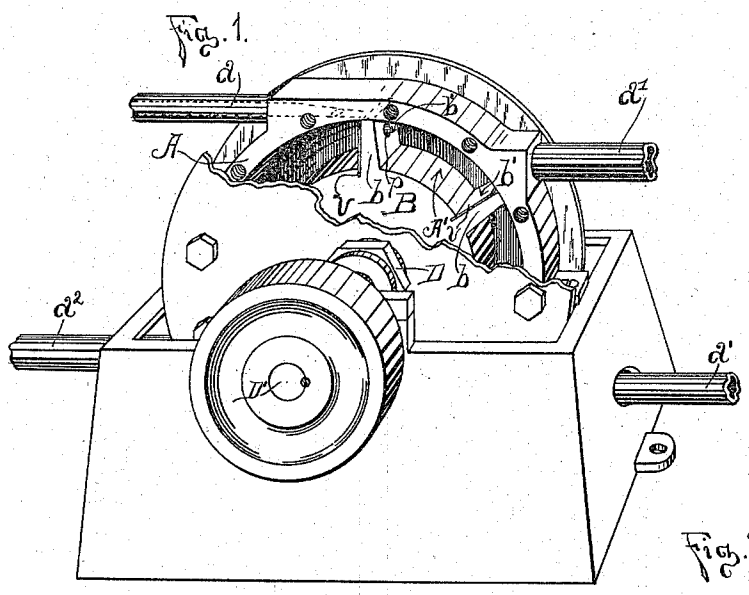


Fig. 3.

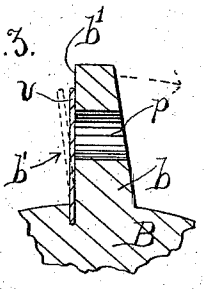


Fig. 2.

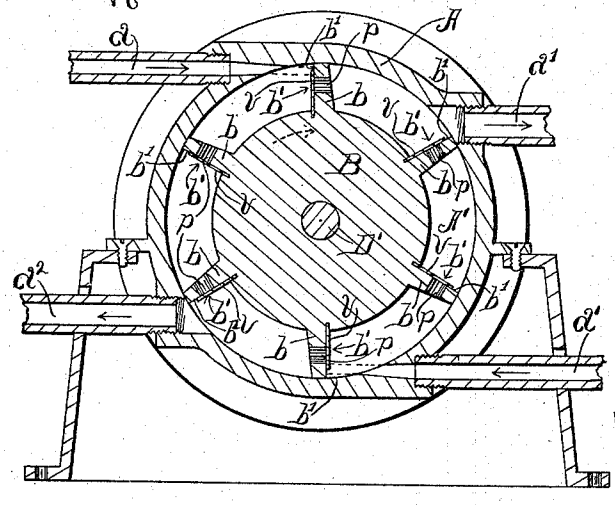
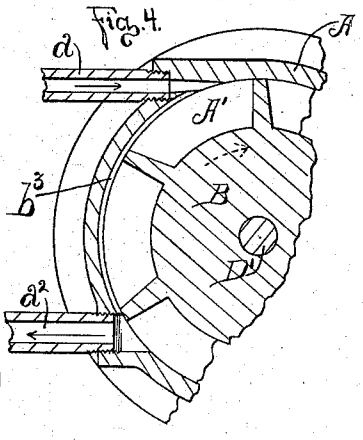


Fig. 4.



Witnesses.

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IMPACT ROTARY STEAM-MOTOR.

SPECIFICATION forming part of Letters Patent No. 530,375, dated December 4, 1894.

Application filed January 29, 1894. Serial No. 498,416. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. WILLEY, a citizen of the United States, residing at Santa Monica, in the county of Los Angeles and State of California, have invented an Impact Rotary Steam-Motor, of which the following is a specification.

My invention is more especially adapted for use with an electric dynamo, but is applicable for all purposes to which power may be applied but especially in cases where high speed can be economically employed.

The object of my invention is to provide a rotary motor which will be operated economically and practically without friction by the impact of a steam jet.

The accompanying drawings illustrate my invention.

Figure 1 is a fragmental perspective view illustrating my invention. Fig. 2 is a vertical section transverse the axis of the motor. Fig. 3 is an enlarged detail of one of the wings of the rotary motor showing the pressure relief valve. Fig. 4 is a fragmental view showing a modification of my invention, in which a relief groove b^3 is provided to allow the escape of steam pressure from the inlet to the exhaust port a^2.

My invention comprises the combination of the inclosing case A which has the circular rotary-piston chamber A′, one or more steam inlets a a' arranged substantially tangential to the circular chamber to discharge steam thereinto, a steam outlet or exhaust a' arranged substantially in line with the inward discharge or jet from the steam inlet or supply port but deflected from such line to correspond with the deflection of the steam caused by the rotation of the rotary piston within the chamber to allow, practically, the direct escape of the injected steam, so that the impact of the steam acting upon the arms or wings b of the rotary piston B will cause the rotation of such arms or wings respectively between the inlet and exhaust and the steam will be discharged freely through the exhaust with only such deflection from a right line as may be necessary to produce the best effects. The piston B provided with the piston wings b each of which has a valved port arranged to allow the escape of steam pressure in a direction opposite that of the inflowing jet of steam and the rotation of the rotary piston.

In practice it is advisable to provide the motor with two or more inlets a a' and two exhausts a' a^2 so that the steam may be applied to the piston on opposite sides of the axis thereof, thus to avoid strain upon the bearings and to double the power without increasing the expense. A further advantage is that the backward escape of steam through the valves b' finds exhaust within about one third of the circle of rotation and therefore will escape more freely than where the escape of such steam pressure would be through the exhaust a' which is arranged for the practically direct discharge of the jet of steam which is operating the rotary motor—that is to say if but one exhaust is employed the steam pressure would have to escape backward through nearly all of the valves b' and finally discharge from the discharge a' which would retard the escape of steam in starting, but by employing two exhausts a' a^2 the same may be arranged so that the back pressure will be discharged sooner than otherwise.

The wings or arms b of the rotary motor fit nicely within the circular chamber A′ so as to be practically steam tight, and the same are arranged so as to avoid any undue friction.

In the drawings I have shown a rotary piston having six wings, as I believe the same to be most advantageous, a greater number being unnecessary for two ports and two exhausts and would increase the friction, while a smaller number will not give the latitude for arrangement of the two inlet and discharge ports which I prefer. The inlet and discharge ports a a' are so arranged with relation to the rotary piston that but one wing will at any time interpose between the inlet port a and the outlet or exhaust port a'—that is to say the space between the inlet and its outlet port does not exceed the space between two wings. In case more inlet ports and exhaust ports are employed, the number of fans or wings must be proportioned to the number of ports.

The valve which I have shown comprises the valve port p and the spring valve v arranged closing against the impact face b' of the wing b, to close the port p against the

passage of steam in the direction of rotation but to allow the escape of steam in a direction opposite to that of rotation.

By my invention I am enabled to dispense with the use of movable parts which will develop friction, or which would cause the motor to become inoperative or less effective if run at a high rate of speed, and for this reason my new motor may be run advantageously connected direct to machinery which is adapted to run at a high rate of speed thus avoiding the friction and wear which is present where the engine must be geared up to give the desired speed to the machinery.

In practice the operation is as follows:—The steam is admitted through the port *a* and strikes upon the wing *b* which is between the inlet port *a* and the exhaust port *a'*. The direct escape of the steam to the exhaust *a'* is thus intercepted by the wing *b* and its valve *b'*. This tends to create a steam pressure within the space between the wing above mentioned and the one immediately back of it but the steam escapes backward through the valves in the several wings which interpose between the inlet *a* and the exhaust a^2 and thus escapes through the exhaust a^2. The impact of the steam upon the wing *b* which is in the path of the jet is thus allowed to overbalance the pressure of the steam on the wings intervening between the exhaust a^2 and the piston is thus caused to rotate in the direction of the jet and of the dotted arrow in Fig. 2. When the piston has thus begun to rotate it brings the wing which had been interposed between the inlet *a* and outlet *a'* below such outlet and thus allows the steam to escape through such outlet *a'* but in the meantime the next rearward wing has been brought into position to receive the impact of the steam jet and is operated upon the jet and is thus driven to continue the rotation of the piston. This rotation becomes more and more rapid until the inlet and discharge of the steam is practically in a right line from the inlet port *a* to the exhaust port *a'*. The escape of steam through the valves *b'* occurs only at the beginning of the operation of the motor. The rotary piston and its power transmitting connections (not shown) are to be so arranged as to allow such a rate of rotation of the piston as to prevent any pressure of steam between the wings of the rotating piston. This avoids backward escape of steam through the valves when the motor is running.

It will thus be seen that the steam ports *p* which are provided in the valves *b'* form in conjunction with each other a steam passage leading from the inlet port to the exhaust, and that when the steam discharged from the inlet port strikes upon a valve the port is thereby closed tightly and the wings which fit closely within the case between the inlet and exhaust thus intercepts all of the steam and retains the force thereof until such wing reaches the exhaust, when the steam is then free to escape in practically the same line in which it is injected into the piston chamber.

The valve spring *v* is preferably made of steel or some other flexible elastic material which will effectually close the port *p* against the impact of the steam but will allow the steam pressure to escape when the piston is being started to rotate.

In Fig. 4 I have shown a modification of the means for allowing the steam pressure to escape. This means consists of a groove b^3 which is cut in the wall of the piston chamber and extends from the inlet port *a* backward to the exhaust a^2. This groove permits escape of the steam backward to the exhaust in somewhat the same manner in which the same is permitted to escape by the valves *b'* and while I claim specifically the peculiar arrangements of the valve which I have described, I do not desire my invention to be limited to any particular means of permitting the escape of the pressure from the piston chamber when the motor is being started. While my improved motor is specially adapted for steam it is to be understood that compressed air or gas may be used to furnish the motive power to drive the motor if desired. A stuffing box D is arranged one upon each side of the case A surrounding the shaft D' of the motor to prevent the escape of steam from the cylinder chamber. But one stuffing box is shown in the drawings but it will be understood that another one is arranged upon the other side of the case.

Now having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A rotary motor comprising the inclosing case having the circular rotary piston chamber, a steam inlet arranged substantially tangential to the circular chamber to discharge steam thereinto, a steam outlet or exhaust arranged substantially in line with the inward discharge or jet from the steam inlet but deflected from such line to correspond with the deflection of the steam caused by the rotation of the piston within the chamber to allow, practically, the direct escape of the injected steam, and the rotary piston arranged in such chamber, provided with the wings arranged to fit closely in the case between the inlet and the exhaust, and provided with a relief escape passage leading backward from the inlet to the exhaust, substantially as and for the purpose set forth.

2. The rotary motor set forth comprising the case having the circular rotary piston chamber; two steam inlets arranged substantially tangential to the circular chamber to discharge steam thereinto in opposite directions and upon opposite sides thereof; two exhausts each arranged substantially in line with its respective inlet but deflected therefrom to correspond to the deflection of the steam caused by the rotation of the piston within the chamber to allow, practically, the direct escape of the steam; the rotary piston

arranged in such chamber and provided with the wings arranged to fit closely within the chamber to intercept the passage of steam between each inlet and its respective exhaust, and suitable pressure relief passages leading backward from and communicating respectively between each inlet and the exhaust of the other inlet.

3. The rotary motor set forth comprising the case having the circular rotary piston chamber; two steam inlets arranged substantially tangential to the circular chamber to discharge steam thereinto in opposite directions and upon opposite sides thereof; two exhausts each arranged substantially in line with its respective inlets but deflected therefrom to correspond to the deflection of the steam caused by the rotation of the piston within the chamber to allow, practically, the direct escape of the steam; the rotary piston arranged in such chamber and provided with the wings arranged to fit closely within the chamber, each wing being provided with a port and with a valve arranged upon the impact face of the wing and adapted to close such port by the impact of steam thereagainst.

4. A rotary steam piston comprising a case provided with a circular chamber and with a steam inlet arranged to discharge tangentially into such chamber, and provided with a rotary piston having wings adapted to fit practically steam tight in such chamber, each of such wings being provided with a relief port and a valve arranged upon the impact face of such wing to receive the impact of the steam jet and to close such port.

5. The rotary motor set forth comprising the case provided with the circular rotary piston chamber, the steam inlet arranged substantially tangential to the circular chamber to discharge steam thereinto, a steam outlet or exhaust arranged substantially in line with the inward discharge or jet from the steam inlet; the rotary piston arranged in such chamber and provided with the wings, each of such wings having a discharge port arranged to pass through the path of the discharge jet, and a spring valve arranged to be operated upon by the impact of the steam jet to close such port during the impact of the steam jet thereupon.

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Witnesses:
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