C. W. WELLMAN.

TURBINE.

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976,109.

Patented Nov. 15, 1910.

Fig. 1.

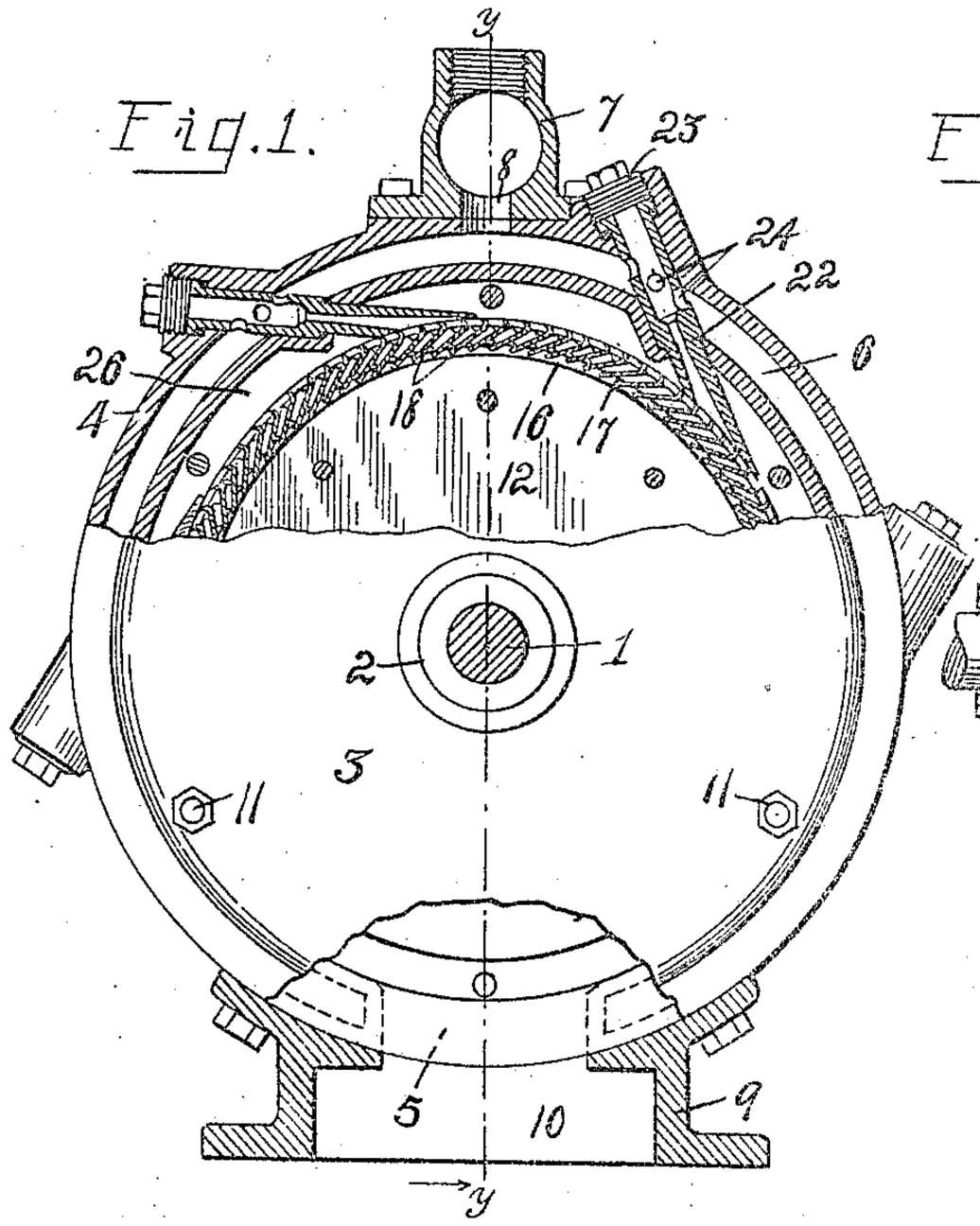

Fig. 2.

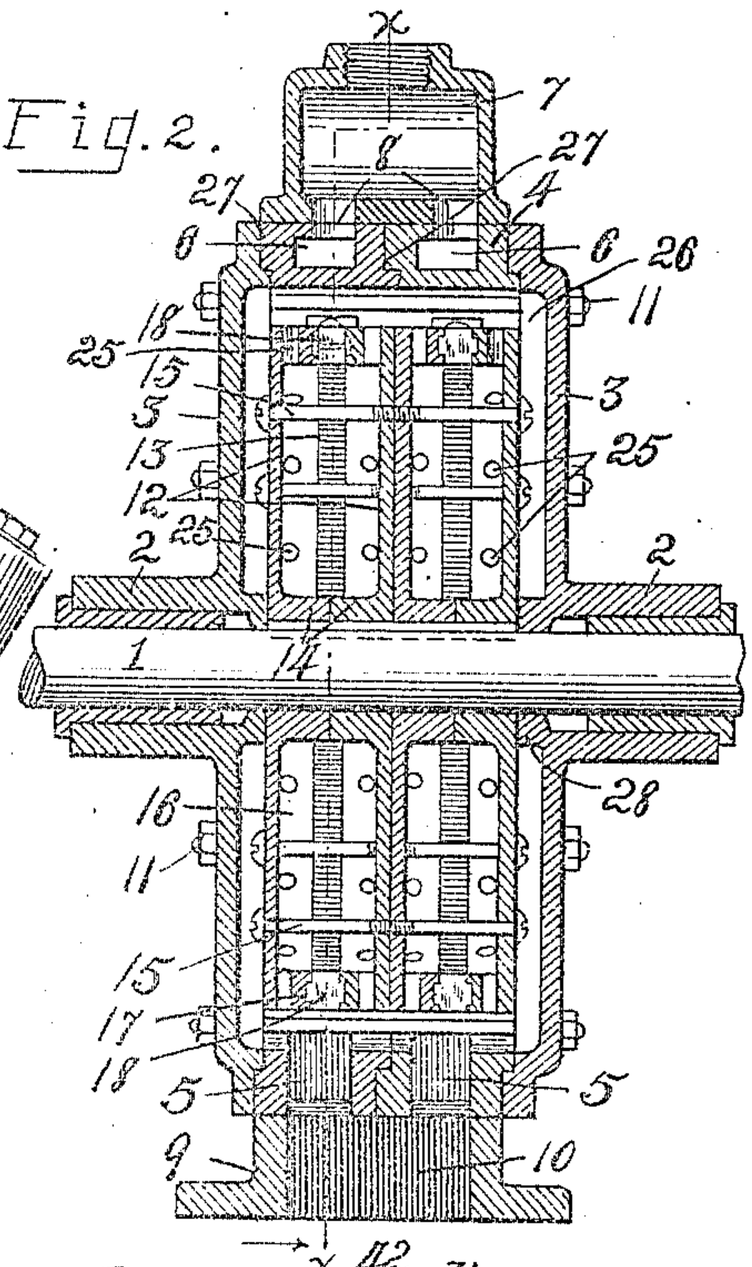

Fig. 3.

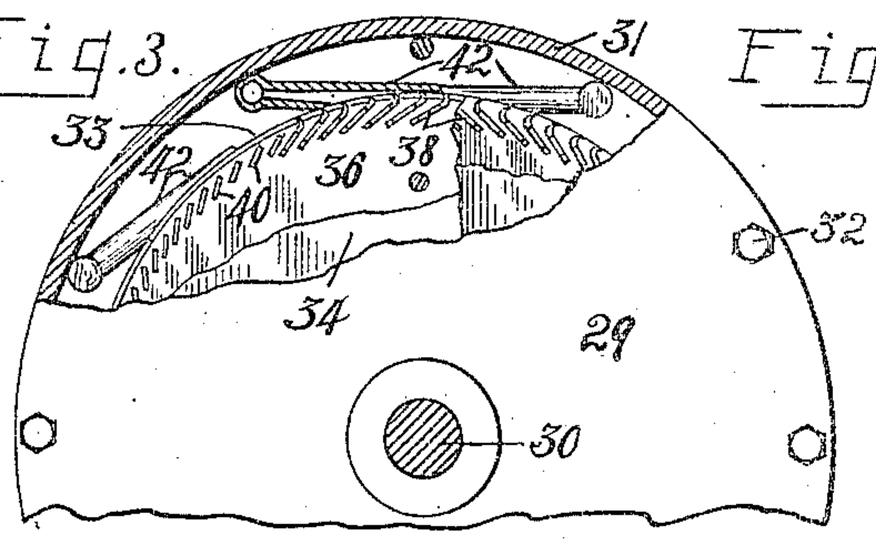

Fig. 4.

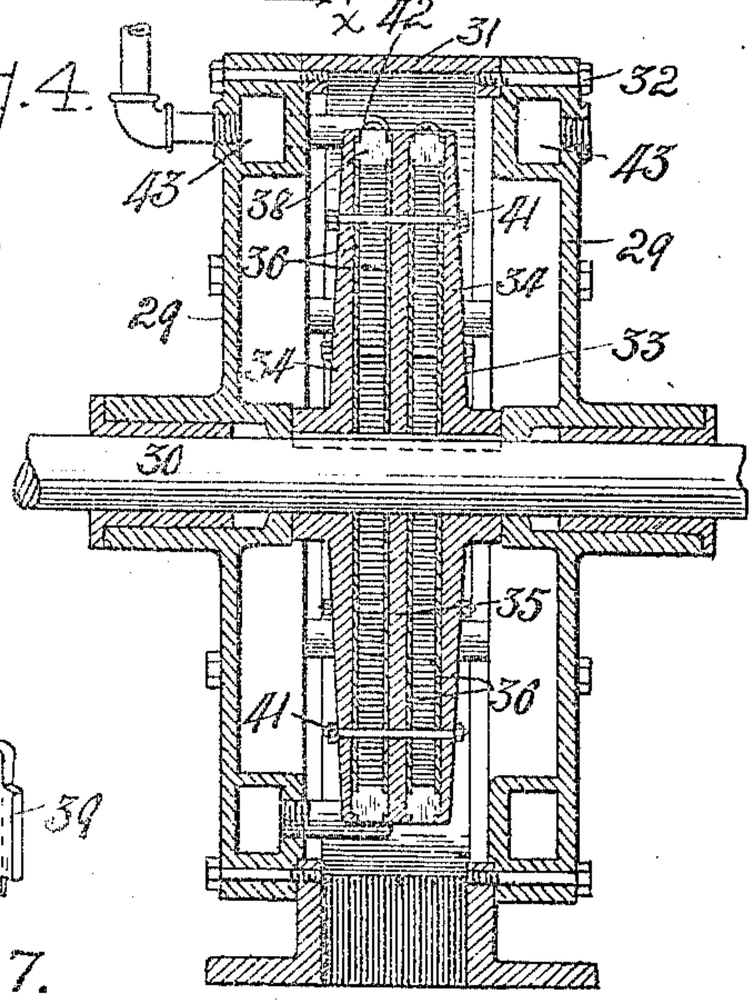

Fig. 5.

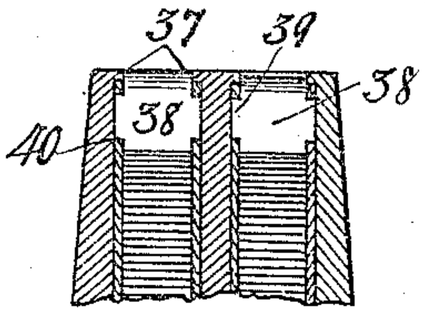

Fig. 6.

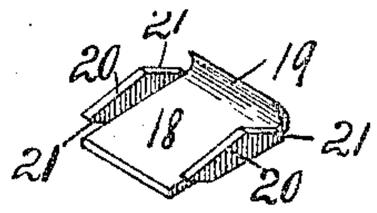

Fig. 7.

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UNITED STATES PATENT OFFICE.

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TURBINE.

976,109. Specification of Letters Patent. Patented Nov. 15, 1910.

Application filed April 2, 1909. Serial No. 487,461.

To all whom it may concern:

Be it known that I, CALVIN W. WELLMAN, a citizen of the United States, and a resident of South Boardman, in the county of Kalkaska and State of Michigan, have invented a certain new and useful Turbine; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to rotary motors or engines of the class adapted to be operated by steam, gases, water or other fluid under pressure.

The primary object of my invention is to provide a motor or engine of this class of such construction as to be thoroughly practical, of high efficiency and economy in the use of steam or other operating fluid, cheap of manufacture, and capable of being easily and quickly put together in building and readily added to for the purpose of enlarging its capacity and horsepower efficiency, and which will require less fluid for operating it per horsepower and be capable of a greater number of revolutions per minute with perfect safety than is possible with the motors now in use.

Further objects of my invention as well as the operation, construction and arrangement of the parts thereof are fully described in the following specification, and while in its broader aspect it is capable of being embodied in numerous forms, two forms of the same are illustrated in the accompanying drawings, in which,—

Figure 1 is a side elevation of my turbine with portions in section on the line *x x* in Fig. 2. Fig. 2 is a vertical cross-section on the line *y y* in Fig. 1. Fig. 3 is a side elevation of a portion of a slightly modified form of the turbine with portions of the same broken away and part of the blades removed. Fig. 4 is a central vertical cross-section of the same. Fig. 5 is an enlarged section of a portion of the rotor of such form. Fig. 6 is a perspective view of one of the blades used in Figs. 1 and 2, and Fig. 7 is a similar view of one of the blades used in Figs. 3, 4 and 5.

Referring to Figs. 1, 2 and 6 of the drawings, 1 designates the turbine shaft, which is journaled in suitably packed bearings 2, 2, provided centrally of the sides 3, 3 of the casing and has the usual rotor keyed thereto.

Secured between the rim portions of the two sides 3, 3, is a ring 4, which surrounds the rotor and is annularly cored, except at the bottom thereof where the exhaust ports 5 are located, to provide a steam or fluid chest 6, or as many of the same as is desired, substantially around the rotor. A steam head 7, having communication with a source of supply, is secured to the top of the ring 4 and has feed ports 8 opening into the annular chest or chests 6 thereof.

9 designates a pedestal support for the casing and has the exhaust passage 10 therethrough in communication with the ports 5 of the ring 4. The sides 3 and peripheral ring 4 of the casing are securely bound together by bolts 11 or in any other suitable manner.

The rotor may comprise any number of like blade-carrying parts or rotor sections, depending upon the power desired, each of which is made up of two disks 12, 12, the major portions of which are laterally spaced to form annular chambers 13 therebetween, due to their abutting hub ends being extended, as at 14, said disks being secured together by screws 15 or the like. The disks 13 have their rim portions provided with the annular inwardly projecting flanges 16, which are broadened and shown in the present instance as having their inner faces annularly grooved, as at 17, to form seats for the interposed blades 18.

The blades 18, in the construction of which a very important feature of my invention resides, are preferably stamped from sheet metal, with one end struck up substantially at right angles to the body thereof to provide a steam impinging hook or lip 19, and its sides provided with wings 20, which are bent at right angles to the blade body in the same direction as the hook 19 and project a suitable distance from the sides of the blade, due to the thickness of the metal, to seat within the grooves 17 of the disk flanges 16. The wings 20 also serve to space the successive blades from each other, being of suitable length for such purpose, and combine to completely fill the grooves 17 so that the blades are rigidly held thereby against relative lateral movements.

In positioning the blades in the grooves

17 they are placed with their body portions disposed diagonally of the grooves, the corners of the wings 20 being clipped, as at 21, for such purpose, and with the hooks 19 thereof disposed outwardly and in the same direction relative to the rotor periphery. The hooks 19 being disposed substantially at right-angles to the blade bodies and such bodies lying diagonally of the grooves 17 prevents any of the actuating steam or fluid, which is directed thereto at substantially a tangent to the rotor, from escaping outwardly, but causes it to take an inwardly disposed backward course between the blades and into the annular chamber 13 of the rotor. The lips or hooks 20 are tapered to a knife edge to assist in cutting and directing all of the steam impinging thereagainst inwardly. Should the lips 19 be bent outward slightly from the form shown so as to permit a portion of the actuating fluid to slide off such lips and escape outwardly it is found that the efficiency of the motor would be very much lessened and that it is lazy in starting.

22 designate the steam nozzles or jets which are tapped through the ring or rings 4, if a plurality be used, at substantially a tangent to the rotor periphery and have their discharge ends undercut, as shown, to provide an overhanging lip whereby a plurality of blades are exposed to the nozzle orifice at one time and the steam is prevented from escaping except through the spaces between the blades and into the central annular chamber 13 of the rotor. The nozzles have their outer ends closed by plugs 23 and receive steam from the chests 6 through perforations 24 in the walls of the nozzles.

In order for the steam which enters the chamber 13 in the rotor to find an exit therefrom it is necessary for it to pass outwardly through the spaces between the blades and the apertures 25 provided in the disk flanges 16 and into the annular space 26 surrounding the rotor within the casing, from whence it exhausts through the exhaust ports 5 and passage 10 at the bottom of the casing. It is found that the efficiency of the motor is considerably increased by causing the exhaust steam to take this course instead of having an axial exhaust from the rotor and housing.

For the purpose of enlarging or decreasing the size of the motor to change its capacity the ring 4 is composed of sections, each of which is substantially equal in width to the width of a rotor section and has its edges interlocking with the contiguous sections or with a section and edge of a side 3, as shown at 27, or in any other suitable manner. The rotor sections are also adapted to be placed side by side on the shaft. It is thus apparent that to enlarge the capacity of the motor it is only necessary to remove one of the sides 3 and place the desired shaft in abutting position and then to build out the casing by adding a number of ring sections thereto corresponding to the rotor sections added, after which the removed side is secured in position to the other casing parts by the bolts 11. When the sides are bolted together their internal hub ends 28 abut against the outer sides of the end rotors of the set and prevent lateral movements thereof on the shaft.

In Figs. 3, 4, 5 and 7, in which a slightly different form of my invention is shown, 29, 29 designate the side walls of the casing; 30 the shaft journaled therein; 31 the ring or peripheral portion of the casing which connects the sides and is secured thereto by screws 32, and 33 designates the rotor. This rotor, if two sets of blades are employed, comprises the two outer disk members 34, 34, and the interposed disk member 35, which are spaced apart and faced on their contiguous sides with disks 36 of sheet metal. The disks 36 are preferably made as large as the disks 34 and 35, except for the provision of annular flanges at the edges of said latter disks, which flanges embrace the edges of the sheet metal disks, as shown at 37 in Fig. 5. The blades 38 of the rotor are substantially the same in construction as the blades of the other form except that in lieu of the wings 20 the blades are formed with lugs or ears 39 adapted to fit into registering slots 40 (Fig. 3) in the sheet metal disks 36 and to have their ends riveted or upset to prevent withdrawal. The slots 40 are annularly arranged around the disks 36 near their edges and are diagonally disposed the same as in the form first described. The several disks composing the rotor 33 with the interposed blades are secured together by bolts 41. The only purpose of the disk members 34 and 35 is to strengthen the sheet-metal disks against the lateral pressure of steam within the rotor.

It is preferable, with both forms of blades shown, to longitudinally taper the body portions thereof from their hooked ends outwardly, as shown in Fig. 7, to make the spaces between the blades of substantially the same thickness from one end to the other thereof, as otherwise such spaces narrow from their outer ends inwardly.

42 designates the nozzles, which lead from annular chests 43 in the sides 29. In this construction the blades 36 of the two sets are shown as being reversely arranged so that when steam is ejected against one set of blades the rotor will be driven in the reverse direction to what it will when the steam is ejected against the other set.

It is apparent that I have provided a turbine of simple, cheap and light construction, and one that may be easily and quickly as-

sembled, disassembled or repaired, and which may also be readily enlarged as occasion or demand may require. It has been demonstrated with the form of blades shown and the manner of arranging them in the rotor that the rotor responds instantly to the action of the steam thereon when starting, and that the entire energy of the steam is expended on the blades due to the decided hooked form thereof.

I wish it understood that my invention is not limited to any specific construction or arrangement of the parts except in so far as such limitations are specified in the claims.

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

1. In a turbine, a rotor comprising sheet metal disks, blades secured between such disks, and reinforcing members for such disks.

2. In a turbine, a rotor comprising spaced sheet metal disks, blades secured to and spacing such disks, and strengthening members embracing the outer sides of the disks and forming the rotor hub, and means securing said parts together.

3. In a turbine, a rotor comprising spaced disk members, sheet metal facings for the inner sides of such members, and blades secured to said facings.

4. In a turbine, a rotor comprising spaced disk members, sheet metal facings for the inner sides of said members, said facings being provided with annular sets of slots, blades secured between said facings and having lugs fitting into said slots, and means for securing said parts together.

5. In a reversible turbine, a rotor comprising a center disk, end disks spaced therefrom, sheet metal facings for the contiguous sides of said disks, said facings having opposed annular rows of slots, annular sets of blades secured between the contiguous facings and having lugs secured in the slots thereof, the blades of each set being reversely arranged, and jets for directing an actuating fluid against said blades.

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

CALVIN W. WELLMAN.

Witnesses:

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