No. 883,966.

PATENTED APR. 7, 1908.

W. A. LOUDON.
TURBINE.

APPLICATION FILED DEC. 28, 1905.

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## TURBINE.

No. 883,966.

Specification of Letters Patent.

Patented April 7, 1908.

Application filed December 28, 1905. Serial No. 293,700.

To all whom it may concern:

Be it known that I, William A. Loudon, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Automatic Turbine, of which the following is a

specification.

My invention relates to turbines, which are provided on their periphery with a plurality of buckets or pockets into which pressure fluid is forced at a tangent, and the objects of my improvement are first, to automatically decrease or increase the size or area of the buckets as the speed of the turbine may require while it is in action, second, to so connect the moving parts in the buckets that they will all move in unison; third, to construct an automatically controlled turbine; fourth, to provide a governing mechanism which will be accurate in its operation, and other objects to become apparent from the description to follow.

In turbines which are in practical use at present the regulation of the speed is accomplished by throttling the steam supply while my device is governed by increasing or decreasing the capacity of the pockets into

which the jets of steam are directed.

The steam or other fluid under pressure is conducted through the ordinary nozzles into the buckets and when the turbine attains the desired speed the buckets are automatically decreased in capacity so as to retain the desired speed. It is immaterial in what manner this regulation of the area or capacity of the buckets is accomplished, and I have shown several modifications.

Another modification not shown may be made by constructing two disks or wheels adjacent to each other and provided with intermeshing teeth in such manner that by shifting the wheels with relation to each other the pockets or buckets formed between the teeth of the wheels are varied in area or 45 capacity.

To describe my invention so that others versed in the art to which it pertains can understand it sufficiently to make and use the same, I have illustrated it on the accom-

50 panying sheet of drawing in which:

Figure 1 is a fragmental cross sectional view through a turbine embodying my invention; Fig. 2 is a detail sectional view of a bucket; Fig. 3 is a similar view to Fig. 1, of a modification; Fig. 4 is a similar view of an-

other modification and Fig. 5 is a similar view of still another modification.

Similar reference characters refer to similar parts throughout the several views.

Referring to Fig. 1 and 2, the steam chest 6 60 is secured to the casing 7, within which is mounted to rotate about the shaft 8 the turbine wheel 9. The periphery of the wheel 9 is provided with a plurality of pockets 10, into which the steam from the steam chest 6 65 is discharged through the nozzles 11. Movably mounted in each pocket 10 is a piston or partition 12, secured to a pin 13 extending through a hole provided therefor in the rim of the wheel 9 which pin has on its exposed 70 end a nut 14; and interposed between said nut 14 and the rim of the wheel 9 is a spring 15, so as to normally hold the piston 12 in against the bottom of the pocket 10, thus leaving the open end of the pocket unob- 75 structed to the action of the steam from the nozzles 11.

All the springs 15 are adjusted, by turning the nuts 14, to resist the radially outward pull, caused by the centrifugal force on the 30 pistons and their connections, until a desired speed of the wheel 9 is attained. Should the wheel 9 for any reason tend to revolve faster than the desired speed the centrifugal force of the pistons will overcome the force of the 85 springs and will move radially outward in the pockets, thus partially or totally obstructing the open end of the pockets, which will act to decrease the speed of the wheel 9 because the steam from the nozzles 11 will be partially 90 or totally prevented from entering the pockets 10.

It will be understood that an intermediate position of the pistons 12 will act as a control over the wheel 9 and the full outer position of 95 said pistons would act to stop the wheel entirely, by closing the entrance to the pockets.

To prevent any possibility of the pistons 12 moving out beyond the peripheral surface of the wheel 9, I prefer to have the side 100 flanges 16 of the wheel provided with the circumferential rim 17 which will serve as a stop for the pistons.

In Fig. 3, the exposed ends of the pins 13 are shown as being pivotally connected to 105 one arm of a bell-crank lever 18 which is pivoted to the wheel 9 at 19. The other arm of the bell-crank lever 18 is pivotally secured to a floating ring 20 which is normally

pulled by a spring 21 in such direction as to 110

hold the pistons 12 down in the bottom of the

pockets 10.

In Fig. 4, the exposed ends of the pins 13 are shown as being connected to a disk 22 5 pivoted about the shaft 8 by connecting rods 23 in such manner that the turning of the disk in one direction will pull the pistons 12 in toward the bottoms of the pockets and turning the disk in an opposite direction will 10 allow the pistons to move out toward the periphery of the wheel. The disk 22 is provided with an eccentric pin 24 which is engaged by the forked arm of a bell-crank lever 25 pivoted to the wheel 9 at 26 and having 15 its other arm provided with a weight 27, so arranged that when the weight 27 swings about the pivot 26 by reason of centrifugal force as the wheel 9 rotates the bell-crank lever 25 will rotate the disk 22 in a direction 20 to permit the pistons 12 to move out toward the periphery of the wheel 9. The movement of the weight 27 is controlled by a spring 28.

In Fig. 5 the wheel 29 is provided on its 25 periphery with pockets 30 having the lids 31 which are pivoted at 32 and each is provided with an arm 33 extending through a slot provided therefor in the rim of the wheel 29. The free end of each arm 33 rests in a recess 30 34 provided in a ring 35. The ring 35 is provided with one or more pins 36 which are engaged by the slotted arm of a bell-crank lever 37 pivoted to the wheel 29 at 38 and having its other arm provided with a weight 35 39, in such manner that when the weight 39 swings about the pivot 38, by reason of the centrifugal force created by the rotation of the wheel 29, the bell-crank lever 37 will move the ring 35 so as to swing the lids 31 40 across the open end of the pockets 30 and thus decrease the size of the pockets exposed

by a spring 40. The means for automatically reducing and increasing the area of the pockets exposed to the jets of steam are capable of radical change from the constructions shown without in the least departing from the spirit of

to the blast of steam from the nozzles 11.

The movement of the weight 39 is controlled

50 the invention. Having thus fully described my invention what I claim as new and desire to secure by Letters Patent of the United States is:-

1. In a turbine, a wheel provided with 55 pockets and means for simultaneously diminishing the capacity of said pockets.

2. In a turbine, a rotatable wheel provided with a plurality of pockets and means mounted to rotate with said wheel to simultane-60 ously diminish the capacity of said pockets.

3. In a turbine, a wheel provided with numerous radial pockets and means for simultaneously diminishing the capacity of said pockets.

vided with a plurality of radial pockets and means mounted to rotate with said wheel to simultaneously diminish the capacity of said pockets.

5. In a turbine, a wheel provided with 763 pockets and means operated by centrifugal force for simultaneously diminishing the ca-

pacity of said pockets.

6. In a turbine, a rotatable wheel provided with a plurality of pockets and means 15 mounted to rotate with said wheel and operated by centrifugal force to simultaneously diminish the capacity of said pockets.

7. In a turbine, a wheel provided with numerous radial pockets and means operated so by centrifugal force for simultaneously diminishing the capacity of said pockets.

8. In a turbine, a rotatable wheel provided with a plurality of radial pockets and means operated by centrifugal force mounted to 85 rotate with said wheel to simultaneously diminish the capacity of said pockets.

9. In a turbine, a wheel provided with a plurality of pockets, pistons fitted to move in said pockets, and means for simultane- 90

ously moving said pistons.

10. In a turbine, a rotatable wheel provided with a plurality of pockets, pistons fitted to move in said pockets, and means mounted to rotate with said wheel to simul- 95 taneously move said pistons.

11. In a turbine, a wheel provided with numerous radial pockets, pistons fitted to move in said pockets, and means for simul-

taneously moving said pistons.

12. In a turbine, a rotatable wheel provided with a plurality of radial pockets, pistons fitted to move in said pockets and means mounted to rotate with said wheel to simultaneously move said pistons.

13. In a turbine, a wheel provided with pockets, pistons fitted to move in said pockets and means operated by centrifugal force for simultaneously moving said pistons.

14. In a turbine, a rotatable wheel pro- 110 vided with a plurality of pockets, pistons fitted to move in said pockets, and means mounted to rotate with said wheel and operated by centrifugal force for simultaneously moving said pistons.

15. In a turbine, a wheel provided with numerous radial pockets, pistons fitted to move in said pockets and means operated by centrifugal force for simultaneously mov-

ing said pistons.

16. In a turbine, a rotatable wheel provided with a plurality of radial pockets, pistons fitted to move in said pockets and means. operated by centrifugal force mounted to rotate with said wheel for simultaneously 125 moving said pistons.

17. In a turbine, a wheel provided with pockets and means for simultaneously diminishing the capacity of said pockets, said 4. In a turbine, a rotatable wheel pro- means comprising a disk loosely mounted 180

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concentric with said wheel and arranged to be moved by a weighted lever.

18. In a turbine, a plurality of pockets and means for simultaneously diminishing the

5 capacity of said pockets.

19. In a turbine, a wheel, a plurality of pockets, and individual means mounted in the pockets and rotating with said wheel to simultaneously change the capacity of said 10 pockets.

20. In a turbine, a wheel a plurality of radial pockets, and means responsive to centrifugal force for simultaneously diminishing

the capacity of said pockets.

21. In a turbine, a rotatable wheel, a plurality of radial pockets, and individual means mounted in the pockets and rotating with said wheel which are responsive to changes in centrifugal force for simultane-20 ously changing the capacity of said pockets.

22. In a turbine, a wheel, a plurality of pockets, and individual means operated by

centrifugal force for simultaneously diminishing the capacity of said pockets as the speed of the wheel exceeds the normal.

23. In a turbine, a rotatable wheel, a plurality of pockets, individual means mounted to rotate with said wheel, and means operated by centrifugal force for simultaneously moving all of said means to change the ca- 30 pacity of said pockets.

24. In a turbine, a wheel, a plurality of radial pockets, individual means incunted in the pockets for simultaneously changing the capacity of said pockets, and mechanism for 35 simultaneously moving said means.

In testimony whereof I have signed my name to this specification in presence of two subscribing witnesses this 9th day of December 1905, at Chicago, Illinois. WILLIAM A. LOUDON.

Witnesses:

M. H. OLSEN, R. J. JACKER.