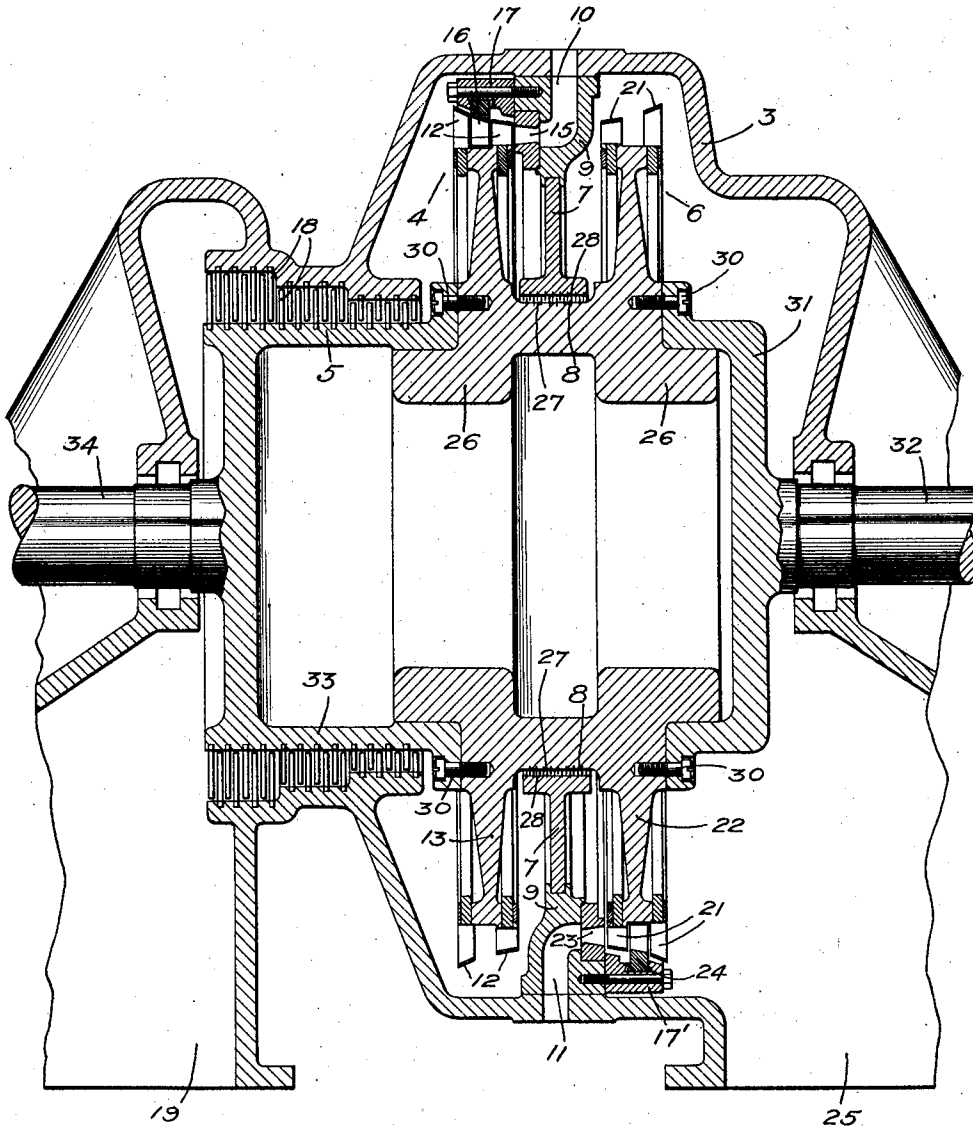


H. T. HERR.
 REVERSING TURBINE.
 APPLICATION FILED JULY 23, 1910.

1,057,055.

Patented Mar. 25, 1913.



WITNESSES:

D. P. Ferro

E. M. Callister

INVENTOR.

Herbert J. Herr.

BY

Geo. D. Green

HIS ATTORNEY IN FACT.

UNITED STATES PATENT OFFICE.

HERBERT T. HERR, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE COLONIAL TRUST COMPANY, TRUSTEE, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

REVERSING TURBINE.

1,057,055.

Specification of Letters Patent.

Patented Mar. 25, 1913.

Application filed July 23, 1910. Serial No. 573,401.

To all whom it may concern:

Be it known that I, HERBERT T. HERR, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Reversing Turbines, of which the following is a specification.

This invention relates to turbines and particularly to reversing turbines.

An object of my invention is to produce a reversing turbine provided with an improved form of rotor element which may be built up from standard parts.

A further object is to produce a turbine in which improved means are employed for balancing the longitudinal thrust on the rotor element.

These and other objects I attain by means of a turbine embodying the features herein described and illustrated.

In the drawings accompanying this application and forming a part thereof, I have illustrated, in longitudinal section, a turbine embodying my invention. A portion of the turbine casing is shown broken away for the convenience of illustration.

The turbine, illustrated as an embodiment of my invention, includes an ahead portion and a reversing portion, both of which are inclosed within a cylinder or casing 3 which, in accordance with the usual practice, is divided on a horizontal plane passing through the axis of the turbine shaft. The ahead portion of the turbine consists of a primary stage or section 4 and a secondary stage or section 5. The primary stage shown, is an impulse stage and the secondary stage is an impulse and reaction, or a so called Parsons stage. The reversing portion shown, comprises a single impulse stage 6, which is located adjacent to the impulse stage of the ahead portion.

The interior of the casing is divided by means of partitions or diaphragms 7, located between the ahead and the reverse portions, and a fluid seal 8, located between the partitions and the rotor element of the turbine. A ring section 9 is located between the ahead and reversing portions and is provided with oppositely discharging passages 10 and 11 which are adapted to deliver motive fluid to the ahead and reversing portions respec-

tively. The ring section may be formed in any convenient number of parts, and is secured to the turbine casing. Each fluid passage of the ring section communicates with a fluid port provided in the casing which in turn communicates with a source of motive fluid through suitably arranged piping, not shown.

The primary stage of the ahead portion of the turbine is provided with two annular rows of blades 12 mounted on a wheel 13 and which receive motive fluid from expansion nozzles 15 communicating with the passages 10. Each nozzle 15 is adapted to partially expand the motive fluid and to deliver it to the first row of blades 12. The motive fluid discharged from the first row of blades is re-directed by vanes 16, located between the two rows of blades 12, and is delivered to the second row of blades. The vanes 16 may be mounted, as illustrated, in a base piece 17 which is secured by bolts or any other suitable means to the ring section 9. Several vanes 16 are located opposite to each nozzle 15 and the base pieces 17 are, therefore, located around the ring section 9 in positions which correspond to the positions of the nozzles 15.

The motive fluid delivered to the initial row of blades 12 is received by the secondary stage 5. This stage consists of alternate rows of stationary and moving blades 18 mounted on the casing and rotor element respectively. The motive fluid discharged from the final row of blades 18 is conducted to the exhaust or to a condenser by an exhaust passage 19 provided in the turbine casing.

The impulse section of the reversing portion is provided with two rows of blades 21 which are mounted on a wheel 22 of the rotor element. The initial row of blades receives motive fluid from expansion nozzles 23, which communicate with the passages 11 and which expand the fluid to exhaust pressure. Vanes 24 are located between the two rows of blades 21 and are mounted on the ring section 17 in a manner similar to that described with reference to vanes 16. The motive fluid discharged from the final row of blades 21 is delivered to an exhaust passage 25 which is formed in the casing 3 and which pref-

erably communicates with the same exhaust or the same condenser as the exhaust passage 19.

The wheels 13 and 22 are formed integrally with a cylinder or quill 26 and are located on opposite sides of grooves or ridges 27 formed in the peripheral face of the quill 26. These grooves or ridges cooperate with similar grooves or ridges 28 provided on flanges of the partitions 7 to form the fluid seal 8. The quill is bi-laterally symmetrical and is adapted to be secured in any suitable manner, for example, by means of screws 30 to various rotor elements. In the drawings one end of the quill is secured to a cap 31 formed integrally with a shaft 32, and the other end is secured to a rotor element 33 on which the moving blades 18 of the secondary stage 5 are mounted. The element 33 is integrally formed with a shaft 34. It will be seen from this arrangement that the cap 31 may be replaced by a rotor element similar to the rotor element 33 and that various modifications may be made in the make up of the turbine rotor without the necessity of varying the construction of the quill 26. The shafts 32 and 34 project through suitable packings formed in the ends of the casing and are adapted to be journaled in suitable bearings located exterior to the casing.

In the turbine illustrated, the impulse sections 4 and 6 do not impart a longitudinal thrust to the turbine rotor, but the secondary stage 5 does induce a longitudinal thrust which must be counterbalanced. While the ahead portion of the turbine is receiving motive fluid, the reversing portion is exposed to exhaust pressure; consequently, I proportion the diameter of the fluid seal 8 so that the fluid pressure in the ahead portion of the turbine, acting on the quill 26 in the direction of the reversing portion, counterbalances the longitudinal thrust of the stage 5. While motive fluid is being admitted to the reversing portion of the turbine, the ahead portion is subjected to ex-

haust pressure, and consequently the turbine will be balanced, since the nozzles 23 expand the fluid to exhaust pressure and the same pressures exist on both sides of the fluid seal 8. It will be apparent that the quill 26 will be capable of balancing the rotor element under such conditions even though the reversing portion is provided with a stage or section corresponding to the stage 5 of the ahead portion. The quill 26 is, in effect, a balanced piston which is capable of balancing the pressures on the rotor element for all loads on the turbine whether the turbine is running ahead or reversing.

What I claim is:

1. A turbine rotor comprising a bi-laterally symmetrical cylinder provided with integrally formed blade-mounting elements, and interchangeable end pieces secured to said cylinder.

2. A turbine rotor comprising a bi-laterally symmetrical balance piston provided with blade mounting elements, and interchangeable elements secured to said piston.

3. A turbine rotor comprising a balance piston provided with integrally formed blade-carrying elements, and cooperating rotor elements secured to each end of said piston.

4. A turbine rotor comprising a balance piston, a blade mounting element on said piston, and rotor elements provided with integrally formed shafts secured to each end of said piston.

5. In combination in a turbine, a bi-laterally symmetrical balance piston, provided with two blade carrying wheels, a fluid seal located between said wheels, and interchangeable rotor elements secured to said piston.

In testimony whereof, I have hereunto subscribed my name this 21st day of July, 1910.

HERBERT T. HERR.

Witnesses:

C. W. MCGHEE,
JNO. S. GREEN.