

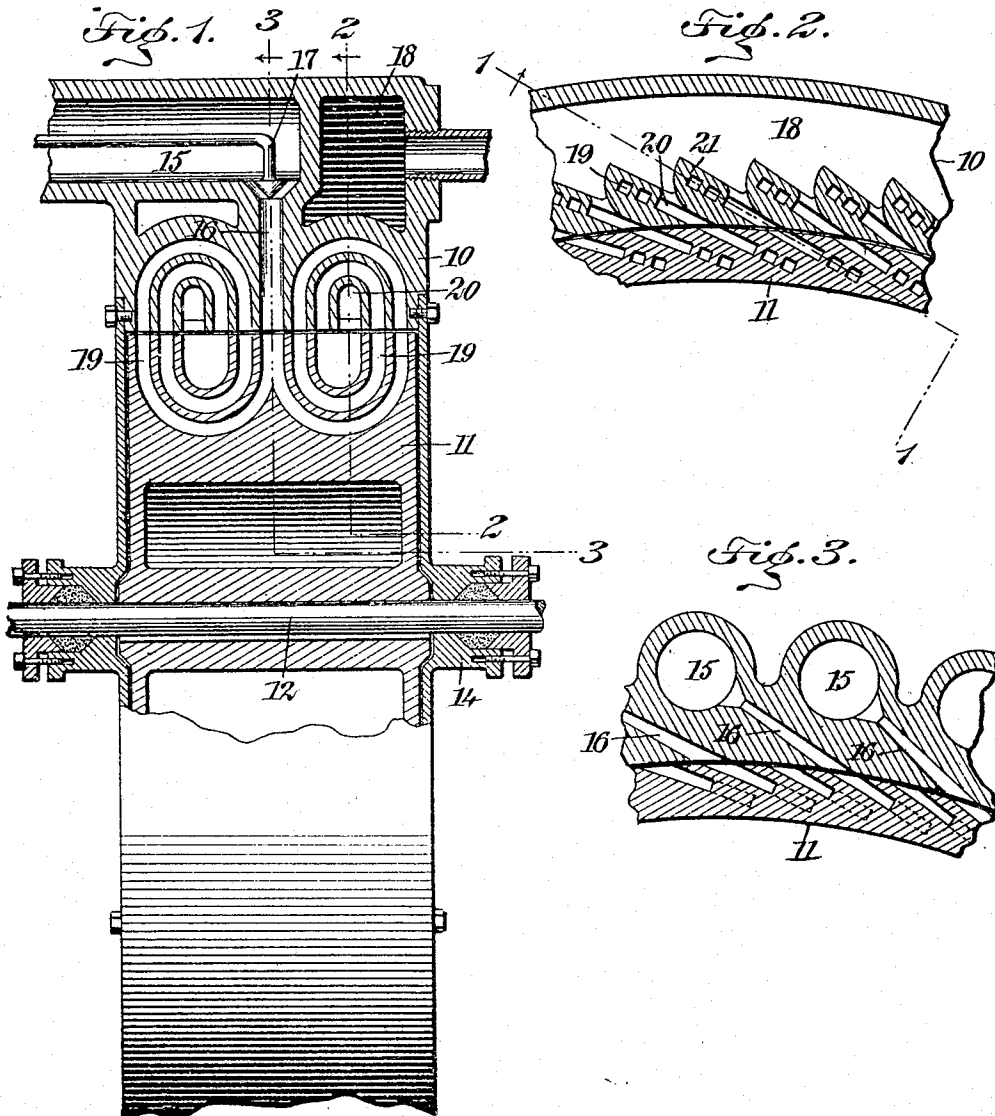
No. 839,086.

PATENTED DEC. 25, 1906.

F. B. ABBOTT.
TURBINE.

APPLICATION FILED MAR. 7, 1906.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 4.

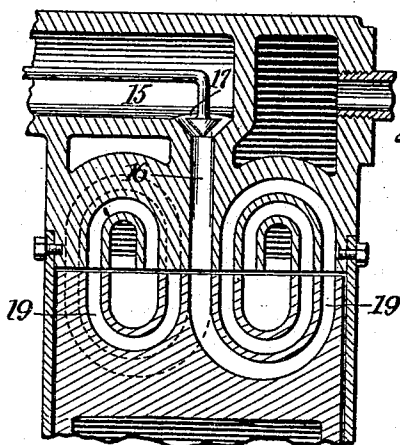


Fig. 5.

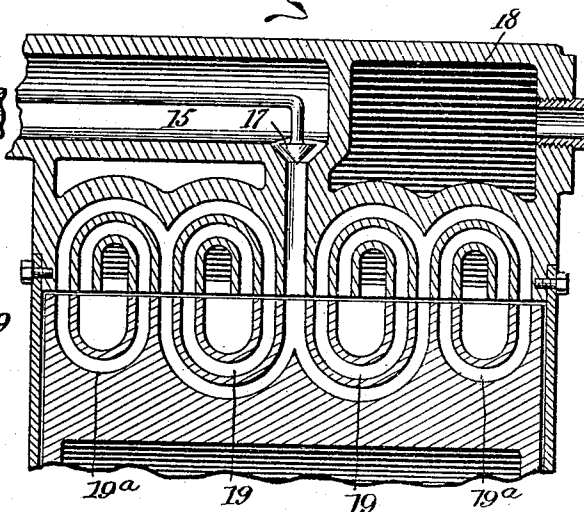


Fig. 6.

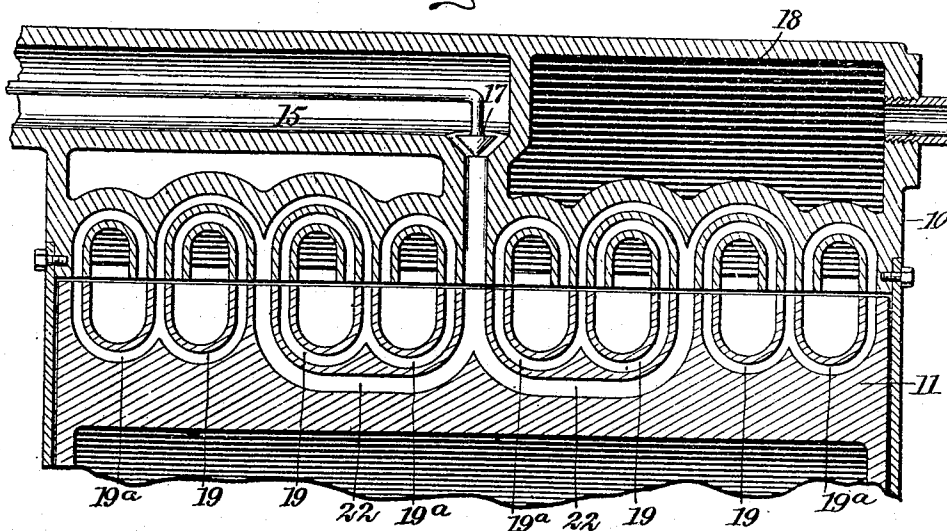
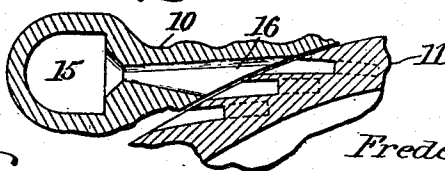


Fig. 7.



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TURBINE.

No. 839,086.

Specification of Letters Patent.

Patented Dec. 25, 1906.

Application filed March 7, 1906. Serial No. 304,707.

To all whom it may concern:

Be it known that I, FREDERICK B. ABBOTT, a citizen of the United States, and a resident of Emporia, in the county of Lyon and State of Kansas, have invented a new and Improved Turbine, of which the following is a full, clear, and exact description.

My invention relates to an impact-turbine of that particular type in which the steam or other working fluid is turned from the rotor back upon the stator and returned to the rotor again to act thereon.

The object of my invention is to increase in a turbine of the type referred to the number of impulses derived from a given body or jet of the working fluid, or, in other words, to increase the number of returns of the fluid to the rotor before the exhaust.

A further object is accurately to balance the strains on the rotor so as to avoid end thrust thereof, particularly in a turbine of the sort referred to hereinbefore.

In attaining these ends I provide the turbine with a number of groups or systems of matching curved or bending passages formed partly in the rotor and partly in the stator, the passages of each group forming, essentially, a spiral which receives the motive agent in its outer convolution and conducts it progressively through the passages to the center of the spiral, where the fluid is exhausted and which in turning and returning the fluid back through the passages of the rotor causes the fluid to exert repeated impulses thereon, the number of which is dependent upon the number of convolutions of the spiral, and to balance the thrust on the axis of the rotor I admit the working fluid intermediate its ends and so dispose the said passages of the turbine that the fluid is equally divided between the end portions of the rotor, and the thrust is therefore against itself and *nil* on the shaft of the turbine.

My invention involves various other features of major or minor importance, and all will be fully set forth hereinafter and particularly pointed out in the claims.

Reference is to be had to the accompanying drawings, which illustrate as an example the preferred embodiment of my invention, in which—

Figure 1 is a sectional view showing my improved turbine in its simple form, taken substantially on the line 1 1 of Fig. 2. Fig.

2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a section on the line 3 3 of Fig. 1. Fig. 4 is a section similar to Fig. 1, but showing a slight modification. Figs. 5 and 6 are sections showing multiple forms of the turbine, and Fig. 7 is a detail view showing the form of nozzle arranged to admit the working fluid simultaneously to two of the fluid-passages.

Referring to Figs. 1, 2, and 3, 10 indicates the stator, and 11 the rotor, the latter being carried on a shaft 12, which is, according to the form illustrated, mounted to turn in bearings 14. The rotor is cylindric in form and fits snugly against the inner walls of the stator. The stator is provided with a number of steam or other working fluid-supply passages 15, communicating with steam-nozzles 16, which nozzles are directed tangentially inward toward the rotor, as shown in Fig. 3, and are commanded by valves 17, which may be of any form desired. The stator is also provided with an exhaust-chamber 18, through which the exhaust-steam may be taken by any desired means. The turbine is formed with a number of bending, turning, or curved passages 19, which are partly in the stator and partly in the rotor and are arranged to match so as to form spirals, the outer convolutions of which, as shown in Fig. 1, register with the steam-nozzles 16, and the inner convolutions of which communicate with the exhaust-passages 20. These systems of passages extend, as shown in Figs. 2 and 3, uniformly around the turbine, and, as best shown in Fig. 2, the spirals thus formed are flat, so that steam entering the outer convolutions of the spirals exerts an impulse on the rotor and is then returned to the stator and directed back to the second convolution of the spiral against the rotor, imparting a second impulse, and, finally, the steam is a second time returned to the stator and again directed through the third convolution of the spiral against the rotor, imparting a third impulse, after which the steam is received in and exhausted through the passage 20 into the chamber 18. It will thus be seen that the steam received in the outer convolution of the passage is three times directed against the rotor, imparting three impulses during the expansion of the steam. Each of the bending or turning passages which are formed in the stator are produced in the wall 21, which constitute the inner wall of the sta-

tor, and the exhaust-passages 20 are produced in this wall between the systems of passages forming the spirals referred to.

In order effectively to balance the strains on the turbine, the steam-nozzles 16 are arranged equidistant around the circumference of the stator, as illustrated in Fig. 3, and to avoid end thrust on the shaft 12 I divide the systems of steam-passages into two circumferential groups, respectively, located at opposite sides of the position of the nozzle 16, which nozzle position is intermediate the ends of the rotor-shaft. The result is that the steam is directed half toward one end and half toward the other end of the rotor, and the pressure thus working against itself entirely relieves the rotor of the thrust common in steam-turbines. As shown in Fig. 1, the outer convolutions of the systems of passages at each side of the nozzle position run into each other and simultaneously receive the steam, which is thus equally divided between the two systems of passages thus communicating. If desired, however, the spiral systems may be arranged as in Fig. 4—that is, with the outer convolutions alternating, so that the system on one side first receives steam and then the system on the other side.

The spiral systems of passages may be multiplied in the turbine almost indefinitely. Referring, for instance, to Fig. 5, it will be seen that the turbine here illustrated involves primary systems of spirals 19 exactly similar to the systems shown in Fig. 1. In addition to these, however, secondary spiral systems 19^a are provided, one for each of the primary spirals, the outer convolutions of the secondary spirals communicating with the outer convolutions of their respective primary spirals. Fig. 6 shows a still further multiplication of the idea in which there are four primary spirals 19 arranged in pairs at each side of the nozzle position and supplied with steam through passages 22, communicating with the nozzles. Each primary system 19 has a secondary system 19^a associated therewith, and these secondary systems, like the secondary systems in Fig. 5, have their outer convolutions respectively communicating with the outer convolutions of the primary systems with which they are related. Not only may the number of spiral systems be multiplied indefinitely along the line indicated, but also the number of convolutions of the spirals may be increased or diminished at will. I deem the three convolutions illustrated in Fig. 1 preferable, thus securing three distinct impulses as the steam passes through each spiral; but this number may be changed without departing from my invention.

The nozzles 16, as shown in Fig. 3, are arranged to supply one system of passages, or one pair of systems, at a time; but, if desired, the nozzles may be enlarged to simulta-

neously communicate with two or more systems or pairs of systems, as shown in Fig. 7.

Having thus described the preferred form of my invention, what I actually claim, and desire to secure by Letters Patent, is—

1. A turbine having a stator and rotor formed with a system of bending or turning passages partly on the stator and partly on the rotor, and matching to form a spiral adapted to take the working fluid at its outer convolution and exhaust it at its center.

2. A turbine having a stator and rotor formed with a system of bending or turning passages partly on the stator and partly on the rotor, and matching to form a flat spiral adapted to take the working fluid at one end and exhaust it at the other.

3. A turbine having a stator and rotor formed with a system of bending or turning passages partly on the stator and partly on the rotor, and matching to form a flat spiral adapted to take the working fluid at its outer convolution and exhaust it at its center.

4. A turbine having a stator, a rotor provided with walls forming a number of systems of bending or turning passages partly on the stator and partly on the rotor, and matching to form spirals adapted to take the working fluid at their outer convolutions and exhaust it at their centers, the exhaust-passages of said systems extending between the walls thereof.

5. A turbine having a stator, a rotor provided with walls forming a number of systems of bending or turning passages partly on the stator and partly on the rotor, and matching to form spirals adapted to take the working fluid at their outer convolutions and exhaust it at their centers, the exhaust-passages of said systems extending between the walls thereof, and leading back into the stator.

6. A turbine having a stator, a rotor provided with walls forming a number of systems of bending or turning passages partly on the stator and partly on the rotor, and matching to form flat spirals adapted to take the working fluid at their outer convolutions and exhaust it at their centers, the exhaust-passages of said systems extending between the walls thereof.

7. A turbine having a stator, a rotor provided with walls forming a number of systems of bending or turning passages partly on the stator and partly on the rotor, and matching to form flat spirals adapted to take the working fluid at their outer convolutions and exhaust it at their centers, the exhaust-passages of said systems extending between the walls thereof and leading back into the stator.

8. A turbine having a stator and rotor, the latter being adapted to take the working fluid at a point intermediate the ends of its axis, and the turbine being formed at each side of said intermediate point with a system of

bending or turning passages partly on the stator and partly on the rotor, the passages of each system matching to form a spiral the outer convolutions of which spirals are coincident with the said intermediate point and adapted to receive thereat the working fluid, and the turbine being provided with means for exhausting the working fluid from the centers of the said spirals.

9. A turbine having a stator and rotor, the latter being adapted to take the working fluid at a point intermediate the ends of its axis, and the turbine being formed at each side of said intermediate point with a system of bending or turning passages partly on the stator and partly on the rotor, the passages of each system matching to form a flat spiral the outer convolutions of which spirals are coincident with the said intermediate point and adapted to receive thereat the working fluid, and the turbine being provided with means for exhausting the working fluid from the centers of the said spirals.

10. A turbine having a stator and rotor, the rotor being adapted to take the motive fluid at a point intermediate the ends of its axis, and the turbine being formed at each side of the said intermediate point with a system of bending or turning passages partly on the stator and partly on the rotor, the passages of each system matching to form a spiral, the outer convolutions of both of the said spirals running into each other at the said intermediate point of the rotor whereby to take the working fluid simultaneously in the outer convolutions of the spirals, and the turbine having means for exhausting the working fluid from the center of each spiral.

11. A turbine having a stator and rotor formed with a primary system of bending or turning passages partly on the stator and partly on the rotor, and matching to form a primary spiral, the turbine being also formed with a secondary system of bending or turning passages partly on the stator and partly on the rotor and matching to form a secondary spiral, the outer convolution of which is in communication with the outer convolution of the primary spiral, and both the spirals being adapted to take the working fluid at one end and exhaust it at the other.

12. A turbine having a stator and rotor formed with a primary system of bending or turning passages partly on the stator and partly on the rotor, and matching to form a primary spiral, the turbine being also formed with a secondary system of bending or turning passages partly on the stator and partly on the rotor and matching to form a secondary spiral, the outer convolution of which is in communication with the outer convolution of the primary spiral, the primary spiral receiving the working fluid in its outer convolution, and said fluid being divided between the two spirals and exhausted from the center of each.

13. A turbine having a stator and rotor formed with a primary system of bending or turning passages partly on the stator and partly on the rotor, and matching to form a flat primary spiral, the turbine being also formed with a secondary system of bending or turning passages partly on the stator and partly on the rotor and matching to form a flat secondary spiral, the outer convolution of which is in communication with the outer convolution of the primary spiral, and both the spirals being adapted to take the working fluid at one end and exhaust it at the other.

14. A turbine having a stator and rotor formed with a primary system of bending or turning passages partly on the stator and partly on the rotor, and matching to form a flat primary spiral, the turbine being also formed with a secondary system of bending or turning passages partly on the stator and partly on the rotor and matching to form a flat secondary spiral, the outer convolution of which is in communication with the outer convolution of the primary spiral, the primary spiral receiving the working fluid in its outer convolution, and said fluid being divided between the two spirals and exhausted from the center of each.

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

FREDERICK B. ABBOTT.

Witnesses:

B. W. HAGGERTY,
A. S. NEWMAN.