No. 762,454. PATENTED JUNE 14, 1904.

J. C. STURGEON.

ELASTIC FLUID TURBINE.

APPLICATION FILED MAR. 7, 1904.

NO MODEL.

Fig. 1.

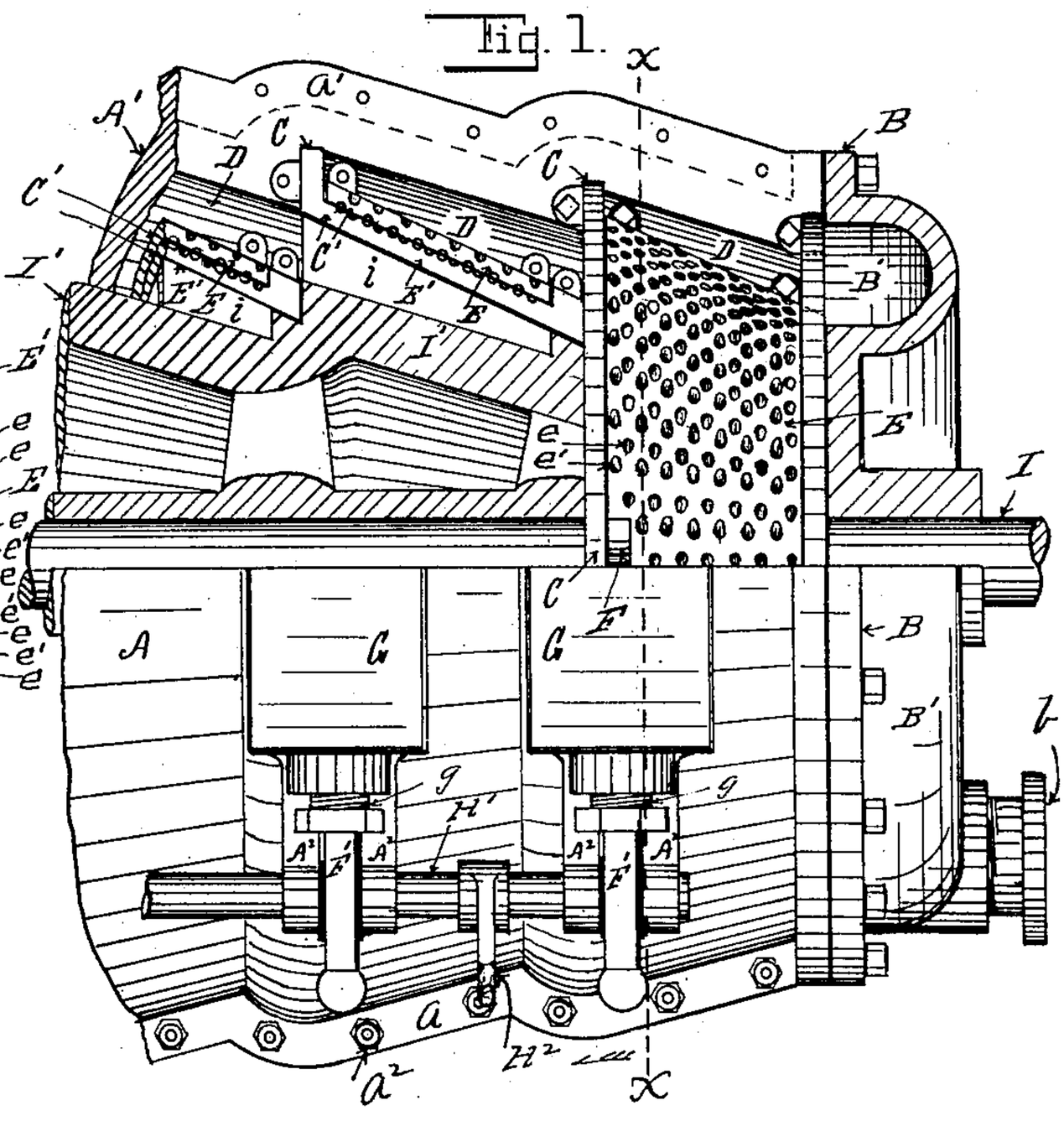


Fig. 2.

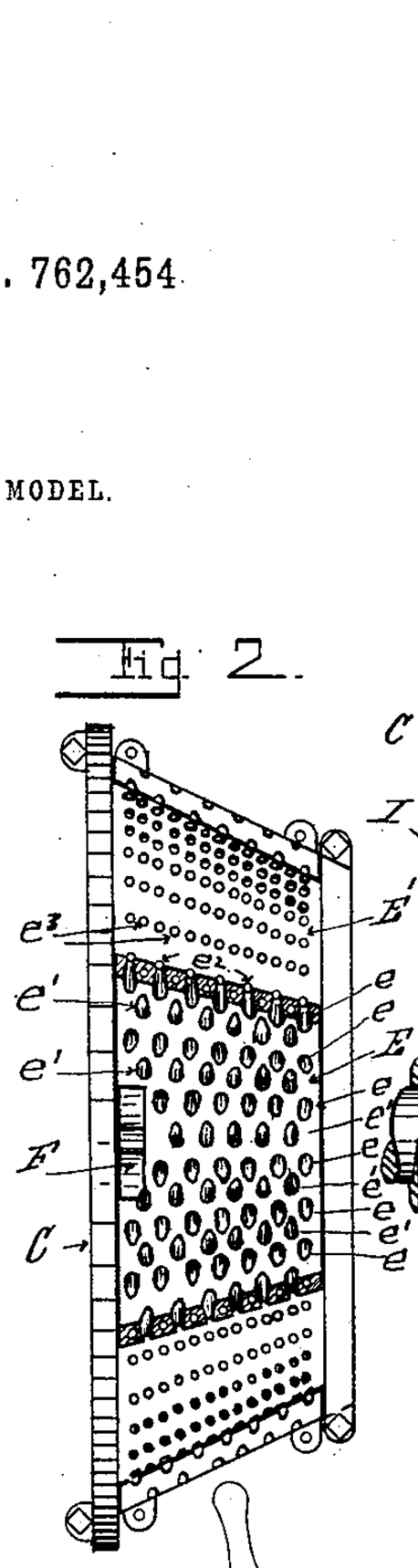


Fig. 3.

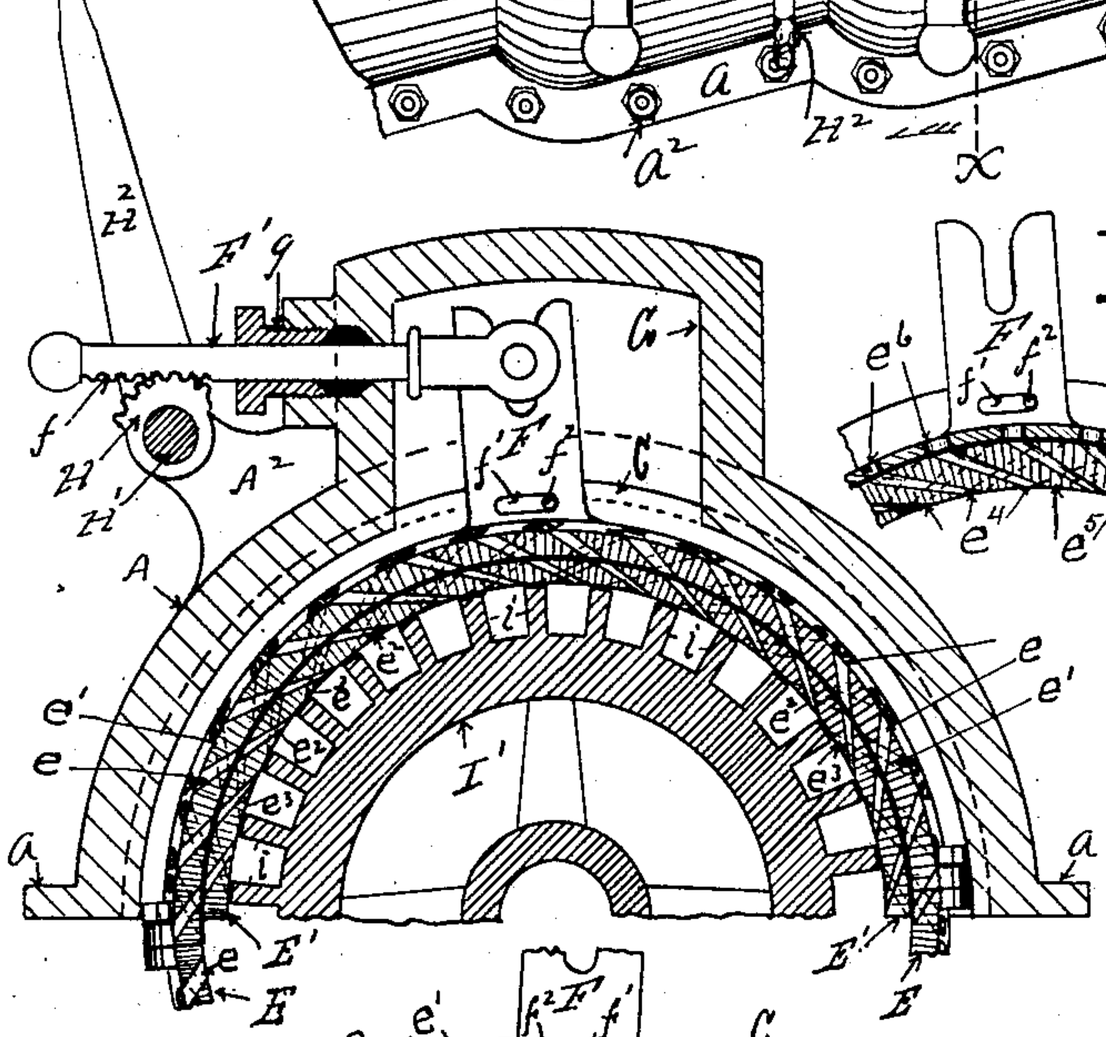


Fig. 5.

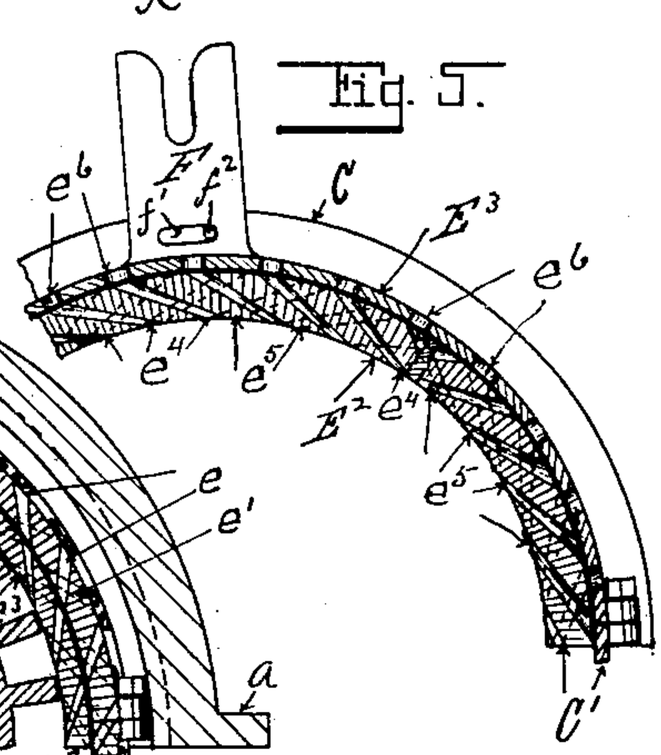
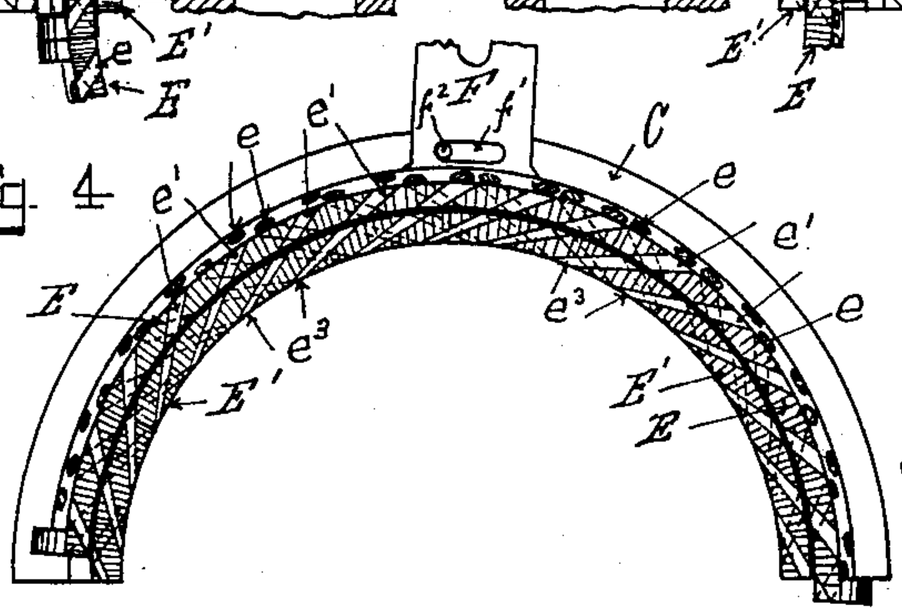


Fig. 4.



Witnesses.

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No. 762,454. Patented June 14, 1904.

UNITED STATES PATENT OFFICE.

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ELASTIC-FLUID TURBINE.

SPECIFICATION forming part of Letters Patent No. 762,454, dated June 14, 1904.

Application filed March 7, 1904. Serial No. 196,951. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. STURGEON, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Elastic-Fluid Turbine-Engines; 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 letters of reference marked thereon, forming part of this specification.

My invention relates to elastic-fluid turbine-engines; and it consists, substantially, in the construction of an elastic-fluid turbine-engine, of a shell having a series of annular chambers therein, the inner annular walls of which are formed of two annular sections, one of which is mounted and rotatable on the other. In the inner chamber-walls there are steam-jet openings adapted to discharge steam from the chambers at angles in opposition to each other and to radial lines through the axes of the annular chambers, which are hereinafter designated as "diagonal" steam-jet openings, through which steam can be alternately discharged from the chambers against rows of vanes on the periphery of a rotatable cylinder coinciding with the inner walls of the chambers in the shell. The steam-jet openings are preferably made in the outer annular sections in alternate rows of steam-jet openings, each alternate row being adapted to alternately discharge the steam from the chamber at angles in opposition to each other, and in the inner sections there are rows of diagonal steam-jet openings adapted to alternately discharge the steam at angles in opposition to each other, with which steam-jet openings the rows of steam-jet openings in the outer section can be alternately brought into coincidence, so as to make continuous steam-jet openings through both sections of the inner chamber-walls in one direction or the other, through which steam can be alternately discharged from the chambers against the cylinder-vanes in one direction or the other, according to the position occupied by the outer sections relatively to the inner sections of the inner chamber-walls, which result is accomplished by the movement for a short distance of one section of the inner chamber-walls upon the other, and thereby the direction of the discharge of the steam from the chambers against the vanes on the cylinder changed from the right to the left of a longitudinal line through the engine, or vice versa, whereby the direction of the rotation of the cylinder actuated thereby can be reversed. The steam in operating this engine enters the first chamber and is discharged therefrom against the first row of vanes on the cylinder, from which it passes into the second chamber and is again discharged, as before, this operation of the steam being consecutively repeated until it has passed into and out of one chamber after the other and finally reaches the exhaust of the engine.

In the construction of an elastic-fluid turbine-engine embodying my invention I preferably make the shell of the engine in two longitudinal half-sections adapted to be secured together and provided with a series of removable chamber-walls adapted to be secured in the shell of the engine, so as to form a series of annular chambers therein open at the ends thereof toward the steam-inlet end of the engine and closed at their opposite or rear ends. These inner and rear end chamber-walls are preferably made in semicircular sections, which when secured together at their ends form complete annular end and inner walls therefor. The inner chamber-walls, however, I make of two annular sections, one of which, preferably the outer one, is adapted to be rotated on the other. In these inner chamber wall-sections I make diagonal steam-jet openings adapted to alternately discharge steam from the chambers at angles in opposition to each other, and the steam-jet openings in one section are so located relatively to the steam-jet openings in the other section that steam can only be discharged through the openings coincident with each other in both sections in one direction at a time, the openings in the opposite direction being then cut off. When,

however, one section is rotated on the other a short distance, the openings in both sections discharging in the opposite direction are brought into coincidence and the openings in the opposite direction cut off, so that the steam is discharged from the chamber in the opposite direction, whereby the direction of the rotation of the cylinder driven thereby is reversed. I also provide mechanism connected with the chamber inner wall-sections in each chamber of the series, whereby the chamber-wall sections of all the series of chambers can be simultaneously rotated to the right or left to reverse the direction of the steam discharge from all the chambers.

The features of my invention are hereinafter fully set forth and described, and illustrated in the accompanying drawings, in which—

Figure 1 shows a section of an elastic-fluid turbine-engine, partially in elevation and partially in section, embodying my invention; Fig. 2, a view, partially in elevation and partially in section, of one of the chamber inner walls. Fig. 3 shows a transverse section of the engine on the line $x\ x$ in Fig. 1. Fig. 4 shows another transverse section of the chamber inner walls. Fig. 5 shows an alternate construction of the chamber inner walls.

In the drawings illustrating my invention the shell of the engine is preferably made in two half-sections A A′, provided with longitudinal flanges $a\ a'$, adapted to be bolted together by means of bolts a^2 and adapted to be secured to a base. (Not shown.) On the steam-inlet end of the shell there is a head B, provided with a steam-chamber B′ and a steam-inlet b. In the shell A A′, I secure walls C C′, which form the rear end and inner annular walls of a series of annular chambers D. The inner walls C′ of these chambers I make of annular sections E and E′, as is clearly shown in all of the figures, one of which sections, preferably the section E, is adapted to be rotated upon the other section, E′, as clearly shown in Figs. 3, 4, 5. In the outer section E, I preferably make two series of diagonal steam-jet openings e and e', the openings e being in one direction and the openings e' in the other direction, and in the section E′, I make diagonal steam-jet openings e^2 and e^3, the openings e^2 being in the same direction as the openings e in the section E, which openings e are so arranged therein with relation to the openings e' therein and to the openings e^2 in the section E′ that the rotation of one section, preferably E, upon the section E′ will bring the openings e therein and e^2 in the section E′ into coincidence with each other, as illustrated in Figs. 2 and 3, and at the same time cut off the openings e' and e^3 in said sections, as illustrated in Fig. 2 and by full and dotted lines in Fig. 3. The openings e' are also so arranged in the section E with relation to the openings e therein and to the openings e^3 in the section E′ that the further rotation of the section E or the rotation thereof in the opposite direction will bring the openings e' therein and the openings e^3 in the section E′ into coincidence with each other, as illustrated in Fig. 3, and at the same time cut off the openings e and e^2 in said sections, as illustrated by full and dotted lines in Fig. 4.

In Fig. 5 I show a modified construction of the chamber inner wall C′, in which I make diagonal steam-jet openings e^4 and e^5 in the inner section E^2 thereof in both directions, preferably staggered, as shown in full and dotted lines in Fig. 5, and in the outer section E^3 thereof I preferably make openings e^6, whereby when the outer section E^3 is rotated upon the inner section E^2 alternate ones of the openings e^6 are brought into coincidence with either the diagonal steam-jet openings e^4 or e^5, as desired, whereby the direction of the discharge of steam from the chambers D against the vanes on the cylinder is reversed, as desired. I can therefore use either type of construction herein described with substantially like results.

For rotating the sections E′ or E^3, I preferably provide the sections E or E^3 with arms F, which extend upward into pockets G in the shell-section A, as illustrated in Figs. 1 and 3, and connected with each arm F there is a rod F′, which extends out through a stuffing-box g and is provided with a rack f, engaging a pinion H on a shaft H′, mounted in bearings A^2 on the shell-section A. The shaft H′ is preferably provided with a lever H^2, whereby all of the chamber wall-sections E or E^3 can be rotated in unison. For limiting the movement of the sections E or E^3 upon the sections E′ E^2, I have provided a slot f' in the arm F, through which a stud f^2 passes into the radial portion C of the sections E′ or E^2, this feature being clearly shown in Figs. 3, 4, and 5.

On a shaft I, I mount a rotatable cylinder I′ concentrically with the inner sections E′ or E^2 of the inner chamber-walls C′ of the annular chambers D, and on the periphery of the cylinder I′, I provide a row of vanes i, coinciding with and adjacent to each chamber inner wall C′. It will readily be seen that with the diagonal steam-jet openings e e^2 in coincidence, as illustrated in Fig. 3, or e^6 and e^4 in Fig. 5, the steam will be discharged from the chambers D against the cylinder-vanes i, so as to rotate the cylinder I′ in one direction, while with the diagonal steam-jet openings e' e^3 in coincidence, as illustrated in Fig. 4, or e^6 and e^5 in Fig. 5, the steam will be discharged from the chambers D against the cylinder-vanes i, so as to rotate the cylinder I′ in the opposite or reverse direction.

I have shown a convenient construction of the chamber inner walls C′ and arrangements of the diagonal steam-jet openings in the sections thereof convenient for utilizing my invention. I am aware, however, that the con-

struction thereof and the arrangement of the steam-jet openings therein may be considerably modified and varied without departing from the spirit of my invention.

Therefore I do not confine myself to the particular constructions thereof herein shown and described, as what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an elastic-fluid turbine-engine of substantially the character described, a chamber inner wall having diagonal steam-jet openings therein in opposing directions, and consisting substantially of two annular sections one imposed and movable upon the other, the steam-jet openings being so located in said sections that one section can be moved upon the other so as to open the steam-jet openings in the chamber inner wall in one direction or the other, and at the same time cut off the steam-jet openings therethrough in the opposite direction, substantially as set forth.

2. In an elastic-fluid turbine-engine of substantially the character described, the combination in a chamber inner wall, of an annular section secured in the engine-shell having diagonal steam-jet openings therein at angles of direction in opposition, and an annular section mounted on the fixed section having steam-jet openings therein and adapted to be moved on the fixed section so as to alternately open the diagonal steam-jet openings having one angle of direction in the fixed section, and at the same time to cut off the diagonal steam-jet openings of the opposite angle of direction therein, substantially as set forth.

3. In an elastic-fluid turbine-engine of substantially the character described, the combination in the chamber inner walls of the engine, of annular sections secured in the engine-shell having diagonal steam-jet openings therein, the angles of direction of which are alternately in opposition, and annular chamber inner wall-sections mounted and movable upon the fixed chamber inner wall-sections having steam-jet openings therein adapted to be moved on the fixed section so as to alternately open the diagonal steam-jet openings having one angle of direction in the fixed sections, and at the same time to cut off the diagonal steam-jet openings at the opposite angle of direction therein, substantially as set forth.

4. In an elastic-fluid turbine-engine of substantially the character described, a chamber inner wall having diagonal steam-jet openings therein at angles of direction in opposition to each other, said walls consisting substantially of annular sections, one imposed and movable upon the other, the steam-jet openings in which sections are so relatively arranged, that the movement of one section thereof upon the other, operates to bring the steam-jet openings at one angle of direction in said sections, into coincidence, and at the same time cut off the steam-jet openings at the opposite angle of direction in said sections, substantially as and for the purpose set forth.

5. In an elastic-fluid turbine-engine of substantially the character described, a series of chamber inner walls having diagonal steam-jet openings therein at angles of direction alternately in opposition to each other, said walls consisting substantially of annular sections, one imposed and movable upon the other, the steam-jet openings in which are so relatively arranged, that the movement of one section thereof upon the other, operates to bring the steam-jet openings in said sections at one angle of direction into coincidence, and at the same time cut off the steam-jet openings in said sections at the opposite angle of direction, and means for moving one section of said chamber inner walls upon the other, substantially as set forth.

6. In an elastic-fluid turbine-engine of substantially the character described, a series of chamber inner walls having diagonal steam-jet openings alternately at angles of direction in opposition to each other, said inner walls consisting substantially of annular sections secured in the engine-shell and annular sections superimposed and rotatable upon said fixed sections, said fixed sections having diagonal steam-jet openings alternately at opposing angles of direction, and said rotatable sections also having diagonal steam-jet openings alternately at opposing angles of direction, and means for rotating said movable sections upon said fixed sections, whereby the steam-jet openings at one angle of direction may be brought into coincidence and at the same time the steam-jet openings at the opposite angle of direction may be cut off, substantially as set forth.

7. In an elastic-fluid turbine-engine of substantially the character described, a series of chamber inner walls having diagonal steam-jet openings therein at angles of direction alternately in opposition to each other, said inner chamber-walls consisting substantially of annular fixed sections and movable sections mounted thereon, the steam-jet openings in which sections are so arranged with relation to each other that the movable sections can be rotated upon the fixed sections so as to bring the steam-jet openings at one angle of direction therein, into coincidence and at the same time cut off the steam-jet openings at the opposite angle of direction therein, and means for simultaneously rotating the movable sections of all the chamber inner walls of the engine, substantially as set forth.

8. The combination in an elastic-fluid turbine-engine of substantially the character described, of a series of walls secured in the engine-shell so as to form sections of the inner walls of a series of annular chambers in the engine-shell said fixed wall-sections being provided with diagonal steam-jet openings alternately at angles of direction in opposition to

each other, movable walls forming the other sections of said walls mounted and rotatable annularly upon the fixed sections so as to form the other sections of said chamber inner walls, steam-jet openings in said rotatable chamber wall-sections so arranged relatively to each other and to the steam-jet openings in the fixed wall-sections, that the removable wall-sections can be rotated upon the fixed sections, so the steam-jet openings in the rotatable section will coincide with the steam-jet openings in the fixed section of one angle of direction, and cut off the steam-jet openings therein of the other angle of direction, and mechanism engaging said movable sections whereby they can be simultaneously rotated, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN C. STURGEON.

Witnesses:
H. M. STURGEON,
G. J. MEAD.