G. H. COOK.

TURBINE.

APPLICATION FILED FEB. 23, 1909.

923,947.

Patented June 8, 1909.

2 SHEETS—SHEET 1.

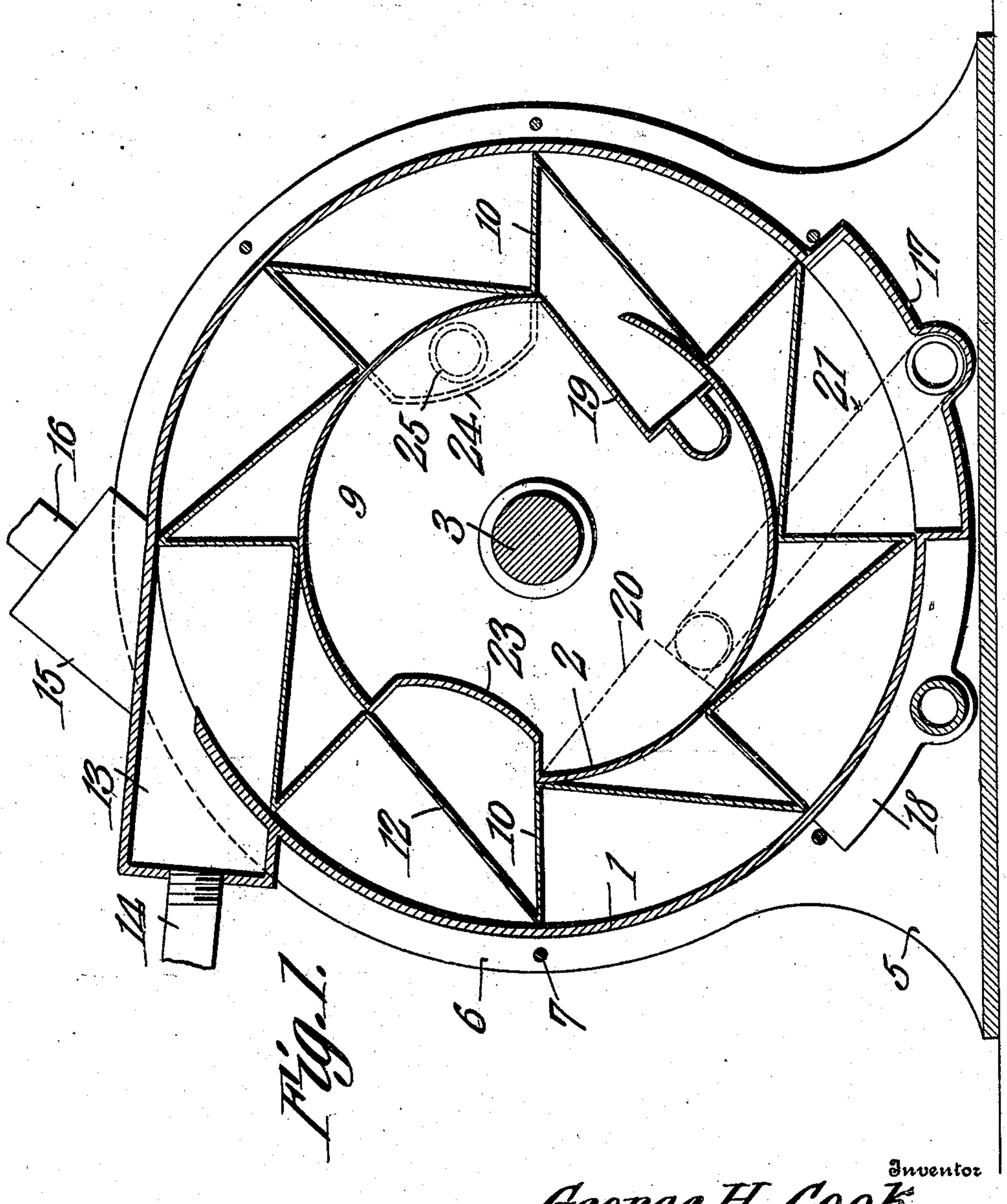

Fig. 1.

Witnesses

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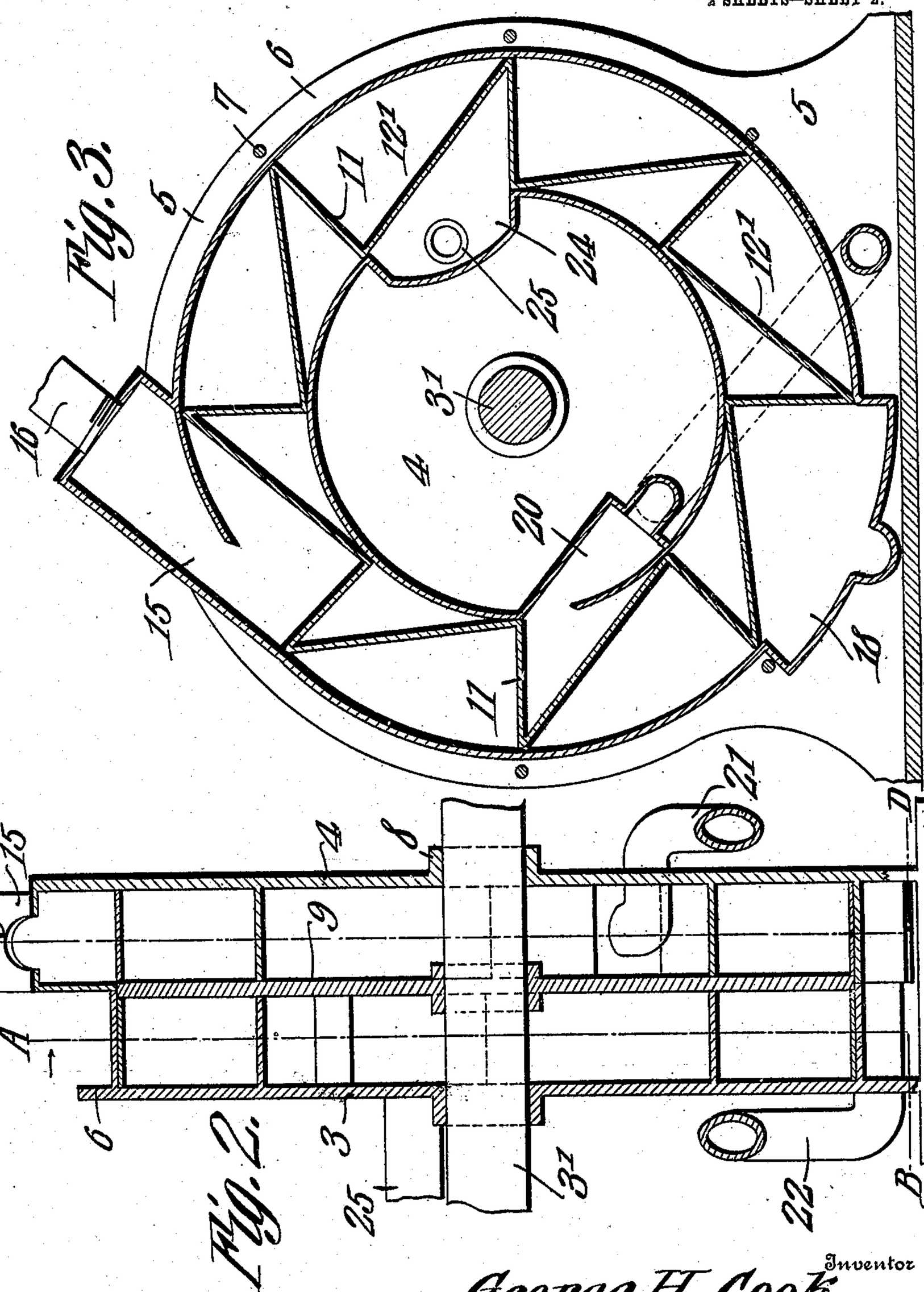

Witnesses

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UNITED STATES PATENT OFFICE.

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TURBINE.

No. 923,947. Specification of Letters Patent. Patented June 8, 1909.

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To all whom it may concern:

Be it known that I, GEORGE H. COOK, a citizen of the United States, residing at Quincy, in the county of Branch and State of Michigan, have invented a new and useful Turbine-Engine, of which the following is a specification.

This invention has reference to improvements in turbine engines and is designed to provide an engine the buckets of which may be acted upon in opposite directions to cause a reversal of the direction of rotation, and also to provide means whereby steam after acting on one series of buckets is carried to a position to act upon the corresponding other face of an oppositely disposed series of buckets so that the second action of the steam is in the same direction, rotationally, as the first action thereof.

In accordance with the present invention, the rotor is provided on opposite sides of a central web with buckets composed of radial blades with the outer end of one blade connected to the base of the next blade in order by an inclined diaphragm, thereby constituting substantially triangular pockets, the inclination of the diaphragm being in opposite directions on the two sides of the central web. Each series of pockets runs between two concentric rings, one being exterior to the series of pockets and the other interior thereto, while suitable inlet and outlet ports are provided, the outlet or exhaust port on one side being connected to the inlet port on the other side.

The invention will be best understood from the following detail description taken in connection with the accompanying drawings forming a part of this specification in which drawings:—

Figure 1 is a section of the turbine engine on the line A—B of Fig. 2. Fig. 2 is a vertical axial section of the engine. Fig. 3 is a section of the engine on the line C—D of Fig. 2.

Referring to the drawings there is shown a stator composed of substantially cylindrical inner and outer casings 1 and 2 concentric with a shaft 3′ constituting the engine shaft. These casing members 1 and 2 are formed on end plates 3 and 4, respectively, which end plates are mounted on a suitable base 5. The outer casings 1 are each provided with a peripheral flange 6 so that the end members 3 and 4 may be secured together by suitable bolts 7. The shaft 3′ is provided with bearings 8 in the end plates 3 and 4. Mounted on the shaft 3′ between the members 3 and 4 is a web or diaphragm 9 extending between the casing members 2 and terminating at the inner periphery of the casing members 1.

On the diaphragm 9 on one side thereof in the zone between the casing members 1 and 2 is a series of equally spaced radial blades 10, and on the other side of the diaphragm within the zone between the corresponding casing members 1 and 2 is another like series of radial blades 11. The blades 10 are connected by diaphragms 12 extending from the outer end of one blade to the inner end of the next succeeding blade, considering these blades successively in clockwise direction as viewed in Fig. 1, while the blades 11 are connected by diaphragms 12′ extending from the outer end of one blade to the inner end of the next succeeding blade, considering these blades as succeeding each other in a counterclockwise direction as viewed in Fig. 1.

The blades 10 and 11 are of such radial extent as to make steam tight connection with the inner walls of the space between the casing members 1 and 2, this space constituting the steam course of the engine on each side of the web 9, and the construction is such that in each course there are two series of pockets, one being in the casing member 1, and the other in the casing member 2.

Entering the steam course on one side of the web 9 is a steam-receiving chamber 13 into which discharges a steam supply pipe 14, and while not shown it will be understood that suitable regulating means are provided in the pipe 14. Steam from the chamber 13 strikes the active faces of the blades 10 of the outer series of pockets on the same side of the web 9 as is the chamber 13, while entering the other steam course in the opposite direction to that of the first mentioned side of the web 9 is a steam chamber 15 the steam from which engages the active faces of the blades 11 in a direction opposite to that at which the steam from the chamber 13 engages the blades 10. Steam entering through the chamber 13 will cause a rotary movement of the rotor in a clockwise direction as viewed in Fig. 1, while the steam entering through the chamber 15, will cause the movement of the rotor in a counterclockwise direction viewed in Fig. 1. Provision is thus made for

the reversal of the rotor at the will of the operator. It will be understood, however, that steam is supplied to only one of the chambers 13 and 15 at any one time.

At points remote from the chambers 13 and 15 are exhaust-receiving chambers 17 and 18, respectively, the exhaust chamber 17 being adapted to receive steam from the pockets supplied by the chamber 13, while the exhaust chamber 18 receives steam from the pocket supplied by the chamber 15.

Entering the steam course at one side of the web 9 through the casing member 2 is a steam chamber 19 and opening into the steam course through the casing member 2 on the other side of the web 9 is still another steam chamber 20.

It will be seen that steam entering through the chamber 20 will engage the corresponding other sides of the blades 11 from those which entering through the chamber 13 will engage with respect to the blades 10 and consequently steam entering through the chamber 20 will tend to drive the rotor in the same direction as steam entering through the chamber 13. The same is true of the chambers 15 and 19. The exhaust chamber 17 is connected by a conduit 21 with the chamber 20 and the exhaust chamber 18 is connected by a conduit 22 with the chamber 19.

The inner series of the pockets are provided with respective exhaust chambers 23 and 24 opening through the respective inner casing members 2 and from these chambers there lead suitable exhaust conduits 25 for the proper disposition of the exhaust steam.

Suppose that steam is entering through the chamber 13 it will engage one face of a blade 10 and tend to rotate the rotor clockwise and as the successive blades 10 are brought into engagement with the chamber 13 a series of impulses are thus imparted to the rotor. Ultimately the pockets formed between the active faces of the blades 10 and diaphragms 12 and the outer casing member 1 are brought to the exhaust chamber 17 and at this point the steam in said chamber is carried by the conduit 21 to the chamber 20 and then the steam is directed against the face of the blade 11 presented in the inner series of pockets on the side of the web 9 remote from the first named pockets. The direction of the impact from the chamber 20 against the blades 11 is the same as the direction of the impact from the chamber 13 against the blades 10. It is therefore evident that the steam acts upon both sides of the web 9, but in one case the outer series of pockets are effective and in the other case the inner series of pockets are effective. Finally the steam acting on the blades 11 through the inner series of pockets escapes into the chamber 24 and out through the exhaust pipe 25. When steam is cut off from the chamber 13 and is allowed to enter through the chamber 15 then the direction of rotation of the rotor is reversed and the steam is finally exhausted through the exhaust chamber 23.

The showing of the drawings is to be taken as illustrative of the invention rather than showing any exactitude or proportion of the parts. To increase the size and power of the engine the diameter of the rotor and stator together with the number of pockets and the number of intake and exhaust ports may be increased thus making it unnecessary to materially increase the thickness of the structure in the direction of the axis of rotation.

What is claimed is:—

1. A steam turbine comprising a stator having an annular steam course with inner and outer steam inlets and outlets, the outlet for one inlet being connected to an inlet acting in the same direction as but in a plane displaced axially with relation to the first inlet, and a rotor having blades with relatively opposite faces in operative relation to the respective inlets.

2. A steam turbine comprising a stator having an annular steam course with inner and outer steam inlets and inner and outer steam outlets communicating with the steam course on opposite sides of a median plane, and a rotor provided with a web in said median plane and having radial blades on each side within the respective sides of the steam course, one steam inlet acting on the blades on one side of the median line and another steam inlet receiving the exhaust from the first set of blades and acting on the blades on the other side of the median line.

3. A steam turbine comprising a stator having an annular steam course with outer steam inlets and with oppositely directed inner steam inlets, and also with corresponding outlets, an outlet corresponding to one of the inlets communicating with an oppositely located steam inlet, and a rotor having sets of blades in said steam course on opposite sides of the median line, each blade having one face in operative relation to an outer inlet and its opposite face in operative relation to the inner inlet connected to the outlet of the other outer inlet.

4. A steam turbine comprising a stator having an annular steam course and oppositely directed outer inlets and with oppositely directed inner inlets and also with corresponding outlets, the outlet corresponding to one set of inlets communicating with the other set of inlets, and a rotor having a web coincident with and dividing the steam course into two laterally disposed like sections, the said web carrying radial blades in each section of the steam course with opposite faces of the blades on opposite sides of the web simultaneously acting.

5. A steam turbine comprising a stator having an annular steam course and oppositely directed outer steam inlets and with

oppositely directed inner steam inlets and also with corresponding outlets, the outlets corresponding to one set of inlets communicating with the outer set of inlets, and a rotor having a web coincident with and dividing the steam course into two laterally disposed like sections, the said web carrying radial blades on opposite sides in the two sections of the course and the said blades being connected by diaphragms extending from the outer end of one blade to the inner end of the next blade.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

GEORGE H. COOK.

Witnesses:
W. H. LOCKERBY,
ELVA PERRY.