No. 790,090. PATENTED MAY 16, 1905.

L. E TRUESDEL.

TURBINE.

APPLICATION FILED DEC. 29, 1904.

2 SHEETS—SHEET 1.

Fig. 2,

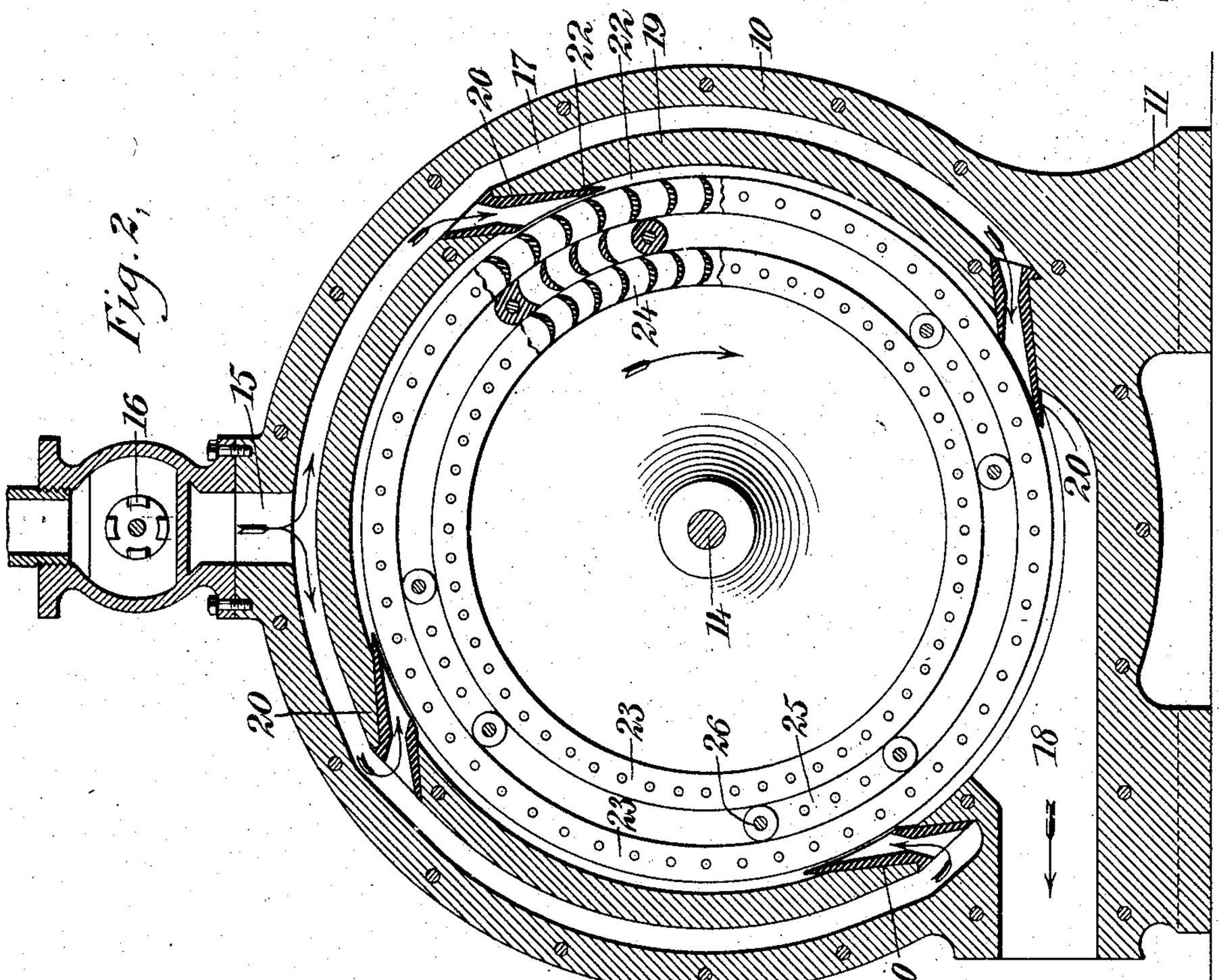
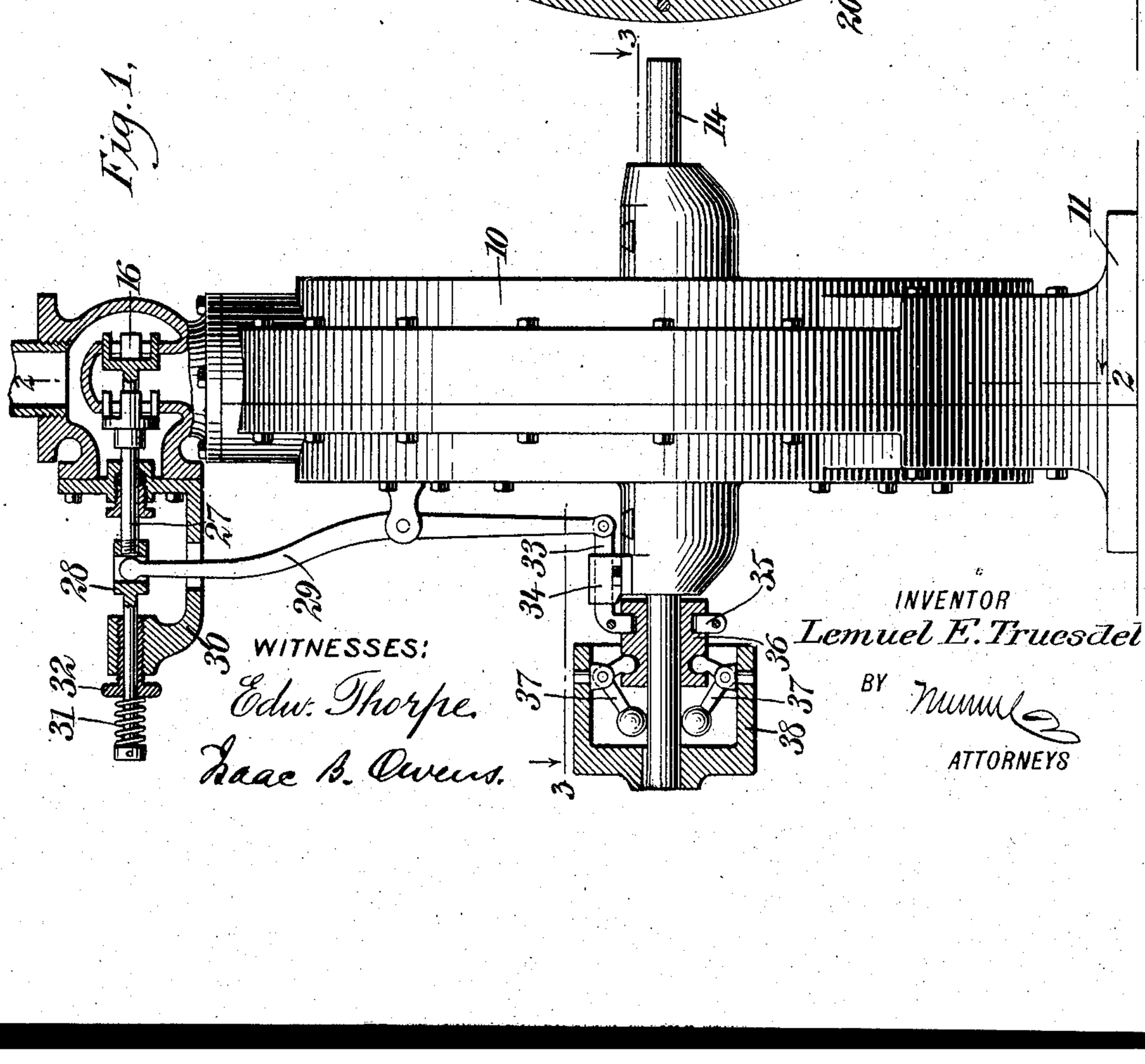


Fig. 1,



WITNESSES:

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Isaac B. Owens.

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2 SHEETS—SHEET 2.

Fig. 3,

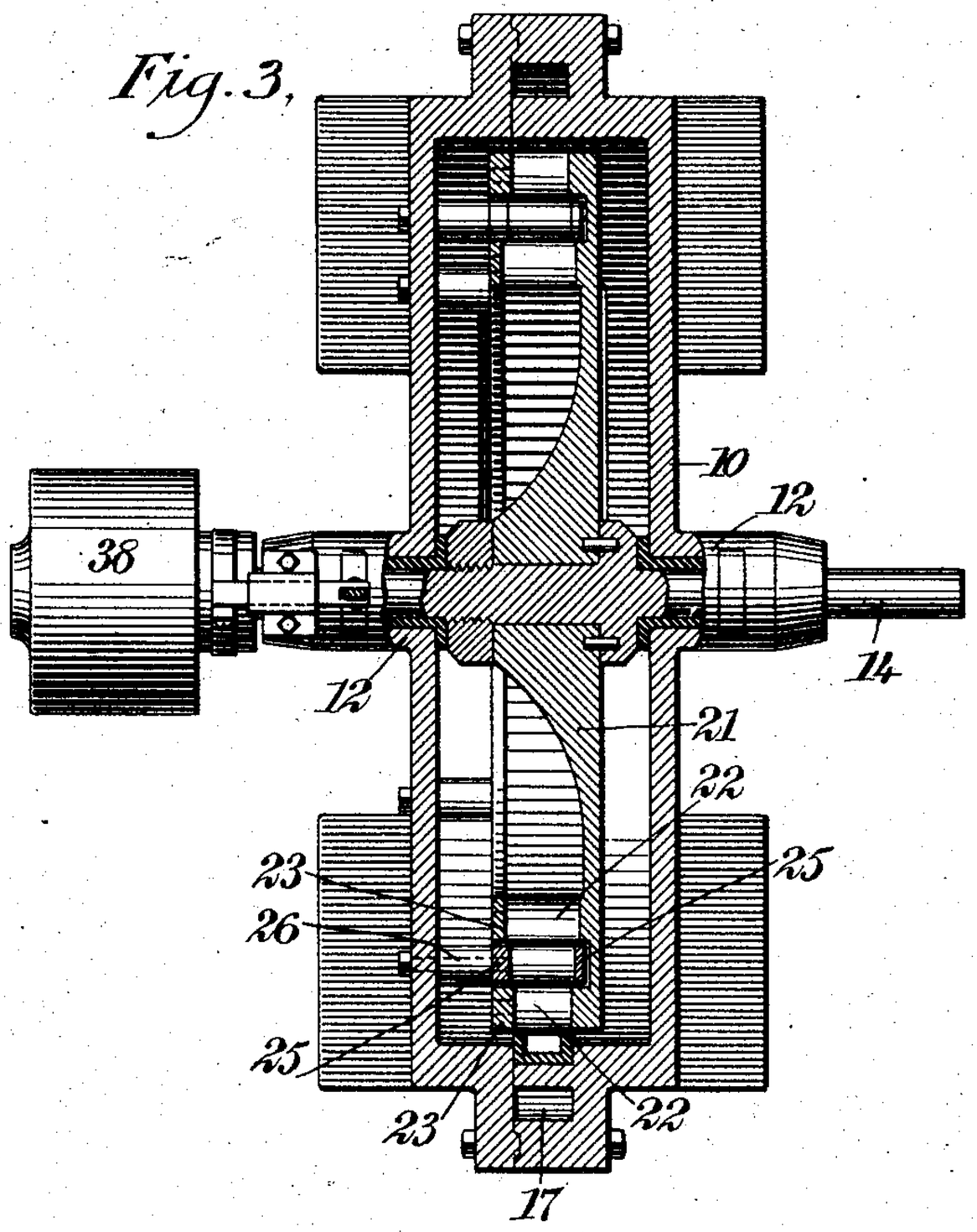
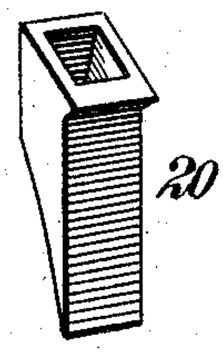


Fig. 4.



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UNITED STATES PATENT OFFICE.

LEMUEL E. TRUESDEL, OF KERSHAW, SOUTH CAROLINA.

TURBINE.

SPECIFICATION forming part of Letters Patent No. 790,090, dated May 16, 1905.

Application filed December 29, 1904. Serial No. 238,742.

To all whom it may concern:

Be it known that I, LEMUEL E. TRUESDEL, a citizen of the United States, and a resident of Kershaw, in the county of Lancaster and State of South Carolina, have invented a new and Improved Turbine, of which the following is a full, clear, and exact description.

The invention relates particularly to an improvement in radial-flow turbines, and it is of the same general class as that forming the subject of my prior patent, No. 769,514, dated September 6, 1904.

The underlying objects of the present improvements are to more effectively distribute the pressure of the steam or other elastic fluid around the periphery of the rotor of the turbine and also to improve the devices for governing the turbine action.

Reference is to be had to the accompanying drawings, which illustrate as an example the preferred embodiment of my invention, in which drawings like characters of reference indicate like parts in the several views, and in which—

Figure 1 is a side elevation of the turbine, partly in section. Fig. 2 is a cross-section thereof on the line 2 2 of Fig. 1. Fig. 3 is a sectional plan on essentially the line 3 3 of Fig. 1. Fig. 4 is a detail view of one of the expansion-nozzles.

The turbine has a shell or casing 10 sustained on a suitable base 11. As shown best in Fig. 3, said shell is provided with bearings 12, in which is mounted to turn the shaft 14, carrying the rotating part or rotor of the turbine. The casing or shell 10 has a steam-inlet port 15 communicating with the steam-supply and controlled by a throttle-valve 16. The port 15 communicates with a steam-passage 17, which extends through a peripheral rib 10^a on one section of the casing, said passage being closed by a rib 10^b on the other section of the casing. The passage 17 is circular except for the exhaust-port 18, which passes tangentially from the inner or central part of the casing between the ends of the passage, as shown best in Fig. 2. The steam-passage 17 is divided by a wall 19 from said inner part of the casing, and this wall is formed with openings in which are placed tangentially-disposed steam-nozzles 20, conducting the steam from the steam-passage to the central part of the casing, where it acts on the rotor, as will be fully set forth hereinafter. These sections of the casing are fastened together by balls through the flanges 10^a and 10^b, as shown in Figs. 1 and 3. The nozzles 20, as shown in Figs. 2 and 4, are of the expansion type, so as to cause an increase in velocity of the steam due to the expansion thereof in the nozzles. Preferably four nozzles are provided, and these are arranged equidistant around the periphery of the rotor, as Fig. 2 illustrates.

The rotor comprises a web or disk 21, fastened to the shaft 14, as shown in Fig. 3, and at its periphery it is provided with a number of buckets 22. These buckets are arranged, preferably, in two concentric rows, and each has one end fastened to or formed integral with the web 21, while the two rows are connected at their outer ends by shrouds 23. Interposed between the concentric rows of buckets 22 are deflecting-vanes 24. These vanes are arranged in groups and the groups being, respectively, juxtaposed to the nozzles 20, as illustrated best in Fig. 2, so that the steam passing from said nozzles will engage first the outer row of buckets 22, imparting movement to the rotor in the direction of the arrow shown in Fig. 2, from which buckets the steam will be deflected from the vanes 24 and in turn deflected by these vanes to the second row of buckets, imparting a further impulse to the rotor. From the inner row of buckets 22 the steam is deflected inward toward the center of the rotor, and it finally emerges from the casing through the exhaust 18. In this connection it will be observed that the groups of deflecting-buckets are so disposed as to provide a free passage for the steam to the exhaust-port, thus avoiding interference between the active and the exhausting steam period. The said groups of deflecting-buckets 24 are provided at their ends with shrouds 25, and they are held stationary within the casing by means of stay-bolts 26, fastened to one wall of the casing and arranged so as to hold the vanes between the concentric rows of buckets.

The throttle-valve 16 may in itself be of any desired type, its stem 27 passing through the shell of the valve and is provided with a loop or orificed block 28, in which is engaged the rounded upper end of a governor-lever 29. Projecting from the valve shell or casing 16 or from any other suitable support is a bracket 30, through which the stem 27 loosely extends.

31 indicates a spring which bears between an enlargement on the outer end of the stem of the valve and a screw 32, which is adjustable in the bracket.

The lever 29 is suitably fulcrumed on the casing 10 and has a slide 33 articulated to its lower end. This slide moves in a guide 34, attached to one of the bearings 12, and it carries at its outer end a fork or collar 35, which loosely engages a sleeve 36, sliding freely on the shaft 14. Said sleeve is connected to centrifugal governor-arms 37, and these are pivoted in a box 38, fastened to and carried by the shaft 14, as shown best in Fig. 1. The spring 31 tends to hold the governor-arms 37 in their inner or active position, and when the turbine acquires excessive speed the arms 37 move out against the action of the spring 31 and through the connections 36, 35, 33, 29, and 27 seat or tend to seat the valve 16, thus throttling the supply of steam and bringing about a consequent decrease in the speed of the moving parts.

Various changes in the form, proportions, and minor details of my invention may be resorted to at will without departing from the spirit and scope thereof. Hence I consider myself entitled to all such variations as may lie within the terms of my claims.

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

1. In a turbine, the combination of a casing provided with an inlet-port, a peripheral steam-port communicating with the inlet-port, an exhaust-port passing from the casing between the ends of said peripheral steam-port, a rotor mounted within the casing, a plurality of nozzles leading from said steam-port into the inner part of the casing to conduct the steam to the rotor, said nozzles being disposed essentially equidistant around the periphery of the case, a turning shaft on which the rotor is mounted, a governor carried by the shaft, a lever fulcrumed on the casing and extending from the shaft radially outward, a connection between the governor and the inner end of the lever, a throttle-valve controlling the steam-supply, and a connection between the outer end of the lever and the throttle-valve.

2. In a turbine, the combination of a casing provided with an inlet-port, a peripheral steam-port communicating with the inlet-port, an exhaust-port passing from the casing between the ends of said peripheral steam-port, a rotor mounted within the casing, a plurality of nozzles leading from said steam-port into the inner part of the casing to conduct the steam to the rotor, said nozzles being disposed essentially equidistant around the periphery of the case, a turning shaft on which the rotor is mounted, a box attached to the turning shaft, a centrifugal arm fulcrumed in the box, a sleeve sliding on the shaft and engaged with the governor-arm, a lever fulcrumed on the casing and extending radially outward from the shaft, a connection between the lever and the sleeve, a throttle-valve controlling the steam-supply, and a connection between the outer end of the lever and the throttle-valve.

3. In a turbine, the combination of a casing provided with an inlet-port, a peripheral steam-port communicating with the inlet-port, an exhaust-port passing from the casing between the ends of said peripheral steam-port, a rotor mounted within the casing, a plurality of nozzles leading from said steam-port into the inner part of the casing to conduct the steam to the rotor, said nozzles being disposed essentially equidistant around the periphery of the case, a turning shaft on which the rotor is mounted, a governor carried by the shaft, a lever fulcrumed on the casing and extending from the shaft radially outward, a connection between the governor and the inner end of the lever, a throttle-valve controlling the steam-supply, a stem in connection with the throttle-valve and having connection with the outer end of the lever, and a spring pressing said stem to hold the governor yieldingly in inactive position.

4. A turbine comprising a circular casing having an exhaust-port passing tangentially therefrom and a steam-passage extending around the peripheral part of the casing from one side of the exhaust-port to the other, a rotor mounted in the casing, nozzles extending from the steam-passage to the interior of the casing to deliver steam to the rotor, and means for supplying steam to the steam-passage.

5. A turbine comprising a circular casing having an exhaust-port passing from the interior of the casing out through the edge in essentially the plane of the casing and a steam-passage extending through the peripheral part of the casing from one side of the exhaust-port to the other, a rotor mounted in the casing, nozzles arranged at essentially equidistant points around the casing and extending from the steam-passage to the interior of the casing to deliver the steam to the rotor, and means for supplying steam to the steam-passage.

6. A turbine comprising a circular casing having two sections with peripheral flanges engaged with each other, the casing having an exhaust-port passing from its edge or periphery and one of the flanges being formed with

a groove extending around the casing from one side of the exhaust-port to the other and forming a steam-passage, means for supplying steam to said passage, a rotor mounted in the casing, and nozzles extending from the steam-passage to the interior of the casing to supply steam to the rotor.

7. A turbine comprising a circular casing having an exhaust-port passing tangentially therefrom, and a steam-passage extending around the peripheral part of the casing from one side of the exhaust-port to the other, a rotor mounted in the casing, a nozzle extending from the steam-passage to the interior of the casing to deliver steam to the steam-passage, a valve controlling the steam-supply, and a governor connected to the rotor and to said valve automatically to operate the valve.

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

LEMUEL E. TRUESDEL.

Witnesses:
W. C. TIVELTY,
J. A. MCCASKILL.