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2,544,154

TUBULAR TURBINE

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2 Sheets-Sheet 1

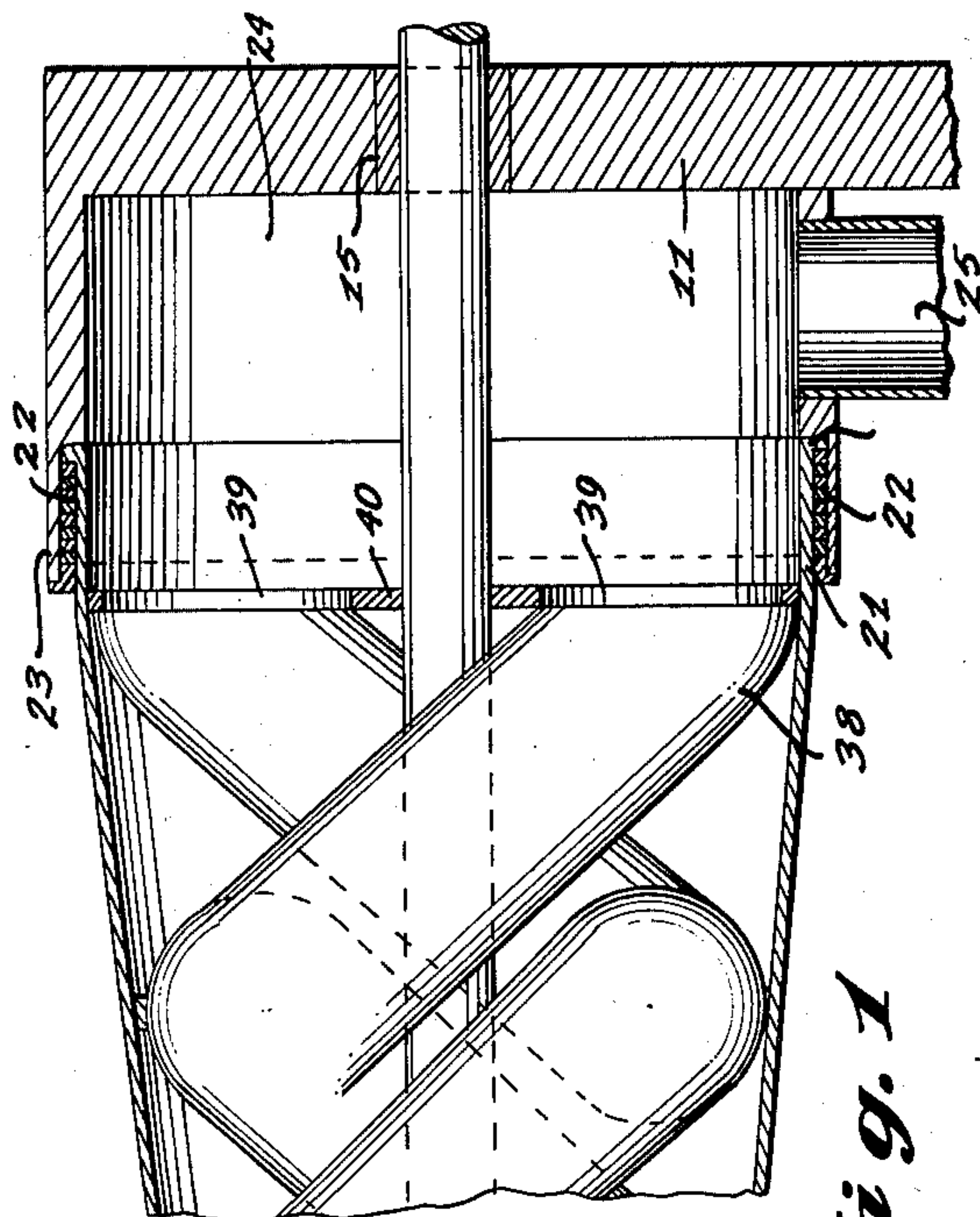


Fig. 1

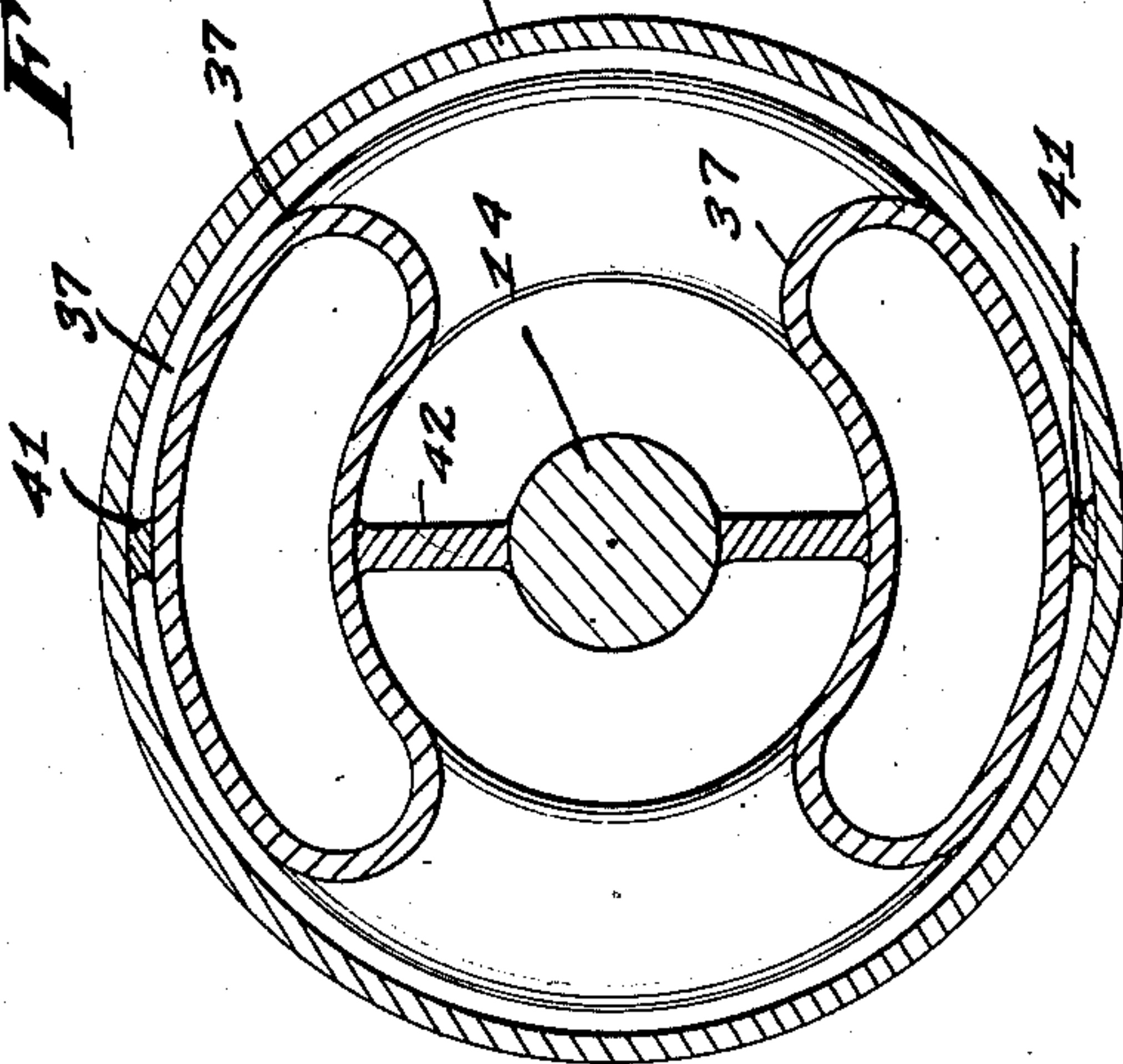
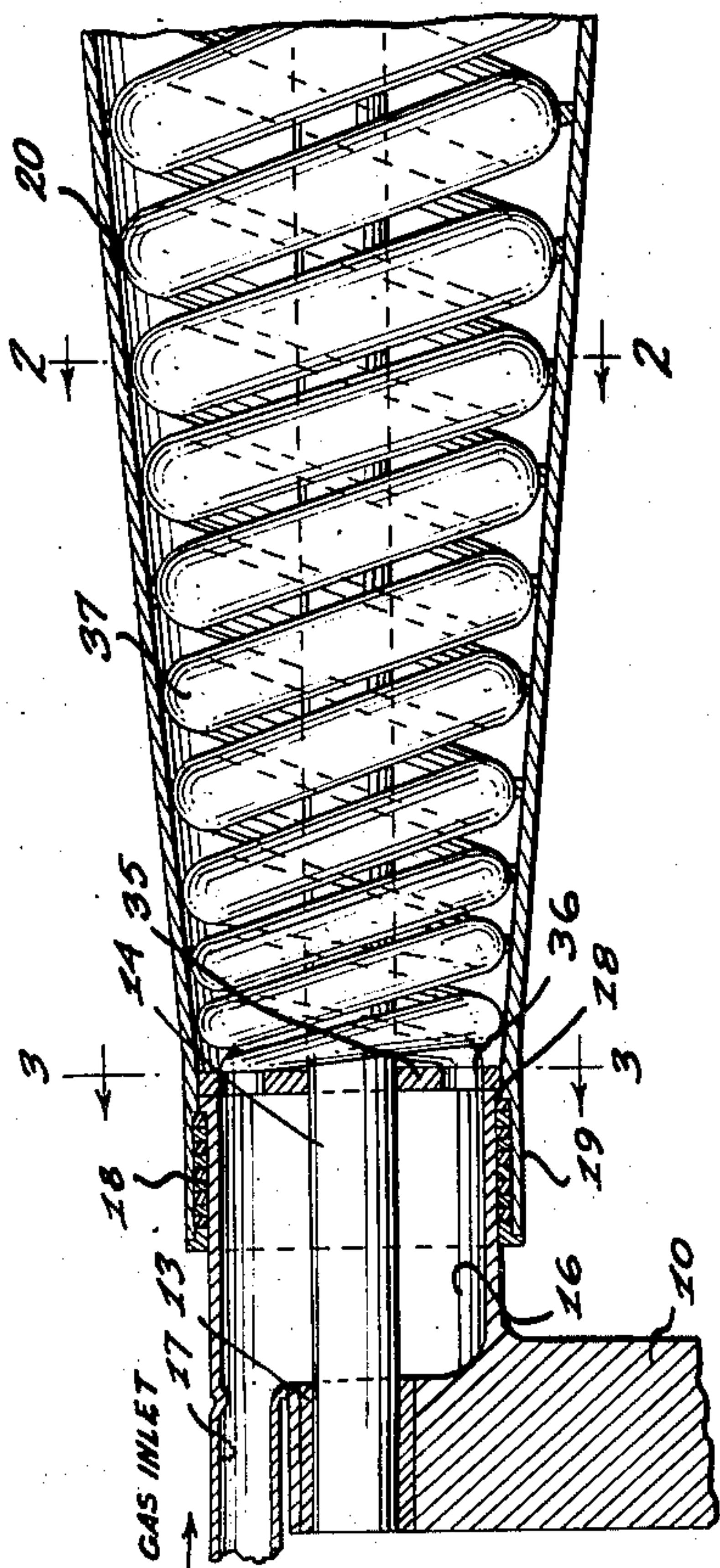


Fig. 2

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354

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2 Sheets-Sheet 2

Fig. 4

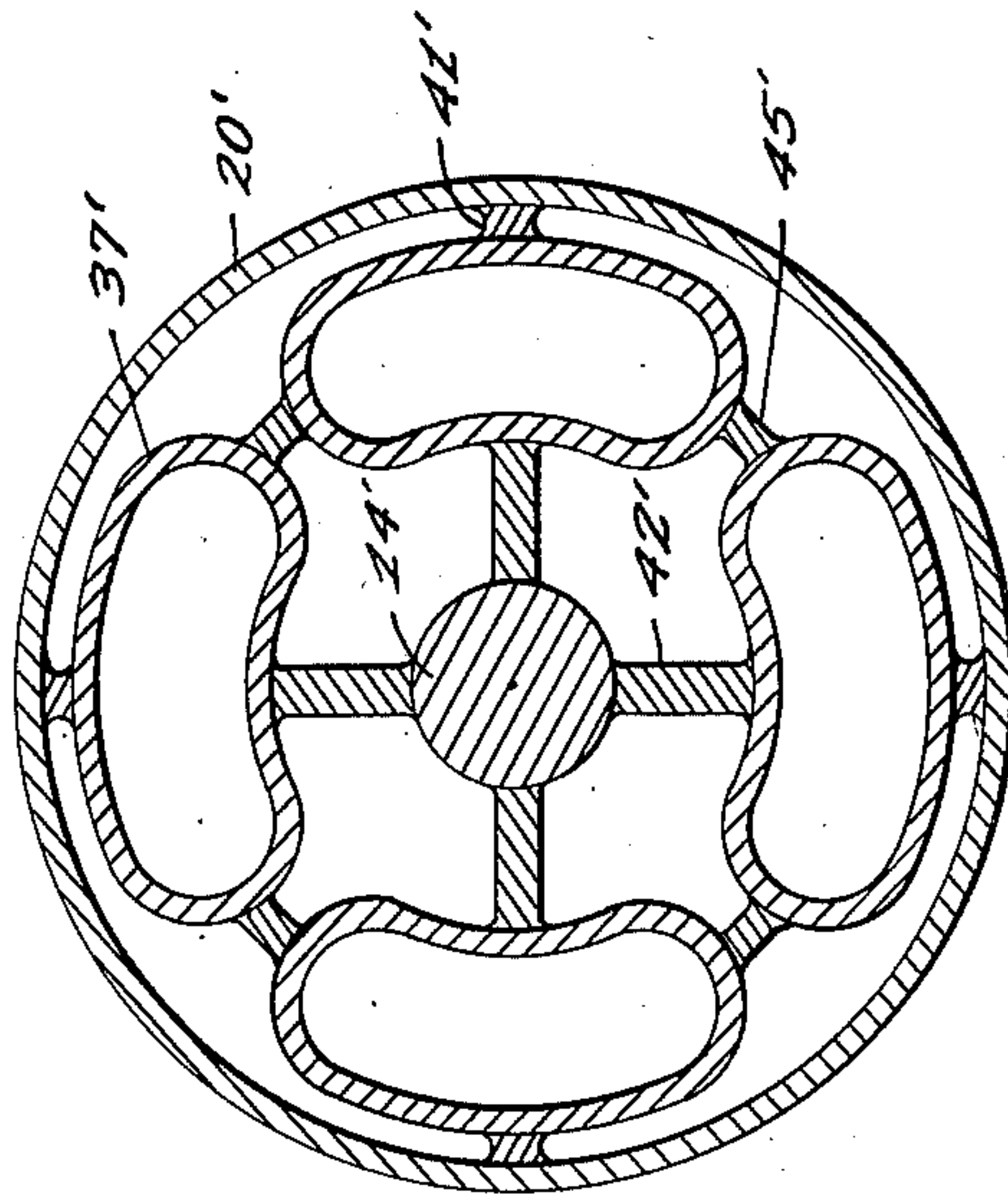
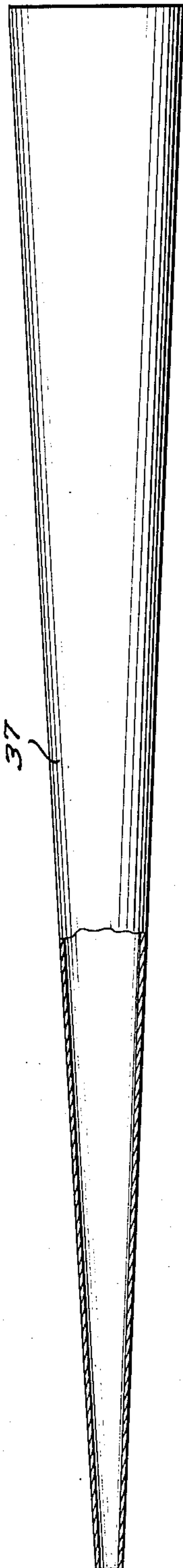


Fig. 5

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TUBULAR TURBINE

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2 Claims. (Cl. 253—65)

1

This invention relates to a tubular turbine, and more particularly to a turbine adapted for utilization of expanding a compressible fluid such as steam or gases of combustion for the rotation of a drive shaft.

The primary object of this invention is the provision of an improved turbine characterized by mechanical simplicity and adaptable to comparative mass production, not requiring the relatively close tolerances of conventional turbines.

A further object of this invention is the provision of a turbine adapted to employ the pure reaction of expanding a compressible fluid which loses no energy to stationary blades as is the case with conventional turbines.

An additional object of the invention is the provision of a device of this character wherein there is relatively little friction between the moving parts, and wherein erosion of the expansion tubes is comparatively negligible.

An additional object of the invention is the provision of such a device wherein losses occasioned by pressure leakage are held to a minimum.

A still further object of the invention is the provision of a device of this character which is sturdy and durable in construction, reliable and efficient in operation, and relatively simple and inexpensive to manufacture, assemble and utilize.

Other objects will in part be obvious and in part be pointed out as the description of the invention proceeds, and shown in the accompanying drawings wherein there is disclosed a preferred embodiment of this inventive concept.

In the drawings:

Figure 1 is a vertical longitudinal sectional view taken substantially through the center line of a turbine embodying features of the instant inventive concept, certain portions thereof being broken away.

Figure 2 is an enlarged sectional view taken substantially on the line 2—2 of Figure 1 as viewed in the direction indicated by the arrows.

Figure 3 is a sectional view taken substantially on the line 3—3 of Figure 1 as viewed in the direction indicated by the arrows.

Figure 4 is a view partially in elevation and partially in section disclosing one of the tubular elements of the turbine prior to formation in helical shape.

Figure 5 is a sectional view similar to Figure 2, but disclosing a modified form of construction.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Referring now to the drawings in detail, the

2

device of the instant invention includes oppositely-disposed supporting members 10 and 11. The member 10 is provided with a journal bearing 13 adapted to rotatably support drive shaft 14, the opposite end of which extends outwardly through a suitable journal bearing 15 in the supporting member 11, and extends to any desired locality for the performance of work.

Support or housing 10 includes a compressible fluid or gas chamber 16, provided with an inlet 17, and is provided exteriorly with labyrinth glands 18, upon which is mounted for rotation the tubular extremity 19 of a frusto-conical sleeve or shell 20, the opposite conical end 21 of which is positioned rotatably on labyrinth glands 22 carried interiorly of the flange 23 of a chamber 24 formed interiorly of the supporting member or housing 11. An outlet 25 is provided for the chamber 24.

Labyrinth glands 22 and 18 are of identical construction and comprise well known structure which forms no part of the present invention.

The inner end of inlet chamber 16 is adapted to be closed by a plate 35 concentric with and secured to the shaft 14, and having its outer rim fixedly secured to the inner side of the frusto-conical shell 20. Apertures 36 through the plate 35 communicate with the small ends of helically-wound, continuously-expanding, tubular members 37 surrounding the drive shaft 14, and expanding constantly in conformity with the taper of the shell 20. The large ends 38 of the helical members communicate with apertures 39 in a closure plate 40 surrounding the shaft 14 in fluid-tight relation, and secured at its outer periphery to the interior of the large end of the shell 20. As best shown in Figure 2, the tubular members 37 are connected to the interior of the shell 20, as by spaced web members 41, and to the shaft 14, as by corresponding web members 42.

The configuration of the tubular members 37 before they are wound in helical form about the shaft 14 and secured to the plates 35 and 40 is frusto-conical and is best indicated in Figure 4.

From the foregoing the operation of the device should now be readily understandable. Any suitable compressible fluid, such as steam or gases of combustion, or the like, is introduced through the inlet 17 into the chamber 16, from which it passes through the apertures 36 into the reduced ends of helices 37. The gas is obviously at a relatively high pressure and under material compression. As the gas passes through the helical expanding tubes it expands at a ratio corresponding to the expansion of the area of

3

the tubes. The expanding gas thus creates a velocity which in turn creates a reaction thrust which imposes a torque on the drive shaft, due to the helical winding of the tubes, and at a distance substantially equal to the clearance space between the shaft and the tube plus the radius of the tube. Obviously, the force multiplied by the distance will equal the torque imparted to the shaft. Due to the helical winding of the tubes, it will be apparent that the force exerted is not exactly perpendicular to the shaft, but the small amount of force not acting to rotate the shaft will be directed in such manner as to partially equalize or neutralize the force imparted by the unequal forces at the two ends of the turbine. After the gas has expanded to final pressure, it exits through the enlarged ends 38 of the helices 37 through the apertures 39 into chamber 24 and thence through outlet 25 either to the atmosphere, to a heat-exchanger, to a compressor, to a condenser, or the like, depending upon the existing conditions.

Obviously, the design illustrated may be modified and the requisite degree of expansion of the tubular members as well as the number of turns required to provide maximum efficiency may be computed mathematically, or in other desired manner.

Figure 5 discloses an additional form of turbine, wherein a frusto-conical shell 20' mounted in a manner substantially identical to the foregoing contains a shaft 14' and four helically-wound, expanding tubular members 37', interwound and secured to the interior of the shell 20' by webs 41', to the shaft by webs 42, and to each other by additional webs 45'.

The operation of the modification of Figure 5 is substantially identical to that previously discussed, and it will be readily apparent that any desired number of tubular members may be employed in accordance with the conditions to provide maximum efficiency.

From the foregoing it will now be seen that there is herein provided an improved turbine characterized by relatively high efficiency and simplicity in construction and operation, which accomplishes all the objects of this invention, and others, including many advantages of great practical utility and commercial importance.

As many embodiments may be made of this inventive concept, and as many modifications may be made in the embodiments hereinbefore shown and described, it is to be understood that all matter herein is to be interpreted merely as illustrative and not in a limiting sense.

I claim:

1. A turbine comprising a horizontally disposed frusto-conical open ended shell, a first fixed housing having one end open positioned adjacent the smaller end of said shell and having the open end rotatably supporting said smaller end of said shell, an inlet in the other end of said housing for connection to a source of compressed fluid, a first transversely disposed plate fixedly positioned within said shell inwardly of and spaced from said smaller end of the latter abutting said one end of said first named housing and forming with said first named housing an inlet chamber, a second fixed housing having one end open and positioned adjacent the larger end of said shell and having the open end rotatably supporting said larger end of said shell, an outlet in said

4

second housing adjacent the other end thereof, a second transversely disposed plate fixedly positioned within said shell inwardly of and spaced from said larger end of said shell and forming with the adjacent portion of said shell and said second housing an outlet chamber, and a conduit of varying diameter having a plurality of convolutions arranged in the form of a helix of frusto-conical shape positioned within said shell intermediate said first and second plates and having its convolutions fixedly secured to said shell, one end of said conduit extending through said first plate and in communication with said inlet chamber and the other end of said conduit extending through said second plate and in communication with said outlet chamber.

2. A turbine comprising a horizontally disposed frusto-conical open ended shell, a first fixed housing having one end open positioned adjacent the smaller end of said shell and having the open end rotatably supporting said smaller end of said shell, an inlet in the other end of said housing for connection to a source of compressed fluid, a first transversely disposed plate fixedly positioned within said shell inwardly of and spaced from said smaller end of the latter abutting said one end of said first named housing and forming with said first named housing an inlet chamber, a second fixed housing having one end open and positioned adjacent the larger end of said shell and having the open end rotatably supporting said larger end of said shell, an outlet in said second housing adjacent the other end thereof, a second transversely disposed plate fixedly positioned within said shell inwardly of and spaced from said larger end of said shell and forming with the adjacent portion of said shell and said second housing an outlet chamber, a longitudinally extending shaft positioned within said shell and fixedly supported on said first and second named plates, one end of said shaft extending through and out of said inlet chamber, the other end of said shaft extending through and out of said outlet chamber, and a conduit of varying diameter having a plurality of convolutions arranged in the form of a helix of frusto-conical shape circumposed about said shaft, intermediate said first and second plates and having its convolutions fixedly secured to said shell and said shaft, one end of said conduit extending through said first plate and in communication with said inlet chamber and the other end of said conduit extending through said second plate and in communication with said outlet chamber.

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