No. 766,872. PATENTED AUG. 9, 1904.

B. J. CAMPBELL.

FLUID VISCOSITY TURBINE.

APPLICATION FILED NOV. 18, 1903.

NO MODEL.

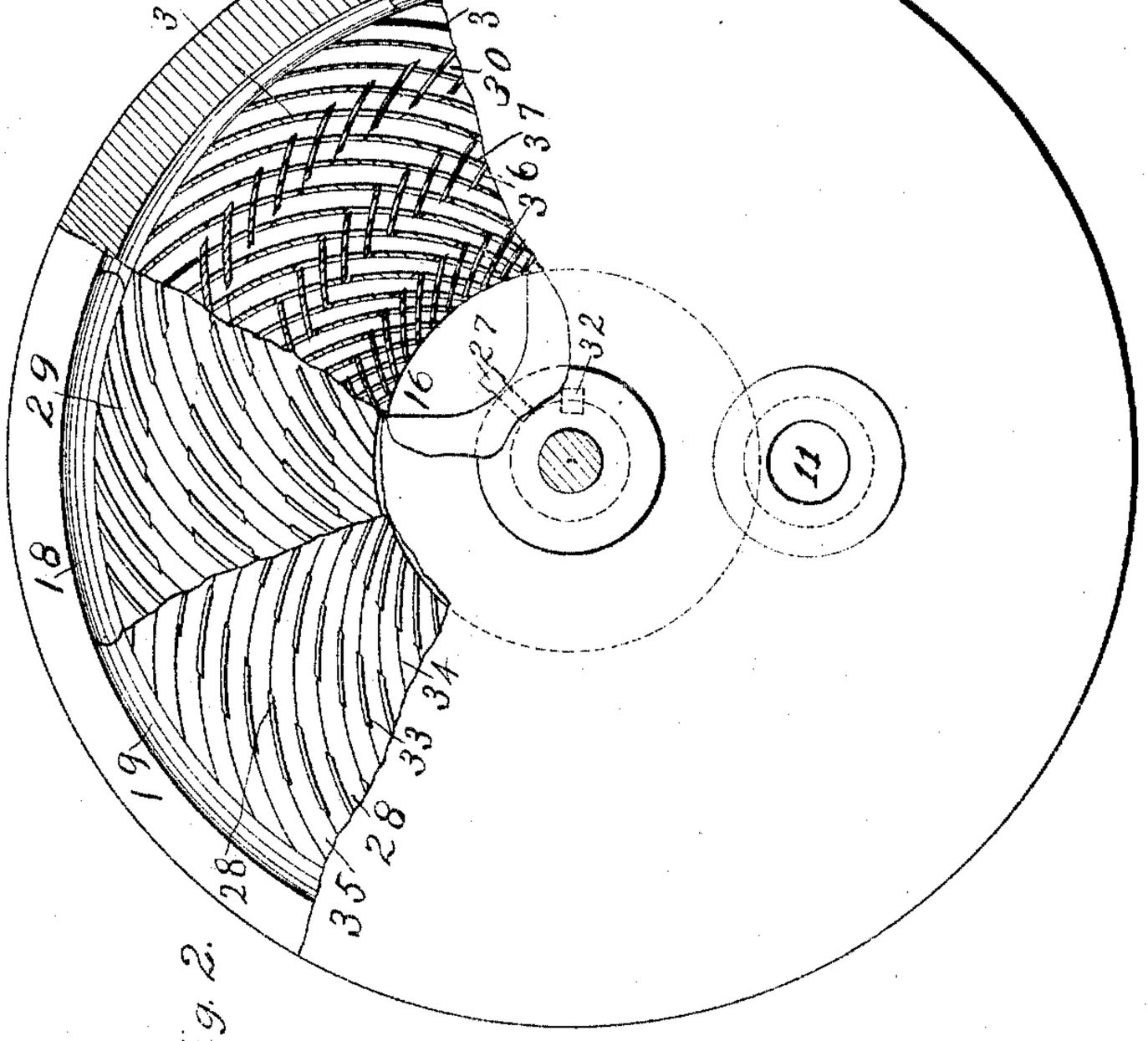

Fig. 2.

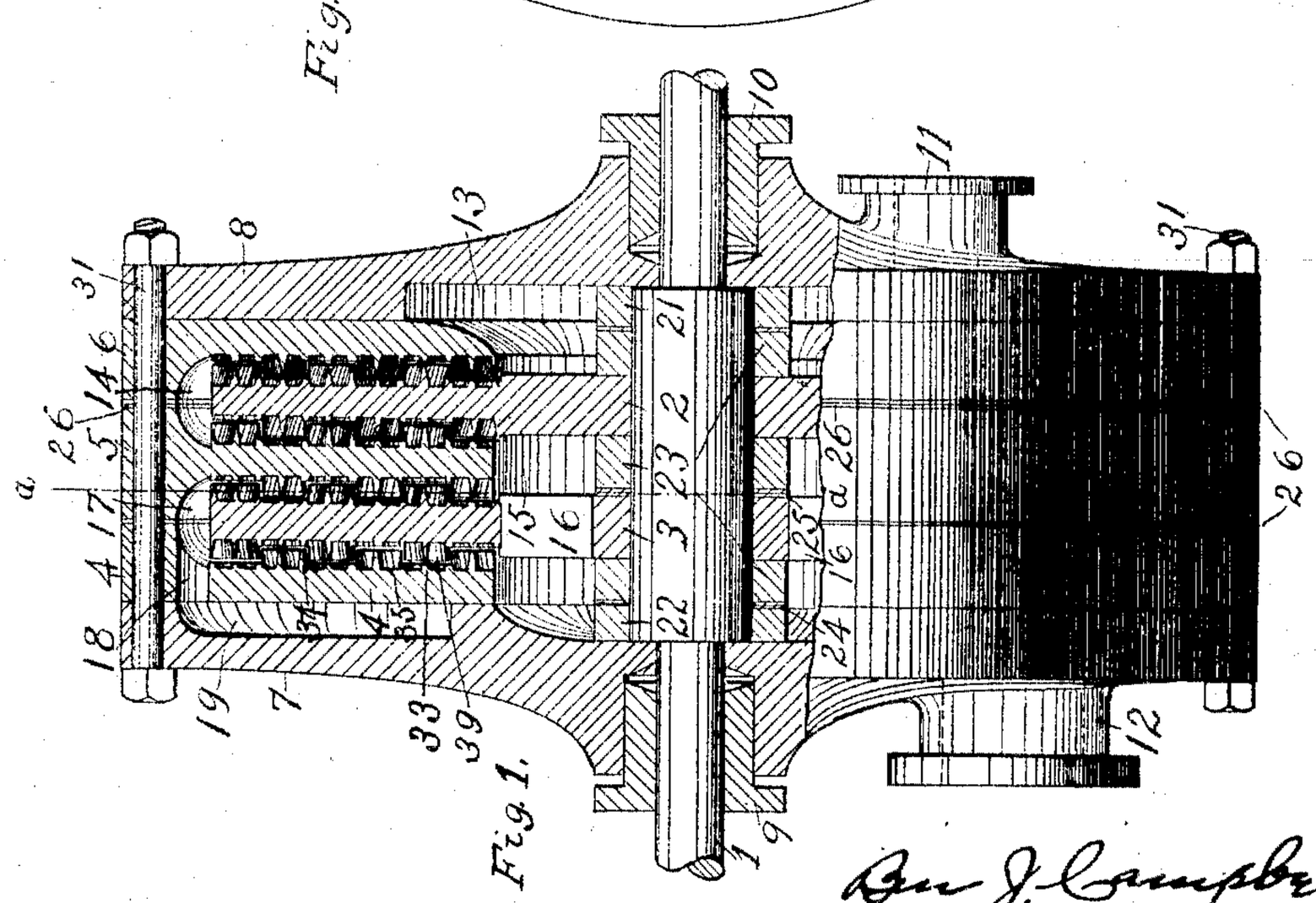

Fig. 1.

WITNESSES:
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INVENTOR.

No. 766,872. Patented August 9, 1904.

UNITED STATES PATENT OFFICE.

BEN J. CAMPBELL, OF DANVILLE, VIRGINIA.

FLUID-VISCOSITY TURBINE.

SPECIFICATION forming part of Letters Patent No. 766,872, dated August 9, 1904.

Application filed November 18, 1903. Serial No. 181,649. (No model.)

To all whom it may concern:

Be it known that I, BEN J. CAMPBELL, a citizen of the United States, residing at Danville, Pittsylvania county, Virginia, have invented new and useful Improvements in Fluid-Viscosity Turbines, of which the following is a specification.

My invention relates to a fluid-viscosity turbine, and has for its object the economic development of this class of engines, and aims to produce a turbine that is at once compact, simple, and cheap of construction, reversible when so desired, of moderate speeds of revolution, and maximum thermal efficiency with practically no loss of effective power by fluid-friction.

In the accompanying drawings, Figure 1 is a part longitudinal section of a turbine, showing the novel features of my invention. Fig. 2 is an end view of same, showing a part section and certain portions removed to more fully set forth its novel features.

Let 1 represent a shaft, to which are suitably secured rotatable members 2 3, with means for longitudinal adjustment, as by rings 23, with set-screws 27, washers 24 25, and bearing collars or disks 21 22.

7 8 are end casings carrying bearings and stuffing-boxes 9 10 and inlet and exhaust ports 11 12.

26 represents metallic gaskets of suitable thickness to give desired adjustment to fixed members 4 5 6, also used to make fluid-tight joints, the whole securely bound together by bolts 31.

13 is an annular chamber in communication with inlet-port 11; 14 17, concentric chambers between stationary and around circumference of rotatable members.

18 18 are ports in stationary member 4, connecting chamber 17 and annular chamber 19, which connects with exhaust-port 12.

16 16 are ports in rotatable member 3, allowing actuating fluid to pass freely to each side of same.

30 shows a section along line *a a*, 36 being vanes cut by said line from stationary member 5, 38 being vanes cut by same on rotatable member 3, 33 37 showing bottom of concentric recess meshing with vanes of opposed member.

28 is portion of rotatable member 3 with parts in front removed, 35 showing the bottom of continuous grooves, the dividing-walls of which form the vanes 34. 29 is a view of fixed member 4 with parts in front removed, showing similar grooves and vanes but oppositely directioned.

As shown at 33 39, Fig. 1, the concentric recesses for vanes of opposed member do not extend to bottom of grooves, which allows a small portion of actuating fluid to flow along the grooves, which is across the streams of fluid and vanes of opposed member, thus setting up a viscosity stress which of itself tends to produce relative motion of the members and effectively prevents the enormous loss of energy by fluid-friction between the almost contacting surfaces when moving at the great velocity relative to each other common to the turbine.

In operation the actuating fluid enters at inlet-port 11 to annular chamber 13, thence through grooves and vanes between members 2 and 6 into concentric chamber 14, thence toward center through grooves and vanes between members 2 and 5 into chamber 15, thence part passing through ports 16 16, flowing outward through grooves and vanes on each side of member 3 into chamber 17, thence through ports 18 18 into annular chamber 19, thence out exhaust 12 to suitable condenser or atmosphere.

To make this engine reversible, it is but necessary to reverse points of admission and exhaust for each of the elements of the turbine with suitable reversing-valves.

The construction shown gives an axial thrust equal to the difference of pressure of the fluid on sides of rotatable member 2, which for certain purposes is desirable, as in a vertical engine carrying a dynamo, &c., or to balance thrust of propeller, but where desired is easily constructed balanced as to thrust, as when made up with all elements as member 3, the pressure on each side of which is equal.

I do not desire to limit myself to the exact

form shown and described, as compounding can be carried to any extent desired, &c., but to make such changes as may fairly come within the spirit and scope of the invention.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is as follows:

1. In a fluid-viscosity turbine in combination, a shaft, rigidly secured thereon, with means for longitudinal adjustment, a plurality of disks, adapted to rotate, having lateral working surfaces made up of a multiplicity of grooves crossing radius at an acute angle, a plurality of concentric recesses on said surfaces, cutting the dividing-walls of said grooves, the alternate recesses and crests of said grooves forming vanes on said disks, a plurality of relatively fixed or stationary members, adapted to inclose said disks, having on opposed surfaces a multiplicity of grooves crossing radius at an acute angle, a plurality of concentric recesses on said surfaces cutting the dividing-walls of said grooves, the alternate crests and recesses on said grooves forming vanes on said members, the crests of vanes of members meshing with or fitting into recesses on opposed members respectively, the grooves and vanes, on opposed members being oppositely directioned, and inlet and exhaust port with suitable means for conducting the actuating fluid to and from the grooves and vanes of one element to those of the next element of the series, and to exhaust.

2. In a fluid-viscosity turbine in combination, a shaft, rigidly secured thereon rotatable members having acting surfaces made up of a multiplicity of grooves, a plurality of concentric recesses, cutting the walls of said grooves, the alternate recesses and crests on said grooves forming the vanes on said members, a plurality of relatively fixed or stationary members adapted to inclose said members, having on opposed surfaces a multiplicity of similar grooves, oppositely directioned, with similar concentric recesses, the vanes of the members meshing with or fitting into concentric recesses on opposed members, concentric recesses on said members having less depth than the grooves on said acting surfaces for purposes specified.

3. In a fluid-viscosity turbine in combination, a shaft, rigidly secured thereto and adapted to rotate rotatable members 2, 3, annular fixed or stationary members 4, 5, 6, end castings 7, 8, having bearings and stuffing-boxes 9, 10, inlet and exhaust ports 11, 12, annular chamber 13 in communication with inlet-port, concentric chambers 14, 17, made between stationary members at circumference of rotatable members, annular chamber 19, in communication with exhaust-port, a plurality of ports 18, connecting-chambers 17 and 19, a plurality of ports 16, in rotatable members 3, means for longitudinal adjustment of rotatable members on shaft, as rings 23 with set-screws 27, and washers 24, 25, shoulder-bearings 21, 22, means for adjusting fixed members and making fluid-tight joints as by gaskets 26, the rotatable disks and opposed annular fixed members having adjacent surfaces made up of a multiplicity of grooves crossing radius at an acute angle, vanes formed by concentric recesses or grooves cutting the division-walls of eccentric grooves, of a less depth than said eccentric grooves, said vanes meshing with or fitting into concentric grooves on opposed members, the direction of vanes and eccentric grooves on fixed members being such that fluid under pressure flowing along them to points of lower pressure flows in direction of motion of rotating member with oppositely-directioned grooves and vanes on rotatable members, substantially as shown as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 17th day of November, 1903.

BEN J. CAMPBELL.

Witnesses:
HENRY M. WATKINS,
RUTLEDGE CARTER.