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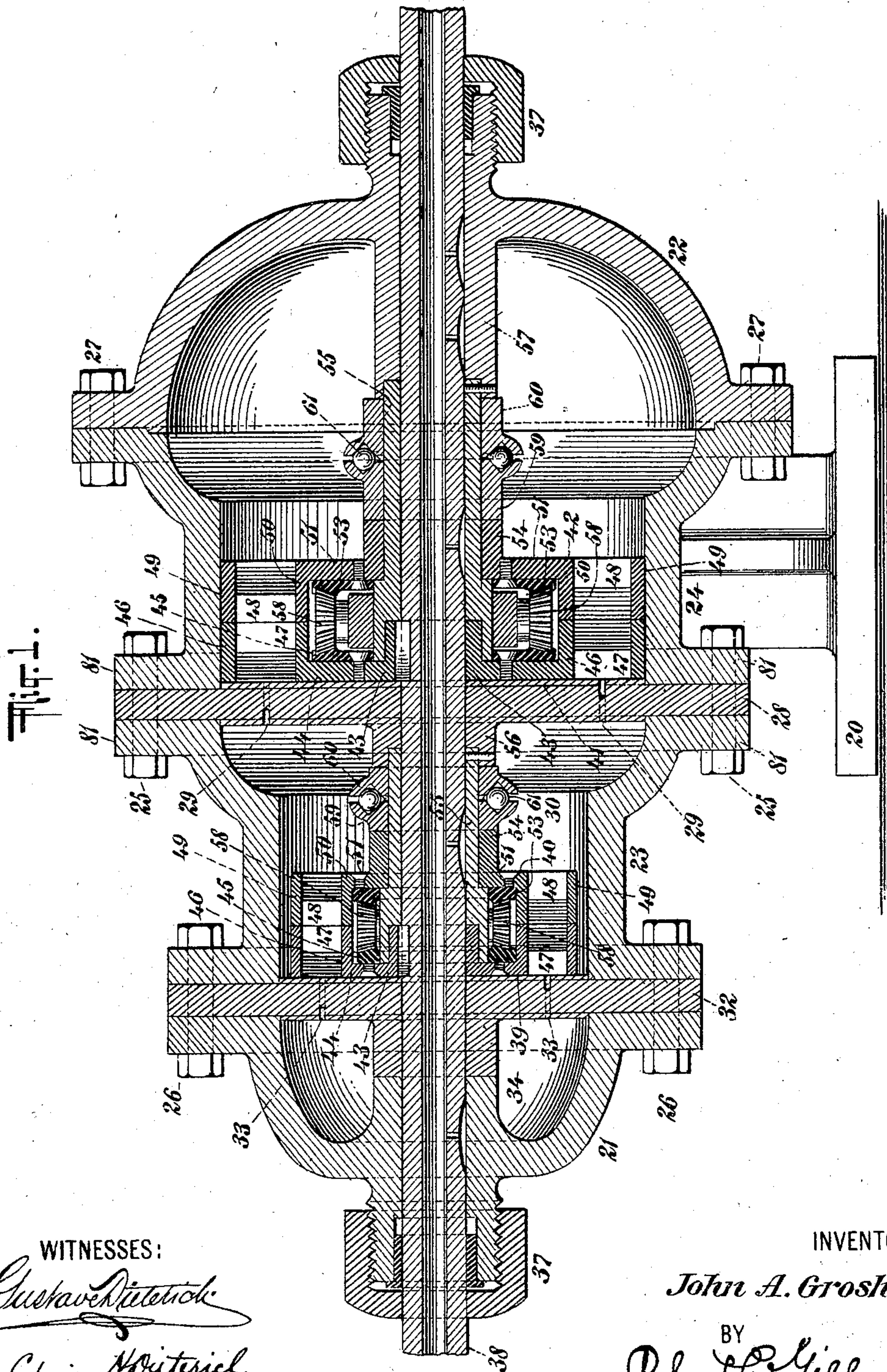
PATENTED APR. 14, 1903.

J. A. GROSHON.  
TURBINE ENGINE.

APPLICATION FILED JULY 21, 1902.

NO MODEL.

4 SHEETS—SHEET 1.



WITNESSES:

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*Edwin H. Dietrich*

INVENTOR

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BY

*Chas. C. Gill*

ATTORNEY



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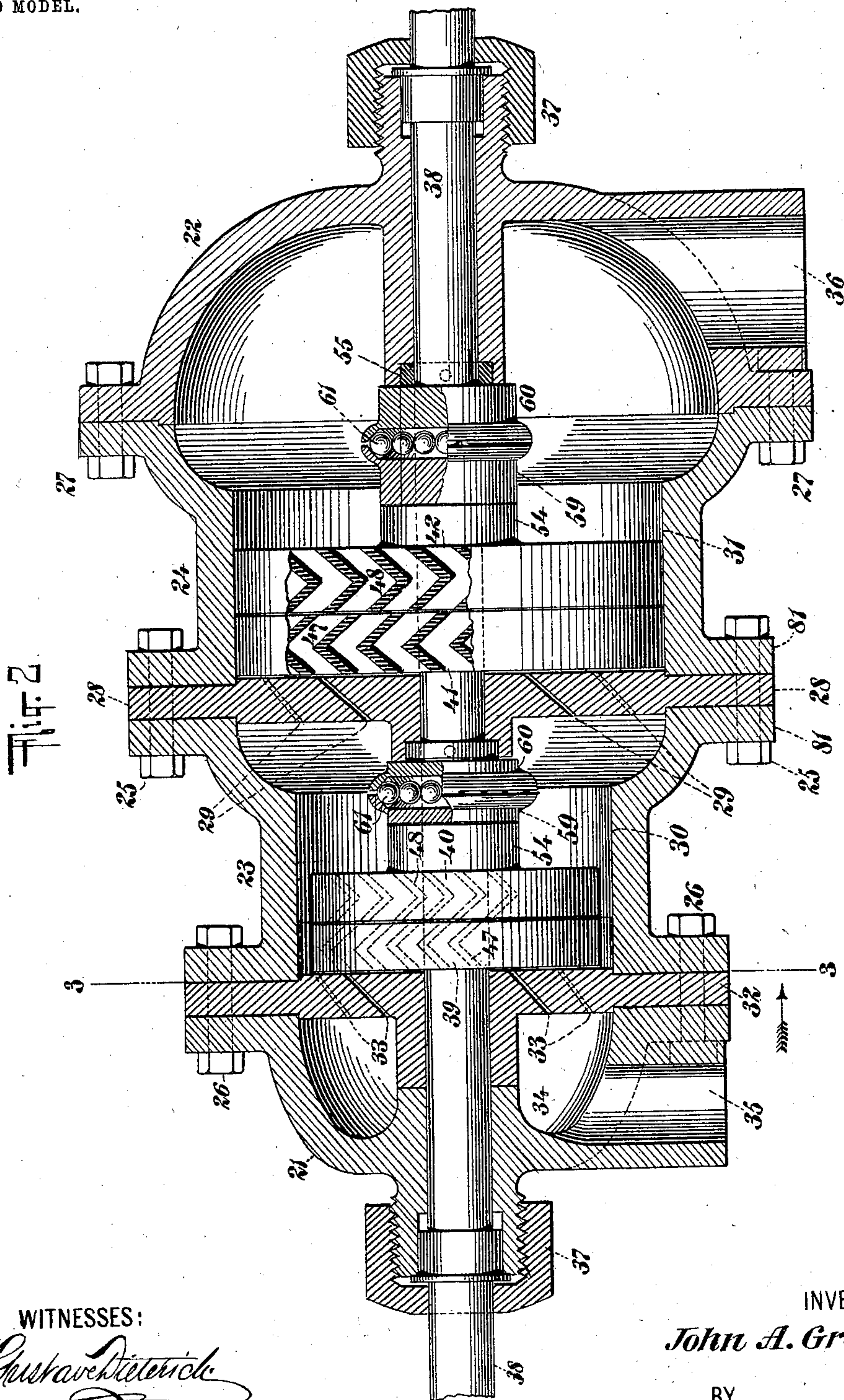
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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

Fig. 3.

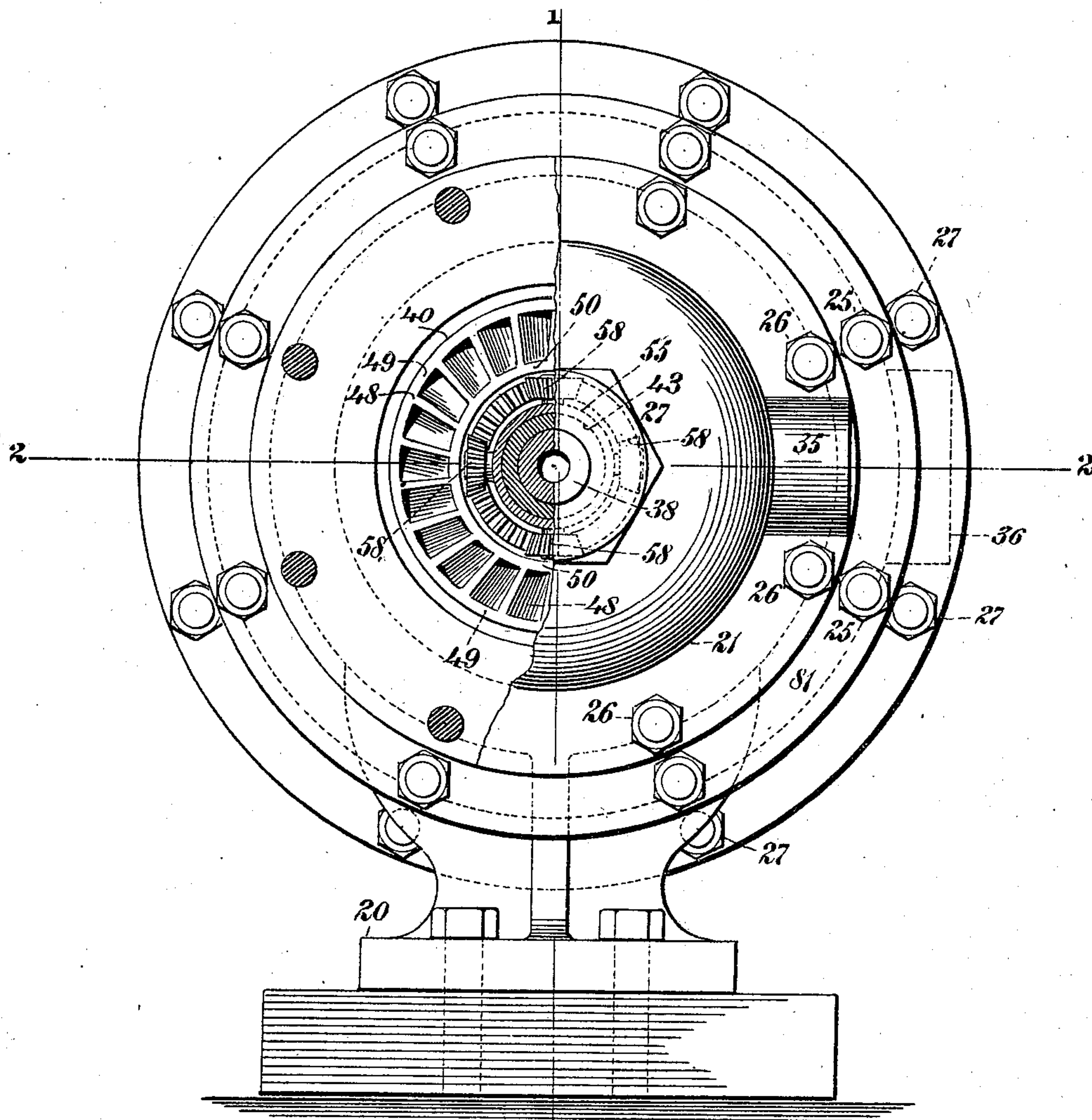
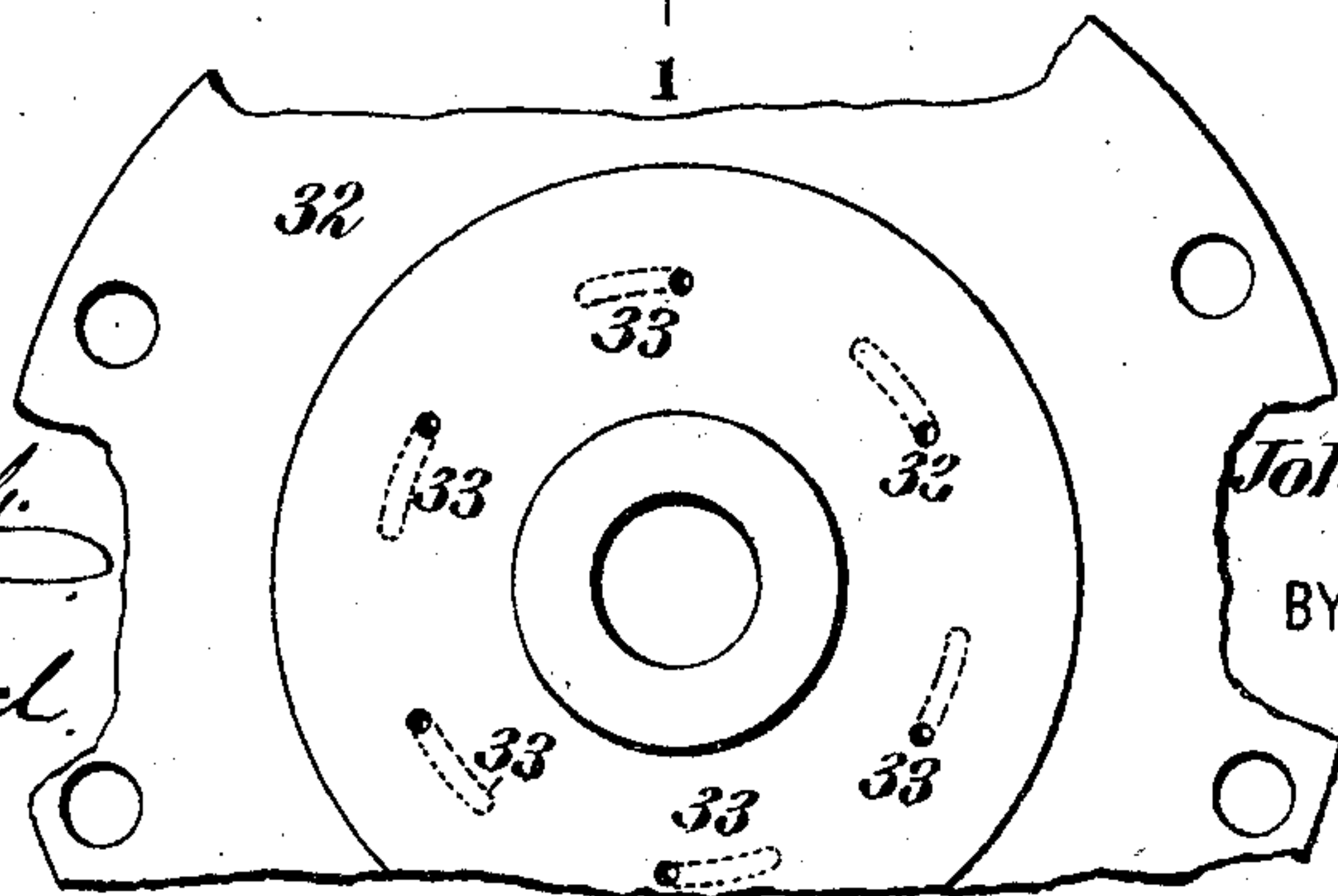


Fig. 4.

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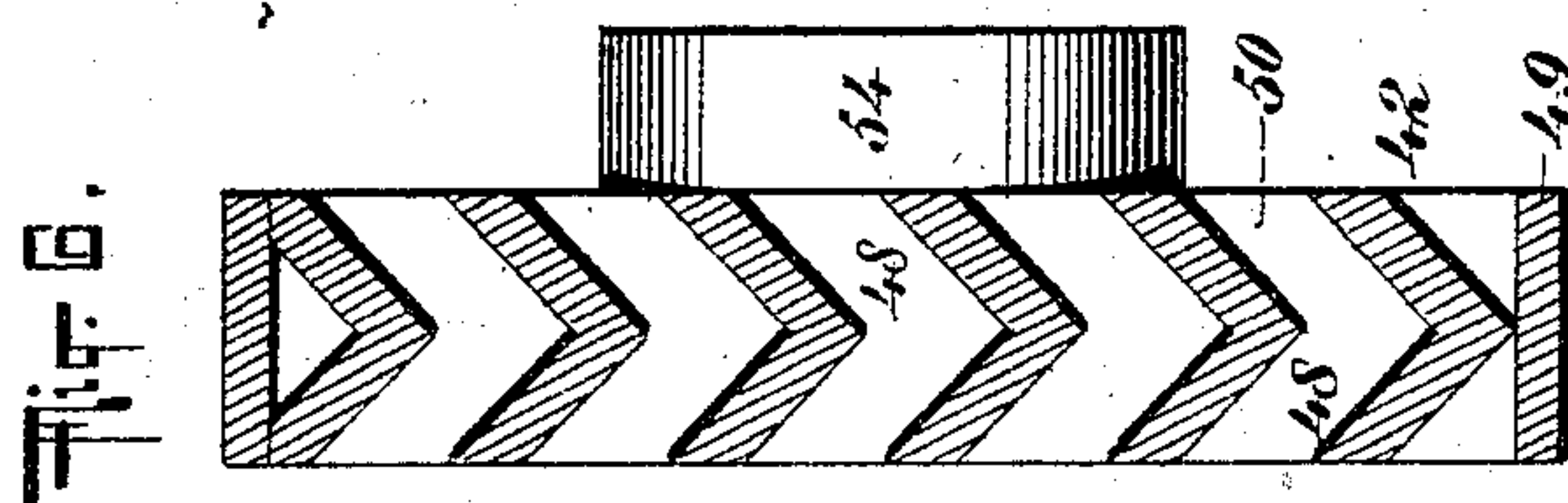
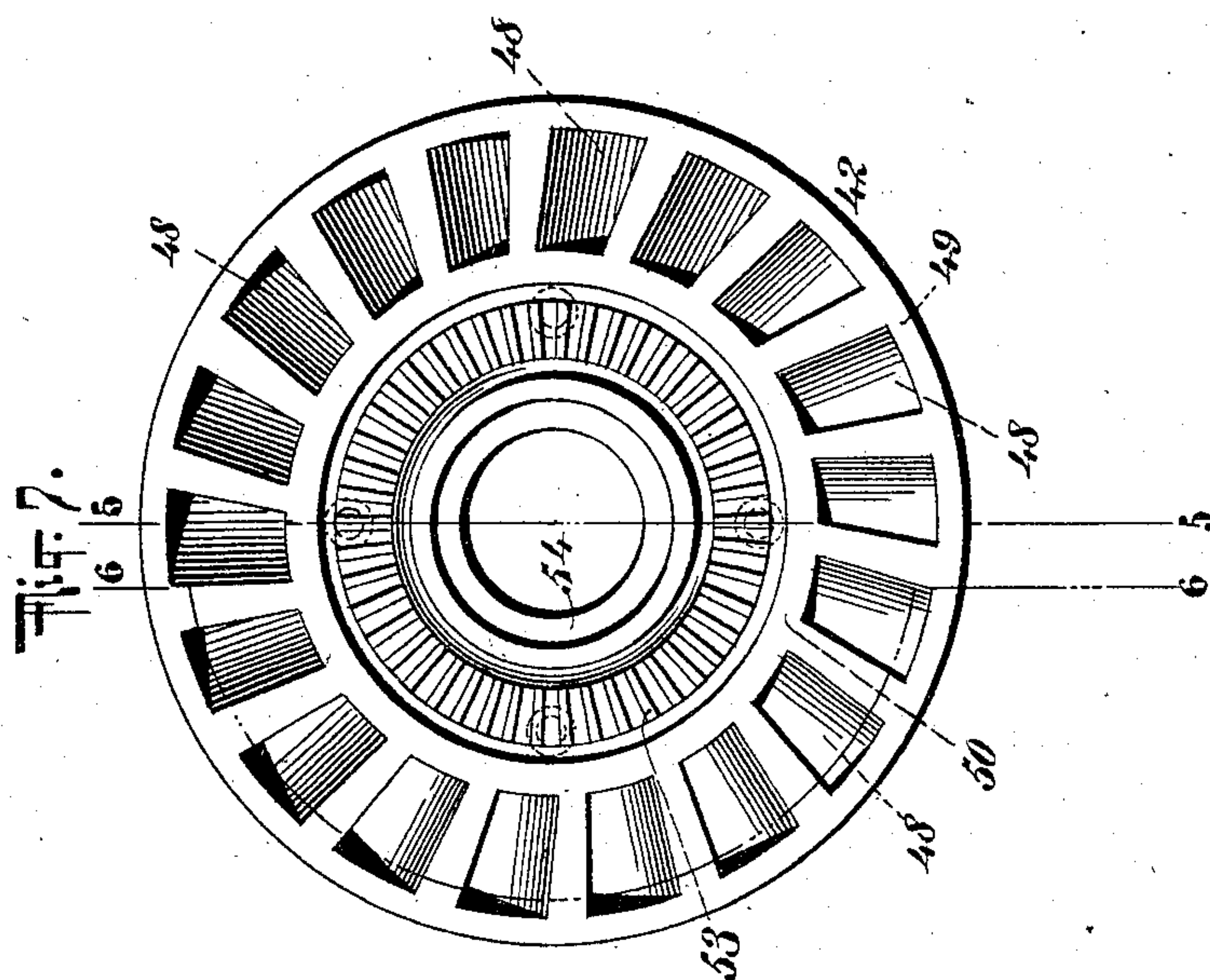
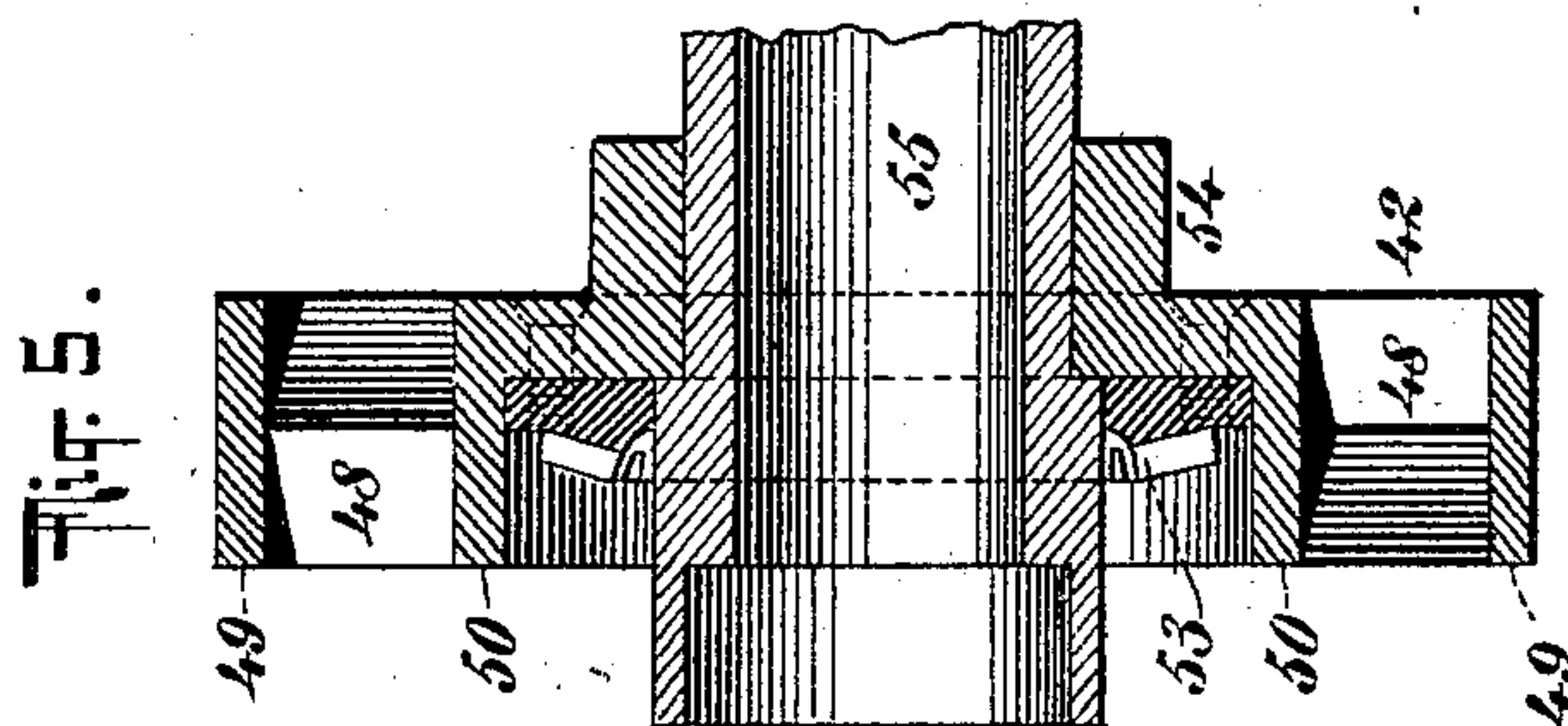
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4 SHEETS—SHEET 4.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

JOHN A. GROSHON, OF NEW YORK, N. Y.

## TURBINE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 725,439, dated April 14, 1903.

Application filed July 21, 1902. Serial No. 116,309. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN A. GROSHON, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Turbine-Engines, of which the following is a specification.

The invention relates to improvements in turbine-engines; and it consists in the novel features, arrangement, and combinations of parts hereinafter described, and particularly pointed out in the claims.

The object of the invention is to produce a comparatively inexpensive form of turbine-engine in which the power may be generated with an economical use of steam.

In carrying my invention into effect I provide an exterior casing through which the shaft to be driven passes, and upon this shaft I provide a series of wheels against which the steam acts on its passage from the source of supply to the exhaust, these wheels being alternately arranged and provided with blades arranged at proper angles for the action of the steam, each alternate wheel being fast upon the said shaft to rotate therewith and the other wheels being free on said shaft and arranged to rotate oppositely to the direction of motion of the said shaft, but to aid in effecting the rotation of said shaft in the proper direction. The exterior casing is rigid and preferably subdivided into a series of compartments or steam-chambers by means of partitions containing ports for the passage of the steam and each compartment or chamber containing two of the aforesaid wheels, one keyed upon the shaft and the other free thereof to rotate in a reverse direction thereto and geared to the wheel which is fast upon the shaft.

The invention will be fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which—

Figure 1 is a central vertical longitudinal section through a turbine-engine constructed in accordance with and embodying the invention. Fig. 2 is a central horizontal longitudinal section of same. Fig. 3 is an end view, partly broken away and partly in section, of same, the sectional portion of Fig. 3 being on the dotted line 3 3 of Fig. 2. Fig. 4 is a de-

tached view, partly broken away, of one of the dividing-partitions of the engine-casing. Fig. 5 is a detached central vertical section on the dotted line 5 5 of Fig. 7 of one of the wheels adapted for reverse rotation on the engine-shaft, this being the right-hand wheel looking at Fig. 1. Fig. 6 is a sectional view of same, taken on the semicircular dotted line 6 6 of Fig. 7; and Fig. 7 is a face view of same.

In the drawings, 20 denotes a suitable supporting frame or base, upon which the exterior casing of the engine is mounted, said exterior casing being rigid and preferably comprising the heads 21 22 and intermediate cylindrical sections 23 24, said sections 23 24 being secured together by bolts 25 and said section 23 having at its outer end the head 21, secured to it by bolts 26, while the outer end of the section 24 has the head 22, secured to it by bolts 27. Between the flanges 81 of the sections 23 24 is securely held, by means of the bolts 25, the partition 28, having a series of ports 29 through it leading from the chamber 30 of the section 23 into the chamber 31 of the section 24. Between the flanges of the section 23 and the head 21 is secured, by means of the aforesaid bolts 26, the partition 32, containing the series of ports 33, leading from the supply-chamber 34 in the head 21 to the aforesaid chamber 30 within the casing 23. The head 21, containing the chamber 34, is provided with a suitable inlet 35, Fig. 2, for the steam, and the chamber within the head 22 is provided with the suitable exhaust-passage 36.

At the outer ends of the heads 21 22 are provided suitable glands 37 for the shaft 38 to be driven, and the said shaft 38 has mounted upon it within the chambers 30 31 the wheels 39 40 and 41 42, respectively, the wheels 39 41 being keyed upon the shaft 38 to rotate therewith and the wheels 40 42 being mounted upon sleeves, as hereinafter described, encompassing and free of said shaft 38 to rotate in a direction reversely thereto. The wheels 39 and 41 are duplicates of each other except as to size, the wheel 41 being the larger, and the wheels 40 42 are duplicates of each other except as to size, the wheel 42 corresponding in size with the wheel 41 and being larger than the wheel 40, which corresponds in size with the wheel 39.



The wheels 39 and 41 each have a hub 43 keyed upon the shaft 38, a vertical flanged portion 44, to which is secured by screws a circular rack or gear-wheel 45, and two horizontal concentric ring portions 46, between which are the V-shaped blades 47, all in series, extending entirely around the said wheels 39 41, respectively, in line with the ports 33 and 29 in the partitions 32 and 28, the purpose being that the steam passing through the said ports 33 29 shall strike the blades 47 of the said wheels 39 and 41 and cause the latter to rotate and drive the shaft 38, the said steam striking the right-hand section of the blades 47 at an angle where said sections join the left-hand sections of said blades, the latter serving to direct the steam to its place of contact against the right-hand sections of said blades, the latter after said contact directing the steam in a reverse direction to the wheels 40 42, whose blades 48 correspond exactly with the blades of the wheels 39 and 41, but are reversely arranged thereto, as illustrated in Fig. 2.

The wheels 40 42 have their blades 48 between the concentric horizontal ring portions 49 50 and are formed with the flange or plate section 51, to which is secured by screws the circular rack or gear-wheel 53, corresponding exactly with the racks or gear-wheels 45, secured to the wheels 39 and 41. The wheels 40 42 have their hubs 54 loosely mounted upon sleeves 55, which are upon but do not turn with the shaft 38, the right-hand end of the sleeve 55 for the wheel 40 (looking at Fig. 1) being pinned to the hub 56 of the partition 28 and the outer end of the sleeve 55 for the wheel 42 being pinned to the hub 57, extending inwardly from the head 22 and encompassing the shaft 38. The inner ends of the sleeves 55 are intermediate the flange-plate portions 44 and 51 of the wheels 39 40 and 41 42, as shown in Fig. 1, and upon the said inner ends of said sleeves 55 are mounted upon pins the rotatable gear-wheels or pinions 58, which engage the racks or gears 45 and 53 of said wheels 39 40 and 41 42, as shown in Fig. 1, the said pinions 58, while capable of rotating, being otherwise stationary with the sleeves 55, which cannot rotate with or upon the shaft 38. The hubs 54 of the wheels 40 42 are capable of rotation upon the sleeves 55 without interfering with the rotation of the wheels 39 41 with the shaft 38, it being the purpose that the wheels 40 and 42 shall rotate in a direction reversely to the direction of motion of the wheels 39 41 and shaft 38.

During the operation of the engine the steam may have a tendency to press the wheels 40 42 toward the right, (looking at Fig. 1,) and hence I interpose between the end of the hub 54 of the wheel 40 and the adjoining end of the hub 56 of the partition 28 and between the end of the hub 54 of the wheel 42 and the adjacent end of the hub 57 antifriction devices comprising in each instance the loose sleeves 59 60, inclosing with-

in a suitable chamber between their facing edges the series of balls 61, so that in the event of undue friction being created the sleeves 59 may turn with the wheels 40 42 and against the balls 61, thereby reducing the friction which otherwise might exist.

The shaft 38 is hollow and communicates by suitable ports, as shown in Fig. 1, with the inner surfaces of the sleeves 55 and 56 and the sleeve or hub portion of the head 21, thereby to lubricate the said shaft and the parts mounted upon or connected with it.

In the drawings I illustrate an engine employing two pairs of the wheels 39 40 and 41 42, but do not limit the invention to the use of two pairs of the said wheels, since one pair of the wheels would embody a portion of the invention, and more than two pairs of the wheels may be employed, if desired, the addition of extra pairs of wheels simply necessitating the addition of additional partitions and sections to the engine-casing. I prefer that each pair of wheels used in the engine may present about double the effective area of the preceding pair of wheels in series and that the chamber 31 shall be about double the cubic area of the chamber 30. In the present instance I provide six ports 33 in the partition 32, while in the partition 28 I provide twelve ports 29 for directing the steam to the wheels 41 42.

In the operation of the engine the steam will be admitted through the passage 35 to the chamber 34, formed by the head 21, and will thence pass through the ports 33 against the inclined blades of the wheel 39, causing the latter to rotate and drive the shaft 38. Upon the steam striking the right-hand portion of the blades of the wheel 39 to effect the rotation of said wheel the steam will by means of said blades be deflected and directed against the right-hand portion of the inclined blades of the wheel 40, with the result that since the blades of the wheel 40 are reversely arranged to the blades of the wheel 39 the wheel 40 will be compelled to rotate in a direction reversely to the direction of motion of the wheel 39 and shaft 38. After the steam strikes and acts upon the blades of the wheel 40 it will by said blades be deflected into the general steam-chamber 30, whence it will pass through the series of ports 29 in the partition 28 and strike the right-hand portions of the blades 47 of the wheel 41, thereby causing said wheel to rotate and communicate its motion to the shaft 38, and after contacting with the right-hand portion of the blades of the wheel 41 the steam will by said blades be deflected and directed against the right-hand portion of the reversely-arranged blades of the wheel 42 and cause said wheel to rotate in a direction reversely to the direction of motion of the wheel 41 and shaft 38, and thereupon the steam leaving the blades of the wheel 42 will pass into the general exhaust-chamber 31, formed in the section 24 of the engine-casing and in the cap 22 at the end of said casing. During the rotation of the wheels



39 and 41 the blades thereof will be carried by the series of ports 33 29, respectively, and all of said blades will be supplied with the steam from said ports, said ports constituting, in effect, nozzles for directing the steam against the blades of said wheels. The oppositely-rotating wheels 40 42 are employed to aid the wheels 39 41 in driving the shaft 38, and this feature of the operation will now be described. The first wheel 39 will while rotating set in motion through its gear 45 the pinion-wheels 58, disposed intermediate the wheels 39 40, and the rotation of these pinion-wheels (said wheels being in mesh with the rack or gear-wheel 53 of the wheel 40) will have the effect of rotating in a reverse direction the said wheel 40, while at the same time the steam which strikes the wheel 40 has the effect of rotating said wheel in its direction of motion reversely to that of the wheel 39. The rotation of the wheel 40 is thus effected, first, by the rotation of the wheel 39 through the intermediate gearing, and, second, by the direct contact of the steam with the blades of said wheel 40, the steam being depended upon to rotate the wheel 40 and the wheel 40 being depended upon to aid, through the intermediate gearing, in driving the wheel 39, so that the power of the wheel 40, though said wheel is traveling reversely to the direction of motion of the wheel 39, may be utilized in aiding to drive the wheel 39 and shaft 38. The motion of the wheel 40 will effect that rotation of the pinion-wheels 58, geared to the same, as will enable said wheels, being geared to the wheel 39, to drive said wheel 39 in its proper direction in motion. The wheels 39 and 40 thus aid each other to have their proper movement, the steam being primarily depended upon to drive the wheels 39 40 in opposite directions and the wheel 39 through the pinions 58 aiding the wheels 40 in their movement, while the wheels 40 through the intermediate gearing communicate their power to the wheels 39 for driving the same.

The wheels 41 42 are geared together in the same manner as the wheels 39 and 40 are geared together, and they operate in the same manner as the wheels 39 40, the wheel 41 aiding in the rotation of the wheels 42 and the power of the wheel 42 being transmitted through the intermediate gearing to the wheel 41 for driving the same. The purpose of increasing the area of the second pair of wheels 41 42 is to enable the steam, although having already acted on the first pair of wheels 39 40, to have the same effective force when applied to the wheels 41 42 as it had when applied to the wheels 39 40. For illustration, if the steam is at one hundred and fifty pounds pressure to the square inch when applied to the wheels 39 40 it will probably have a pressure of seventy-five pounds to the square inch when striking the wheels 41 42, and hence with the decrease of pressure in steam due to its continued use I increase the area of the wheels succeeding the

first pair of wheels in accordance with such decrease of pressure in the steam, whereby I am enabled to effectively use the steam until its force has become exhausted. It will be observed that the chamber 31 is of greater cubic area than the chamber 30, the steam passing from this chamber 30 to the wheels of greater area 41 42. If additional chambers and additional wheels were added to the end of the engine, the chambers and wheels should have an increasing area in series, so that after each use of the steam it would pass into a chamber of larger area than before and engage wheels of larger area than the preceding wheels.

I regard the special construction of wheels 39 40 41 42, having the approximately V-shaped blades, as of great importance owing to their efficiency in use; but I do not limit my invention in every respect to the special construction of the said wheels shown, since within the scope of my invention the form and construction of said wheels may be varied.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The turbine-engine comprising the exterior inclosing casing having the supply and exhaust, and the shaft extending through said casing, combined with the pair of wheels on said shaft within said casing and having the reversely-arranged blades, gearings substantially as described disposed within said casing intermediate and connecting said wheels so that the motion of one wheel may be communicated to the other wheel, and means for directing the steam against the blades of one wheel, whence it will pass to the blades of the other wheel, one of said wheels being fast on said shaft to rotate therewith and drive the same, and the other of said wheels being loose on said shaft to rotate reversely thereto and communicate its motion through said gearing to the said wheel fast on said shaft; substantially as set forth.

2. The turbine-engine comprising the exterior inclosing casing, the shaft, and supply and exhaust for steam, combined with the pair of wheels on said shaft and having the reversely-arranged approximately V-shaped blades, gearing connecting said wheels so that the motion of one wheel may be communicated to the other wheel, and means for directing the steam against the blades of one wheel, whence it will pass to the blades of the other wheel, one of said wheels being fast on said shaft to rotate therewith, and the other of said wheels being loose on said shaft to rotate reversely thereto; substantially as set forth.

3. The turbine-engine comprising the exterior inclosing casing, the shaft, and supply and exhaust for steam, combined with the pair of wheels on said shaft and having reversely-arranged blades, the circular racks on said wheels, the pinion-wheels engaging said racks for transmitting the motion of one wheel to the other wheel, and means for di-



recting the steam against the blades of one wheel, whence it will pass to the blades of the other wheel, one of said wheels being fast on said shaft to rotate therewith, and the other of said wheels being loose on said shaft to rotate reversely thereto; substantially as set forth.

4. The turbine-engine comprising the exterior inclosing casing, the shaft, and supply and exhaust for steam, combined with the pair of wheels on said shaft and having reversely-arranged blades, the circular racks on the facing sides of said wheels, the pinion-wheels confined between said wheels and in mesh with said racks for transmitting the motion of one wheel to the other wheel, a stationary sleeve on said shaft supporting said pinion-wheels, and means for directing the steam against the blades of one wheel, whence it will pass to the blades of the other wheel, one of said wheels being fast on said shaft to rotate therewith, and the other of said wheels being loose on said shaft to rotate reversely thereto; substantially as set forth.

5. The turbine-engine comprising the exterior inclosing casing, the shaft, and supply and exhaust for steam, combined with the pair of wheels on said shaft and having the hub, flange or plate portion, concentric rings and series of blades between said rings, the blades of one wheel being arranged reversely to the blades of the other wheel, the circular racks on the said flange or plate portions of said wheels, the pinion-wheels engaging said racks and confined between said wheels for transmitting the motion of one wheel to the other wheel, a stationary sleeve on said shaft supporting said pinion-wheels, and means for directing the steam against the blades of one wheel, whence it will pass to the blades of the other wheel, one of said wheels being fast on said shaft to rotate therewith, and the other of said wheels being loose on said shaft to rotate reversely thereto; substantially as set forth.

6. The turbine-engine comprising the exterior inclosing casing, the shaft, and supply and exhaust for steam, combined with the pair of wheels on said shaft and having the hub, flange or plate portion, concentric rings and series of approximately V-shaped blades between said rings, the blades of one wheel being arranged reversely to the blades of the other wheel, the circular racks on the said flange or plate portions of said wheels, the pinion-wheels engaging said racks and confined between said wheels for transmitting the motion of one wheel to the other wheel, a stationary sleeve on said shaft supporting said pinion-wheels, and means for directing the steam against the blades of one wheel, whence it will pass to the blades of the other wheel, one of said wheels being fast on said shaft to rotate therewith, and the other of said wheels being loose on said shaft to rotate reversely thereto; substantially as set forth.

7. The turbine-engine comprising the exterior inclosing casing having the supply for steam at one end and the exhaust at the other end, and the shaft extending through said casing, combined with the pair of wheels on said shaft within said casing and having the reversely-arranged blades, gearing within said casing independent of said shaft and directly connecting said wheels so that the motion of one wheel may be communicated to the other wheel, and means for directing the steam against the blades of one wheel, whence it will pass to the blades of the other wheel, one of said wheels being fast on said shaft to rotate therewith and drive the same, and the other of said wheels being loose on said shaft to rotate reversely thereto and communicate its motion through said gearing to the said wheel fast on said shaft; substantially as set forth.

8. The engine comprising the exterior rigid casing, the shaft, and supply and exhaust for steam, combined with a pair of driving-wheels on said shaft within said casing and having reversely-arranged approximately V-shaped blades, one of said wheels being fast on said shaft to rotate therewith and the other of said wheels being loose on said shaft to rotate reversely thereto, means for supplying the steam to the blades of one of said wheels whence it will pass to and act upon the blades of the other wheel, and means for communicating power from the wheel rotating with the shaft to the wheel rotating in an opposite direction and from said oppositely-rotating wheel to the wheel fast on said shaft; substantially as set forth.

9. The turbine-engine comprising the exterior inclosing casing having at one end the supply-chamber for steam and supply-inlet thereto, and at the other end the exhaust-chamber and outlet therefrom, the partition separating said supply-chamber from the general chamber of the engine and having the series of circularly-arranged ports leading from said supply-chamber to said general chamber, and the shaft extending through said casing, combined with the pair of wheels on said shaft in said general chamber close to said partition and having the reversely-arranged blades in line with said ports to receive the steam therefrom, gearing within said casing independent of said shaft and directly connecting said wheels so that the motion of one wheel may be communicated to the other wheel, one of said wheels being fast on said shaft to rotate therewith and drive the same, and the other of said wheels being loose on said shaft to rotate reversely thereto and communicate its motion through said gearing to the said wheel fast on said shaft; substantially as set forth.

10. The engine comprising the exterior rigid casing, the shaft, and supply and exhaust for steam, combined with the series of driving-wheels on said shaft within said casing and having the reversely-arranged ap-



proximately V-shaped blades, the alternate wheels being free on said shaft to rotate oppositely thereto, and the other wheels being fast on said shaft, and all of said wheels being exposed to the action of the steam on its passage from the supply to the exhaust, and means for communicating power from the wheels rotating with the shaft to the wheels rotating in an opposite direction and from said oppositely-rotating wheels to the wheels fast on said shaft; substantially as set forth.

11. The engine comprising the exterior casing, the shaft, the supply and exhaust for steam, and the partitions subdividing the interior of said casing into communicating chambers of increasing cubic area in series toward the exhaust, combined with the wheels in pairs on said shaft in said chambers and having the reversely-arranged blades to be acted on by the steam on its passage to the exhaust for driving said shaft, one wheel of each pair being fast on said shaft to rotate therewith and the other wheel being free on said shaft to rotate reversely thereto, and means for communicating power from the wheels rotating with the shaft to the wheels rotating in an opposite direction and from said oppositely-rotating wheels to the wheels fast on said shaft, said wheels increasing in area toward said exhaust; substantially as set forth.

12. The engine comprising the exterior casing, the shaft, the supply and exhaust for steam, and the partitions subdividing the interior of said casing into communicating chambers of increasing cubic area in series toward the exhaust, combined with the wheels in pairs on said shaft in said chambers and having the reversely-arranged approximately V-shaped blades to be acted on by the steam on its passage to the exhaust for driving said shaft, one wheel of each pair being fast on said shaft to rotate therewith and the other wheel being free on said shaft to rotate reversely thereto, and means for communicating power from the wheels rotating with the shaft to the wheels rotating in an opposite direction and from said oppositely-rotating wheels to the wheels fast on said shaft, said wheels increasing in area toward said exhaust; substantially as set forth.

13. The engine comprising the exterior casing, the shaft, the supply and exhaust for steam, and the partitions subdividing the interior of said casing into communicating chambers of increasing cubic area in series toward said exhaust, said partitions having the series of ports extending directly through them, combined with the wheels in pairs on said shaft in said chambers and having the

reversely-arranged blades to be acted on by the steam on its passage to the exhaust for driving said shaft, one wheel of each pair being fast on said shaft to rotate therewith and the other wheel being free on said shaft to rotate reversely thereto, and means for communicating power from the wheels rotating with the shaft to the wheels rotating in an opposite direction and from said oppositely-rotating wheels to the wheels fast on said shaft, said wheels increasing in area toward said exhaust, and said blades and said ports being in line with each other so that the said ports may direct the steam against a series of said blades; substantially as set forth.

14. The engine comprising the casing, the shaft, the supply and exhaust for steam, and the partitions subdividing the interior of said casing into communicating chambers of increasing cubic area in series toward the exhaust, combined with the driving-wheels in pairs on said shaft in said chambers and having the reversely-arranged blades to be acted on by the steam on its passage to the exhaust, one wheel of each pair being fast on said shaft and the other wheel being free on said shaft to rotate reversely thereto, and means for communicating the power of the reversely-rotating wheels to the said shaft, said wheels increasing in area toward said exhaust; substantially as set forth.

15. The engine comprising the casing, the shaft, the supply and exhaust for steam, and the partitions subdividing the interior of said casing into communicating chambers of increasing cubic area in series toward the exhaust, said partitions having the series of ports extending directly through them, combined with the driving-wheels in pairs on said shaft in said chambers and having the reversely-arranged blades to be acted on by the steam on its passage to the exhaust, one wheel of each pair being fast on said shaft and the other wheel being free on said shaft to rotate reversely thereto, and means for communicating the power of the reversely-rotating wheels to the said shaft, said wheels increasing in area toward said exhaust, and the said ports in said partitions and said blades being in line with each other so that the said ports may direct the steam against a series of said blades; substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 19th day of July, A. D. 1902.

JOHN A. GROSHON.

Witnesses:

CHAS. C. GILL,  
ARTHUR MARION.