No. 757,300. PATENTED APR. 12, 1904.

K. P. HANGL.

ROTARY FLUID MOTOR.

APPLICATION FILED AUG. 18, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

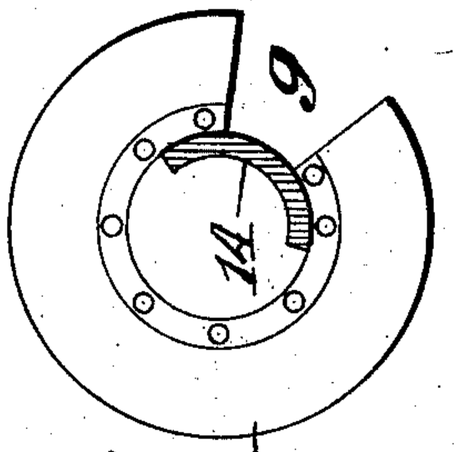

Fig. 4.

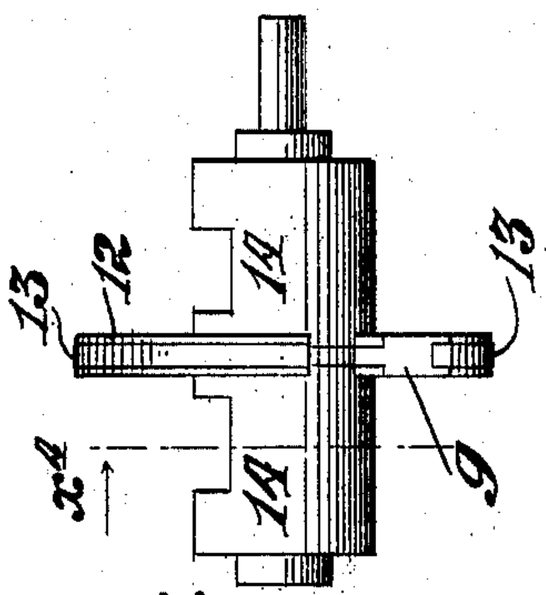

Fig. 5.

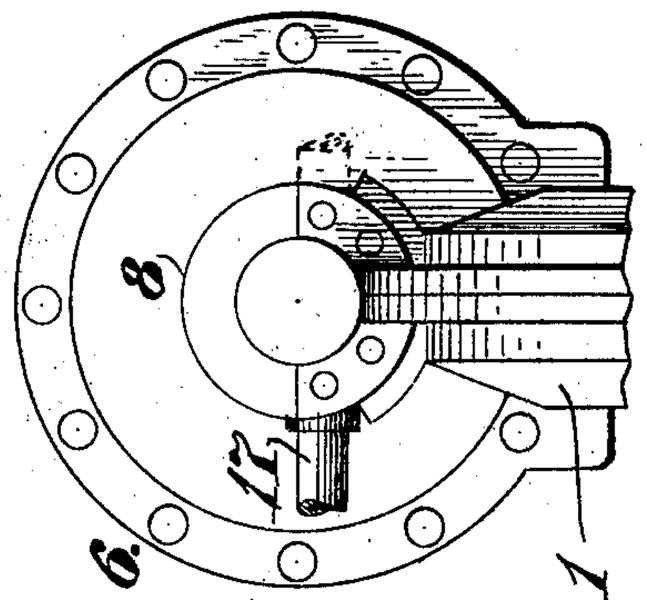

Fig. 6.

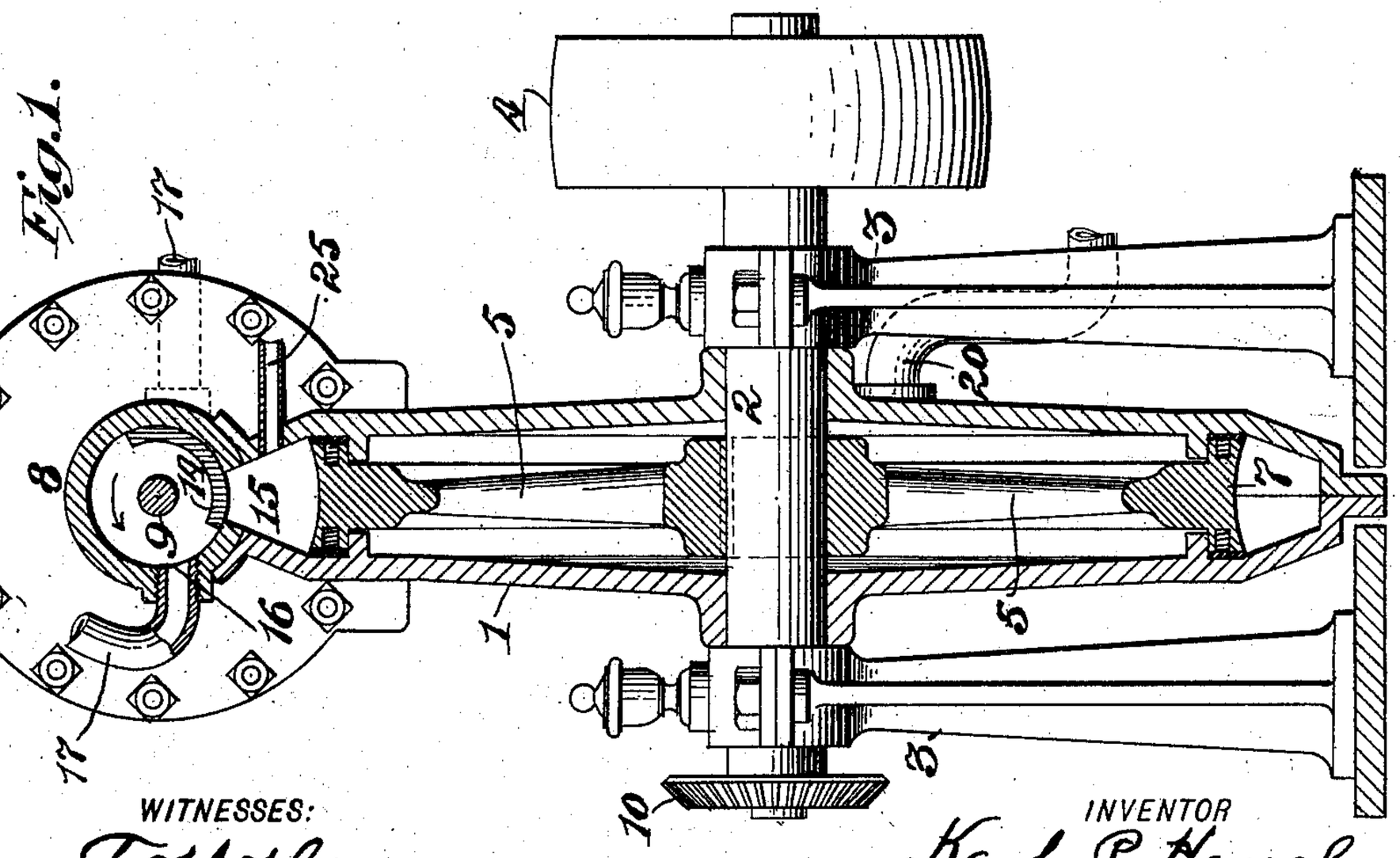

Fig. 1.

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NO MODEL. 3 SHEETS—SHEET 2.

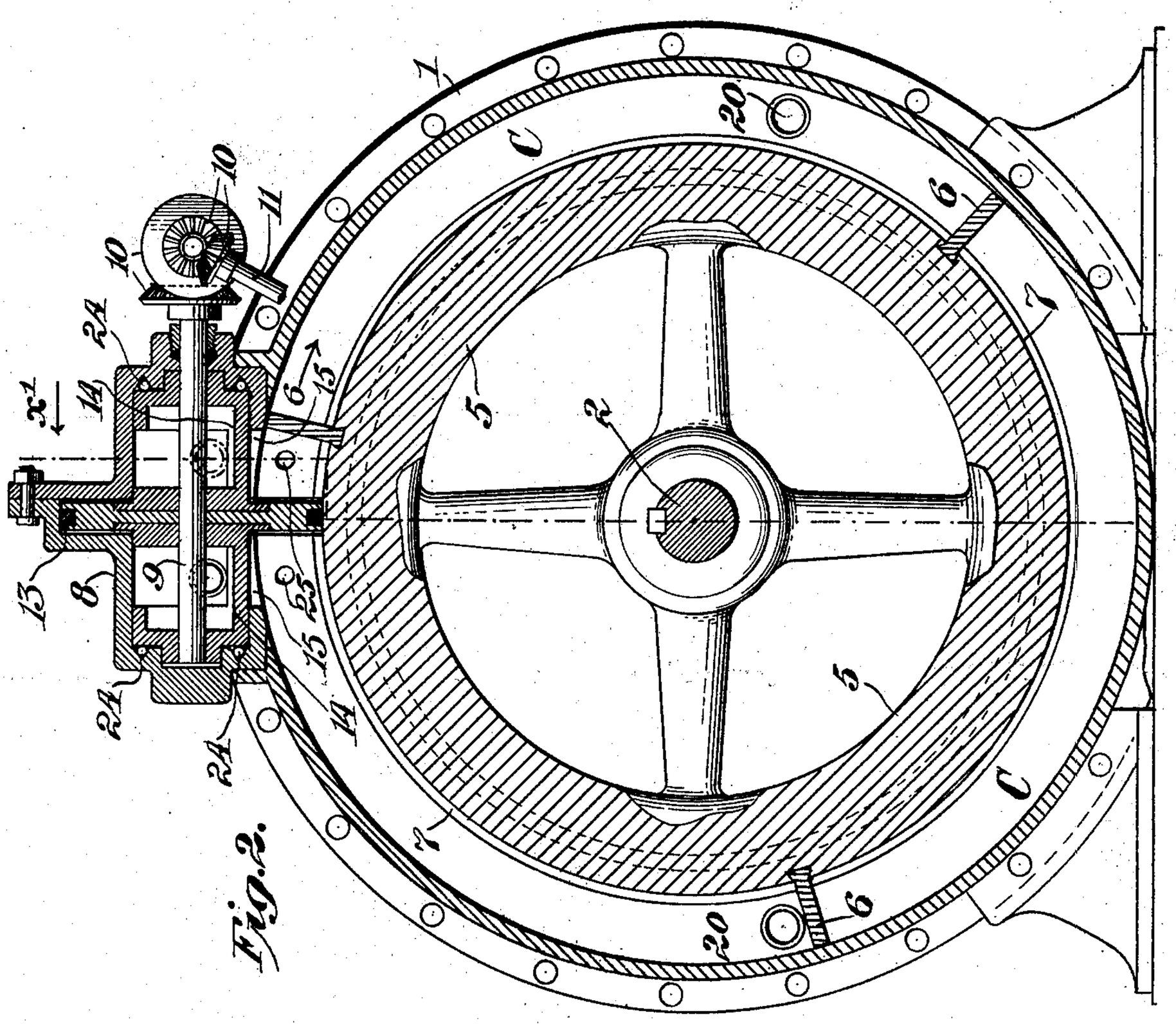

Fig. 2.

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No. 757,300. PATENTED APR. 12, 1904.

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ROTARY FLUID MOTOR.

APPLICATION FILED AUG. 18, 1903.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 2.

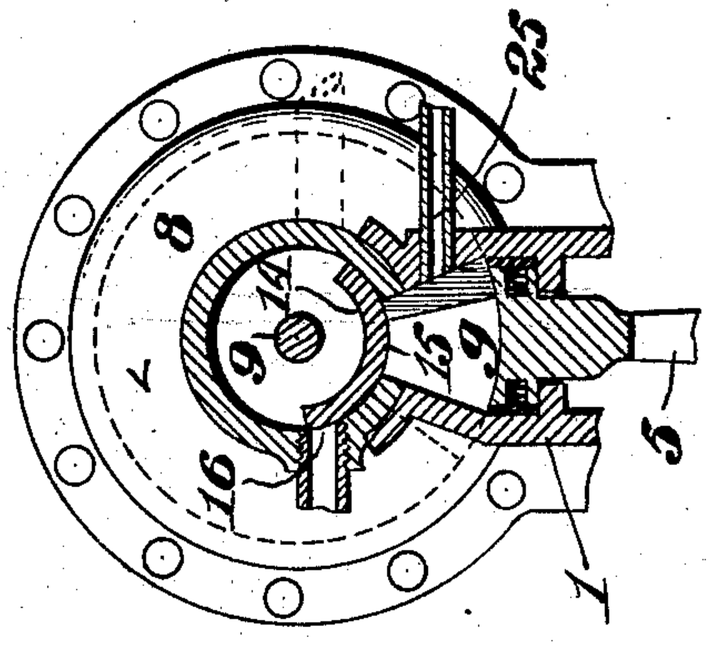
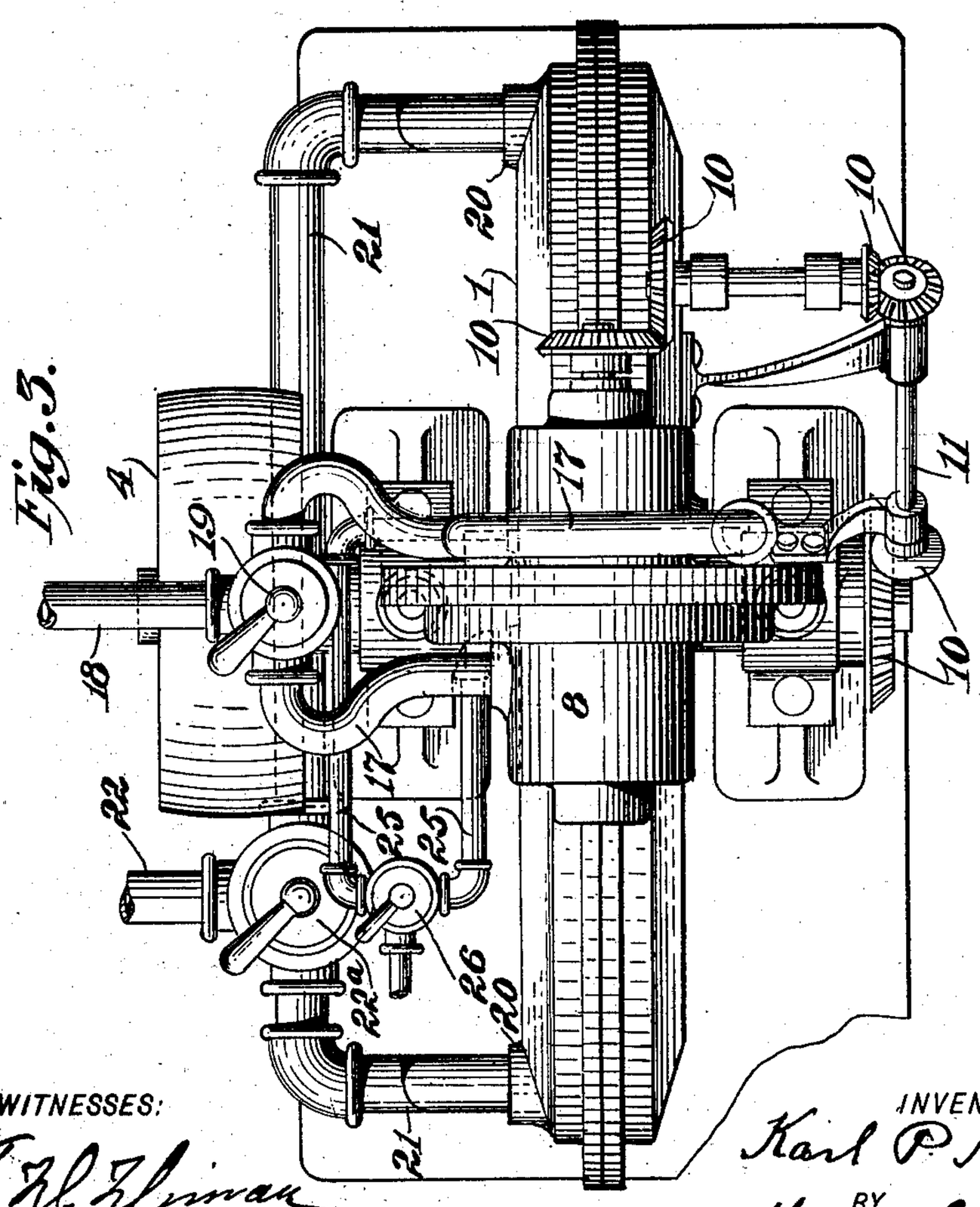


Fig. 3.



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No. 757,300. Patented April 12, 1904.

UNITED STATES PATENT OFFICE.

KARL P. HANGL, OF NEW YORK, N. Y.

ROTARY FLUID-MOTOR.

SPECIFICATION forming part of Letters Patent No. 757,300, dated April 12, 1904.

Application filed August 18, 1903. Serial No. 169,927. (No model.)

To all whom it may concern:

Be it known that I, KARL P. HANGL, residing in the borough of the Bronx, in the city and State of New York, have invented certain new and useful Improvements in Rotary Fluid Motors, of which the following is a specification.

This invention relates to a motor operatable by an elastic fluid, as steam, and to that class of such motors wherein the pressure of the fluid is applied in a tangential direction on radial piston-blades carried by a disk or wheel fixed on a shaft to be driven, the pistons or piston-blades traveling in an annular chamber in the motor-casing.

The main purpose of the invention is to provide improved means for operating the elastic fluid expansively, improved means for providing an abutment to take behind each succeeding piston before the fluid is admitted to the chamber of the motor behind the active piston, and improved means for reversing or driving the motor-shaft in either direction at will.

In the accompanying drawings, illustrating an embodiment of the invention, Figure 1 is a diametrical section in substantially the plane indicated by line x' in Fig. 2. Fig. 2 is a mid-section taken at right angles to the plane of the section of Fig. 1. Fig. 3 is a plan of the motor. Figs. 4 and 5 are views of the connected abutment and valves detached, the former being a section at x^4 in Fig. 5. Fig. 6 is a fragmentary edge view of the motor, showing the end of the valve-chest. Fig. 7 is a sectional fragmentary view similar to Fig. 1, but showing the valve in another position.

1 designates a fixed casing or frame.

2 is the motor-shaft extending through the casing and rotatively mounted in bearings 3 3.

4 is a pulley on the shaft for transmitting the motion of the latter.

5 is a disk or wheel keyed on the motor-shaft within the casing, and 6 designates the piston-blades or pistons fixed radially in the rim 7 of said wheel and traversing the annular motor-chamber C in the casing exterior to the rim of the carrying wheel or disk.

All of the above features may be found in existing types of rotary motors in some form.

In the construction shown there are three pistons 6, disposed at uniform distances apart about the rim of the wheel 5 and adapted by the rotation of said wheel to be brought successively into position to be acted upon by the elastic fluid or steam; but there may be any number of such pistons, this feature being governed in some degree by the diameter of the wheel 5 or rotating piston-carrier. Obviously where such pistons are brought successively into operative position there must be a displaceable abutment provided to move out of the path of the oncoming piston and to close in behind it, so that the steam may be admitted between said abutment and piston, and the means shown herein for this purpose will now be described in connection with the valve mechanism employed for admitting and cutting off the steam.

In the upper part of the annular steam-chamber C is an opening over which is mounted on the casing a valve-chest 8 of general cylindrical form, the axis of the chest being tangential to the wheel 5. Mounted rotatively in said chest and extending lengthwise of the same is a shaft 9, and this shaft is driven from the main shaft 2 through gear-wheels 10 and an oblique shaft 11. The shaft 9 is so geared as to make three rotations to one rotation of the main shaft, for the reason that there are three pistons. Fixed on the shaft 9 is an abutment-disk 12, the periphery of which carries a suitable packing-ring 13, which bears all around in the central enlargement of the valve-chest and also in the concave periphery of the wheel-rim 7, which latter is turned out to fit the disk 12. This disk 12 serves as a partition to cut the steam-chamber C during the main portion of its rotation; but it has in it a gateway g of truncated sectoral form, (see Fig. 4,) which is of such dimensions that when brought to register with the steam-chamber (which latter has a similar form in cross-section) it provides an open way or gate for the pistons to pass the abutment.

The abutment 12 divides the interior of the valve-chest 8 into two like chambers, in each of which is a valve 14, mounted on the shaft 9. These valves are alike and control, respectively, ports 15, which allow steam to flow from the chambers of the chest to the cham-

ber C at the respective sides of the abutment. These valves also control ports 16, which admit steam through branches 17 from a steam-supply pipe 18, Fig. 3. A multiple-way cock or throttle-valve 19 controls the flow of steam, being adapted to cut it off from the motor altogether or permit it to pass to either end of the valve-chest, as desired. The valves 14 each consists, as herein shown, of a segment of a cylinder having a width sufficient to close both the inlet steam-port and the outlet steam-port at the same time, as seen in Fig. 7.

20 designates the two exhaust-ports from the chamber C. These ports connect, as here shown, by branch pipes 21 with a main exhaust-pipe 22, the exhaust being controlled by a two-way valve 22ª, which connects the pipe 22 with either of said branches 21. This latter feature, however, is not essential to the invention, as the exhaust may be taken away in any manner desired.

The operation will be readily understood. Suppose that steam be admitted to the valve-chest at the right-hand end as the parts are seen in Fig. 2. It enters between the abutment and the adjacent piston at the right thereof and drives the latter to the right, as indicated by the arrow at the piston. The rotation of the piston-wheel rotates the motor-shaft, and through the intermediate gearing the abutment-disk and valve are rotated. After the piston shall have traveled to a predetermined extent under the influence of the steam at full pressure the latter is cut off at port 16 by the valve 14, and the continued movement of the piston will be under the influence of expanded steam. As the piston nears the end of its effective stroke, which will include nearly one-third of its entire travel, it opens the exhaust part way. At this moment the abutment moves the gateway *g* therein into coincidence with the piston-path, and as the operative piston passes the exhaust-port and the end of the first third of its entire movement the next following piston passes the gateway, and the abutment closes behind it. The following piston now becomes the operating-piston, and when it shall have advanced far enough to uncover the port 15 the valve 14 will have moved far enough to open said port and admit steam behind the operative piston and between it and the abutment. If it be desired to reverse the motion or run the motor in the opposite direction, it is only necessary to admit the steam to the opposite end of the valve-chest and to open the exhaust on that side.

As it will require a measurable portion of time for the gateway *g* to move into position for the passage of the next following piston, it is necessary that the operating-piston shall uncover the exhaust before it quite reaches the end of one-third of its full travel, and during this brief period the motor is carried by the momentum of the parts or by a suitable fly-wheel. It is preferred, however, in practice to employ two or more of these motors fixed on the same shaft and having their operative parts so set that while the piston of one is on the dead-point that of another will be under pressure of steam. This is merely operating the motors in a gang and will require no illustration. Obviously, also, the motor would be fully operative without the means for reversing herein shown.

The intermediate mechanism whereby the motor-shaft drives the valve-shaft may be of any known kind, and it will of course be so constructed as to impart to the valves the proper rotative speed.

In order to economize space, it is preferred to employ an abutment 12 of moderate size with but one gateway *g* and to drive it at a speed equal to that of the motor-shaft multiplied by the number of pistons on the rotating carrier. The abutment has a pressure on it tending to drive the shaft 9 and valves endwise, and in order to lessen the friction there may be balls 24, Fig. 2, at the outer ends of the respective valves running in ball-tracks in the valve-chest.

The gateway *g* in the abutment 12 will be a little wider than the piston, so as to permit the piston to move through while the abutment is rotating. The point of cut-off of the steam will be regulated by the lead of the valve, and in starting the engine it will be set in motion by hand or with a lever in case the valve should not be open.

The "dead" or inactive piston which is following next after the active piston will tend to compress air in the chamber C between said inactive piston and the abutment 12, and to avoid this air-outlets 25 are provided, one at each side of the abutment, and these are or may be controlled by a two-way cock 26, so as to open the proper air outlet or port and close the other. Obviously any simple petcock would serve to control the air-port, but the single cock is most convenient.

Having thus described my invention, I claim—

1. A rotary motor, having an annular chamber, a rotating piston-carrier provided with radial pistons movable through said chamber, a main shaft driven by the piston-carrier, a valve-chest mounted on the said chamber, a valve mounted rotatively therein and controlling the inlet and outlet ports for the fluid, mechanism between the main shaft and said valve for rotating the latter, and an abutment-disk rotating with said valve and having a gateway for the passage of the pistons, said abutment having its axis of rotation at right angles to the axis of the motor-shaft and its periphery so disposed as to rotate fluid-tight across the concave surface of the piston-carrier.

2. A rotary motor, having an annular chamber, a rotating piston-carrier provided with

radial pistons movable through said chamber, a main shaft driven by the piston-carrier, a valve-chest mounted on said chamber, two like connected valves mounted rotatively in said chest and controlling, respectively, inlet and outlet port-passages in the chest, an abutment-disk between and rotating with said valves, and having a gateway for the passage of the pistons, said abutment and valves having their common axis of rotation at right angles to the axis of the motor-shaft and the abutment having its periphery disposed to rotate fluid-tight across the concave surface of the piston-carrier, and means for controlling the admission of the fluid to the valve-chest at either side of said abutment.

3. In a rotary motor, a casing having in it an annular chamber C, a main shaft concentric with said chamber, a piston-carrier 5, fixed on said shaft and having a concave rim 7 forming one wall of the chamber C, pistons 6 secured in said rim 7, and adapted to travel through the chamber C, a valve-chest 8 mounted on the casing and connected with the chamber by parts 15, a shaft 9 rotatively mounted in said chest at right angles to the axis of the motor-shaft, a disk-like abutment 12 fixed on said shaft, said abutment having in it a gateway *g* and bearing about its periphery on the inner surface of the chest and on the concave rim of the piston-carrier, two valves 14 and the shaft 9 in said chest at the respective sides of said abutment and controlling the supply of fluid to the motor, means for driving the shaft 9 from the motor-shaft, and means for admitting fluid to the chest at either side of the abutment at will.

In witness whereof I have hereunto signed my name, this 12th day of August, 1903, in the presence of two subscribing witnesses.

KARL P. HANGL.

Witnesses:

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WILLIAM J. FIRTH.