

No. 673,290.

Patented Apr. 30, 1901.

J. P. RUNKEL.
ROTARY ENGINE.

(Application filed Oct. 22, 1900.)

(No Model.)

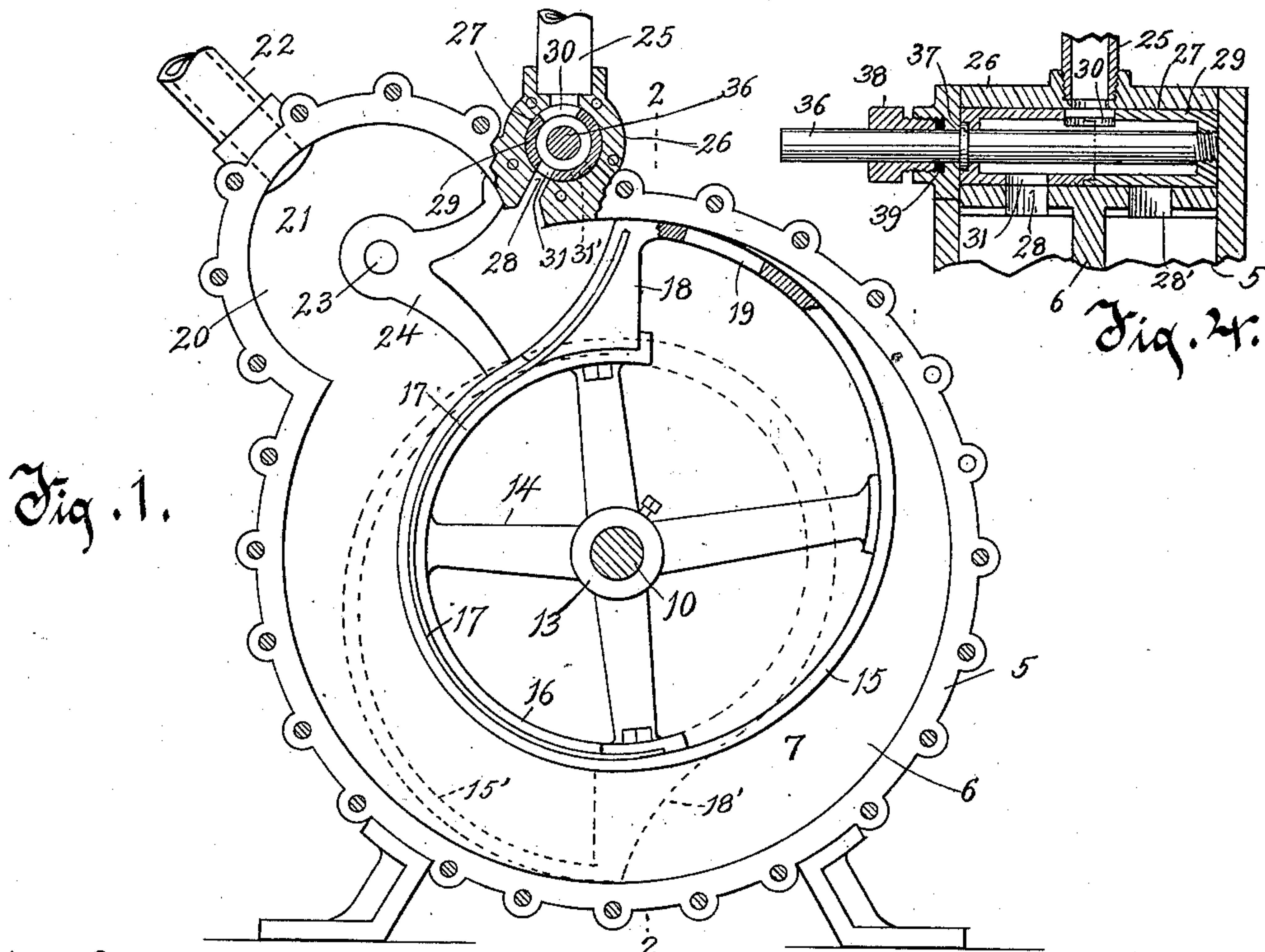


Fig. 1.

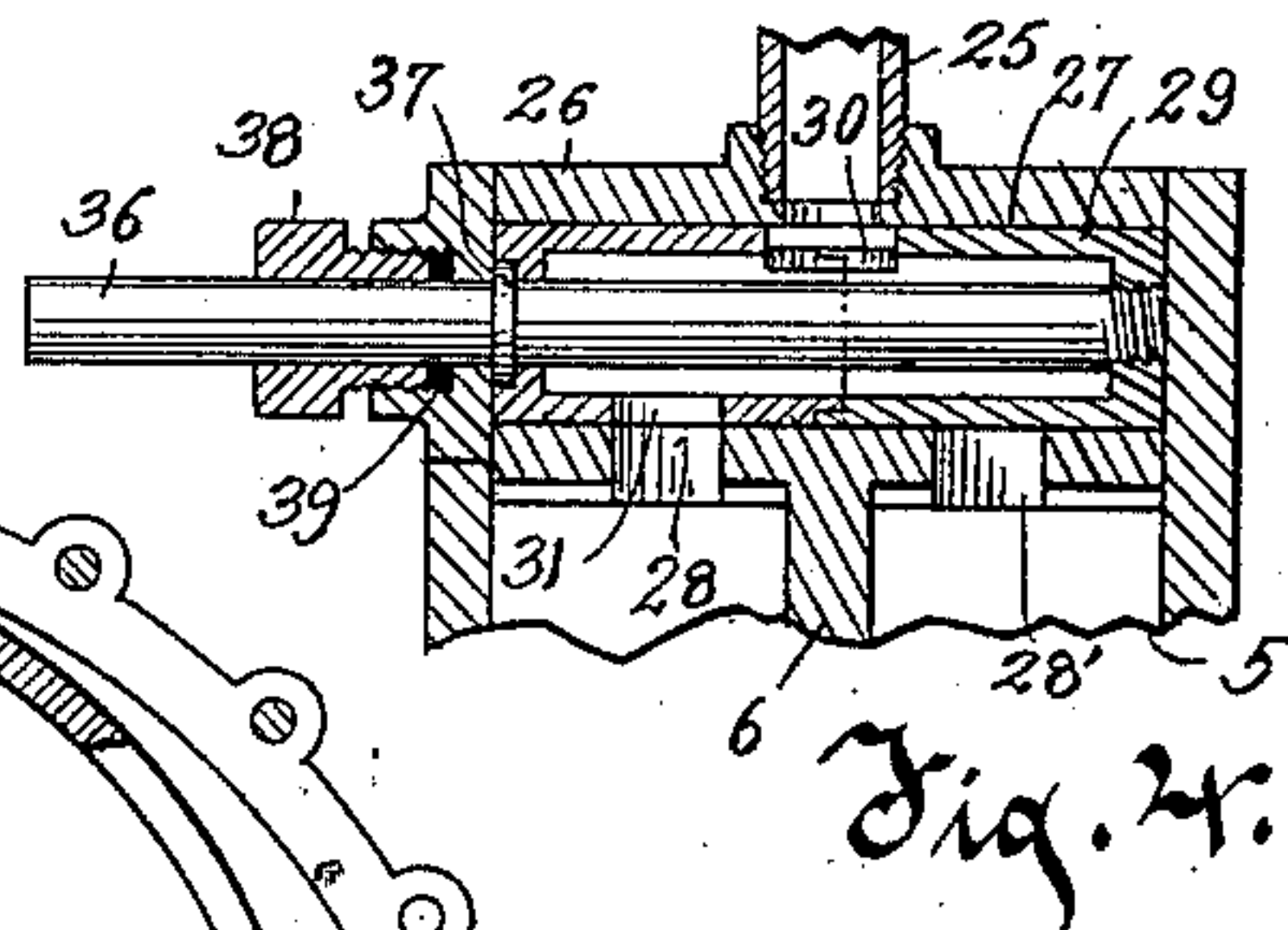


Fig. 4.

Fig. 3.

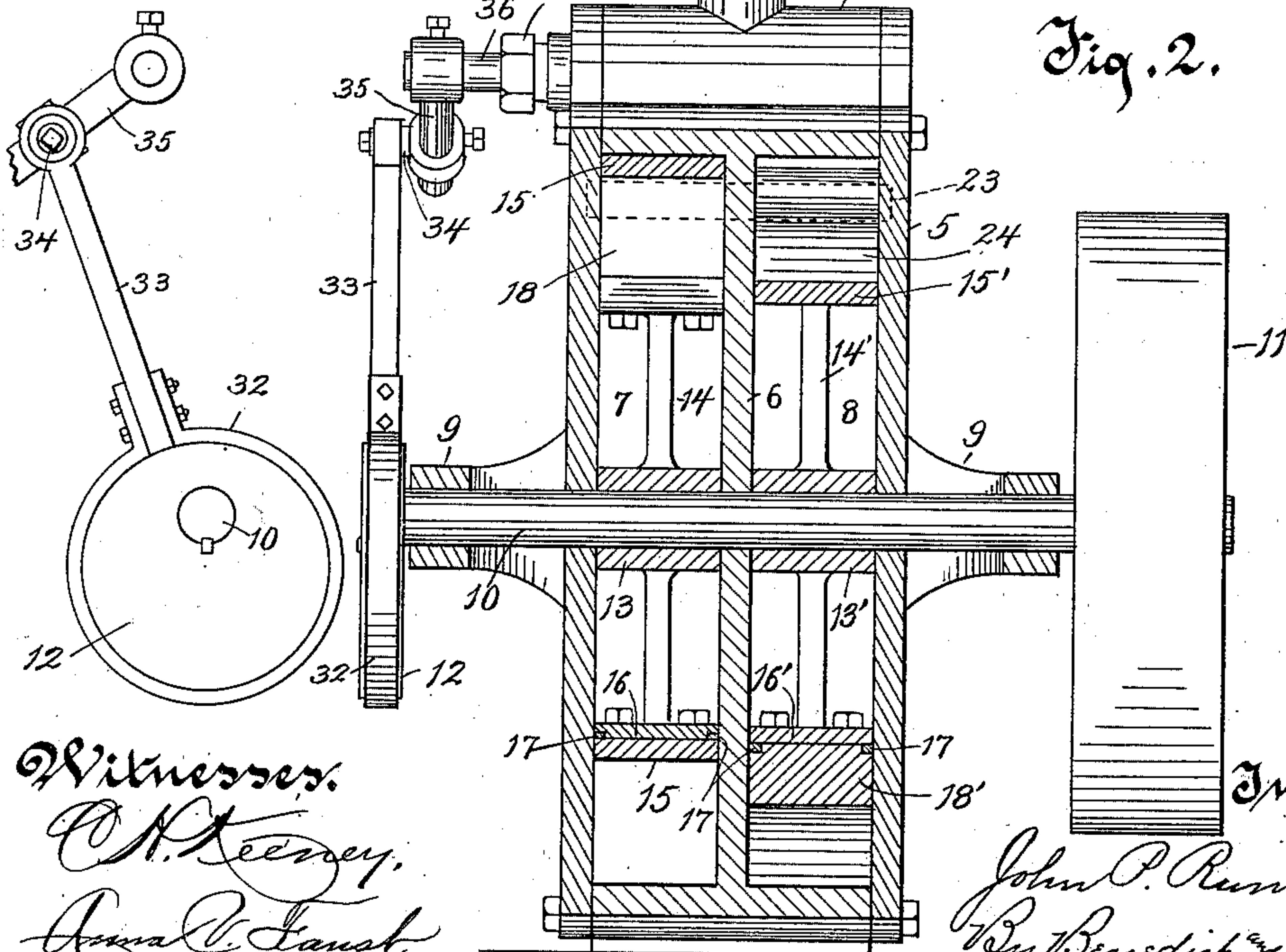


Fig. 2.

Witnesses:

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UNITED STATES PATENT OFFICE.

JOHN P. RUNKEL, OF MILWAUKEE, WISCONSIN.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 673,290, dated April 30, 1901.

Application filed October 22, 1900. Serial No. 33,859. (No model.)

To all whom it may concern:

Be it known that I, JOHN P. RUNKEL, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a new and useful Improvement in Rotary Engines, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention has relation to improvements in rotary engines.

The object of the invention is to provide an improved form of rotary engine which shall be efficient in operation and combine simplicity in construction with inexpensiveness of production.

With the above and other incidental objects in view the invention consists of the devices and parts or their equivalents, as hereinafter set forth.

In the accompanying drawings, Figure 1 is a side elevation of the invention with one side piece of the casing removed and parts broken away. Fig. 2 is a transverse section on the line 2 2 of Fig. 1. Fig. 3 is a detail of the eccentric and its connections, and Fig. 4 is a longitudinal section of the valve mechanism.

Referring to the drawings, the numeral 5 indicates the casing of the engine, composed, as usual, of the two side pieces and the connecting annular rim. The casing is divided centrally by a partition 6 into two chambers 7 and 8, respectively. Mounted in the side pieces of the casing and also journaled in bearings 9 9, extending laterally from the side pieces, is a main shaft 10. On one end of this shaft is mounted a large belt-wheel 11, around which a belt (not shown) is passed for the purpose of transferring the rotation of the main shaft to the mechanism to be operated. On the opposite end of the shaft is an eccentric disk 12.

Mounted fast upon the main shaft in the respective chambers 7 and 8 of the casing are hubs 13 13', from which radiate, respectively, spokes 14 14'. It will be noticed from the drawings that one spoke of each set is projected outwardly a greater distance than the other spokes of the set, so that the rims 15 15', to which the spokes radiate, are given the form of cams—that is to say, a portion of the rim of each wheel is in a true circle, while

the remaining portion thereof is in the form of a spiral curve, said spiral formation continuing to the point where the spiral curve contacts with the rim of the casing. These rims could be connected directly to the spokes; but I prefer to connect the three short spokes of the sets by segments 16 16'. The rims 15 15' surround and are secured to these segments and have packings 17 interposed therebetween. From points where the rims 15 15' connect with the outer rim of the casing they are projected inwardly at an angle to form abutments 18 18', which abutments extend to and connect with the segments 16 16' and are on a slightly-inward curve, as clearly shown in Fig. 1.

The rims 15 15' are each provided with an opening 19, which allows any steam which may get inside thereof to escape into the space between its outer surface and the inner side of the casing.

Extending from the upper portion of the casing 5 and in communication with the interior of said casing is an exhaust-steam chamber 20, which is divided into two separate compartments by means of a dividing-partition 21, one of said compartments being in communication with the chamber 7 of the casing and the other compartment being in communication with the chamber 8 of the casing. Both of the compartments of the steam-chamber 20 are in communication with a common discharge or exhaust pipe 22.

Pivoted upon a common pivot-pin 23 are steam-gates 24, said gates each having two arms extending therefrom, one arm being longer than the other. The long arms of these gates extend to and bear against the rims 15 15' and the short arms against the inner side of the rim of the exhaust-chamber 20.

The inlet-steam enters the casing through an inlet-pipe 25, leading into a valve-casing 26, which is formed by an upward projection from the upper portion of the main casing 5. This valve-casing is provided with a longitudinal circular opening 27, with which the inlet-pipe is in communication. This longitudinal opening is in communication with the chambers 7 and 8 of the main casing by way of ports 28 28', said ports adapted to feed the steam into the space between the crotch

formed by the arms of the steam-gates 24 on one side and the abutments 18 18' on the other side.

The numeral 29 indicates a tubular valve 5 arranged within the longitudinal opening 27 of the valve-casing. This valve is provided with a wide port 30 on its upper side and with two narrow non-aligned ports 31-31' on its under side, which are adapted to be brought alternately into registration with the ports 28 28'.

Any desirable means may be provided for rocking the valve; but I prefer to provide an eccentric-strap 32, which has extending therefrom an arm 33, said arm having a short stud 15 34 projecting at an angle from the upper end thereof, said stud being formed at its outer end with a collar in which the lower end of a rod 35 is adjustably held by means of a set-screw. The upper end of the rod is also provided with a collar in which the outer end of the valve-stem 36 is adjustably held by means of a set-screw. As the valve-stem is connected to the valve, it is obvious that as the main shaft 10 is rotated a rocking motion will be 25 imparted to the valve-stem by reason of the described connection from the eccentric, and this rocking motion will alternately throw the ports 31 31' into registration with the ports 28 28'.

In order to provide for conveniently adjusting the ports 31 31' when the machine is first put together, I prefer to form the valve of two sections, said sections being united by a rabbet-joint, as clearly shown. After the proper 35 adjustment is obtained in order to hold the sections firmly together the valve-stem is extended through the bore of the valve, and the inner end of said stem is connected by a thread with the inner end of the valve. The stem is 40 also formed or provided with a shoulder 37, which bears firmly against the outer end of the valve. A stuffing-nut 38 surrounds the valve-stem and screws into a threaded boss projecting from the valve-casing. The nut 45 is adapted to be turned against a packing 39 in order to prevent leakage. This construction also permits the valve to be adjusted at any time, so that the position of the ports 31 31' may be changed to admit either a full 50 quantity of steam or a less quantity. This is accomplished merely by turning the valve-rod slightly on its thread.

In the position of the parts shown in the accompanying drawings the ports 31 and 28 are 55 in registration, and hence the steam which passes through the pipe 25 is free to flow through said registering ports and into the chamber 7 in the space formed between the abutment 18 and the crotch of the gate 24. 60 As the leg of the gate which bears against the rim 15 is longer than the other leg of the gate, the steam-pressure against said long leg will only tend to press the end of the leg more firmly against said rim 15, and consequently 65 said gate is held immovably and fixedly. The expansive power of the steam will act against the abutment 18 and cause a rotation of the

rim 15, which rotation, of course, will be communicated to the spokes 14 and to the main shaft 10. When the abutment 18 is in the 70 position shown in Fig. 1, the other abutment 18' is in the position indicated by the dotted lines in Fig. 1. Now with the continued rotation of the shaft the abutment 18' will be brought into registration with its exhaust- 75 compartment of the exhaust-chamber 20, and the moment the abutment passes clear of the rim of the casing 5 the steam back of the abutment 18' will be free to enter the exhaust-chamber and exhaust out of the pipe 22; also, 80 as the larger portion of the circle of the rim 15' begins to act on the long arm of the gate said arm will be swung outwardly, so as to permit the rim 15' to complete its revolution and permit the abutment 18' to arrive at the 85 position which the abutment 18 occupies in Fig. 1, and by this time the eccentric-strap will have so acted as to shift the ports 31 31', so that the ports 31' and 28' are in register, and hence the abutment 18' will then be acted 90 upon by the steam. At the time the abutment 18' is taking steam then the abutment 18 is in the position which the abutment 18' is shown as occupying by the dotted lines in Fig. 1. In this manner a continuous rotation 95 is imparted to the main shaft, the chambers 7 and 8 alternately taking steam and the separate compartments of the exhaust-chamber 20 alternately exhausting steam.

It will be understood that the port 30 in the 100 upper portion of the valve is sufficiently elongated to always take the inlet-steam notwithstanding the change of the position of the valve by reason of the rocking thereof.

The important feature of my invention resides in the peculiar construction of the 105 wheels—i. e., the rims thereof having a spirally-curved portion, which spiral is continued to the point of contact with the rim of the casing, and an abutment connecting the 110 point of contact with that portion of the rim of the wheel which is of considerably less curvature, whereby an abrupt shoulder is formed, the preferred specific construction being the formation of substantially one-half 115 of the rim in the arc of a true circle and the remaining portion in a spiral. By the peculiar construction described I am enabled to provide the abrupt abutments 18 18', and at the same time the construction does not form 120 an unduly-contracted space for the exhaust-steam between the rim of the wheel and the casing, a portion of said space having the full width between the rim of the casing and the portion of the rim of the wheel which is of 125 less circumference. Furthermore, when the steam drives one of the wheels around there is, owing to the gradually-increasing circumference of the spiral portion of the rim, no straight abutment on the exhaust side to 130 retard the rotation of the wheel by back pressure, whereby each wheel is permitted to revolve with the slightest possible retarding influence. The increasing periphery of each

wheel also effects the gradual turning of the steam-gate, thereby avoiding the noise which would occur if the gate were opened suddenly or with violence.

5 While my improved engine mechanism is preferably of the double form herein shown and described, yet I do not wish to be understood as limiting myself thereto, inasmuch as only a single casing-chamber 7 or 8 and a
10 single rim 15 or 15' and related parts could be employed and successful results obtained without departing from the spirit and scope of my invention. Also while I have herein described steam as the medium for causing
15 the rotation of the engine, yet I do not wish to be understood as confining myself thereto, inasmuch as any other suitable agent may be employed in lieu thereof.

What I claim as my invention is—

20 1. In a rotary engine, the combination of a casing having an exhaust-chamber in communication therewith, a main shaft mounted in the casing, a wheel mounted on the shaft, the rim of said wheel having a gradually-in-
25 creasing arc or circle extending to a point of contact with the rim of the casing, and provided with an abutment extending inwardly from the contacting point at an angle and connecting with a portion of the rim of its
30 wheel which is of considerable less arc, thereby providing an abrupt shoulder, a pivoted gate provided with two arms one longer than the other, the long arm bearing against the
35 the casing, and means for introducing an actuating agent into the space between the crotch of the gate and one side of the abutment.

2. In a rotary engine, the combination of
40 a casing divided into two interior chambers, said chambers having exhaust-chambers in communication therewith, a main shaft mounted in the casing, wheels mounted on said shafts and located, respectively, in the
45 chambers of the casings, the rim of each wheel having a gradually-increasing arc or circle to a point where it contacts with the rim of the casing, and provided with an abutment extending inwardly from the contacting point
50 at an angle and connecting with the portion of the rim of its wheel which is of a considerably-less arc, the abutment of each wheel located at opposite points of the respective wheels, thereby providing abrupt shoulders

at said opposite points, pivoted gates for each 55 casing-chamber, each gate provided with two arms, one longer than the other, the long arm bearing against the rim of the wheel relating thereto, and the short arm bearing against the casing, and means for alternately intro- 60 ducing an actuating agent into the spaces between the crotches of the gates and the sides of the abutments.

3. In a rotary engine, the combination of a main casing having an exhaust-chamber 65 in communication therewith, a main shaft mounted in the casing, a wheel mounted on the shaft, the rim of said wheel being in the form of a cam and provided with an abutment connecting the highest point of the cam 70 with the lowest point thereof, the edge of the abutment which faces the inlet portion of the casing being on an inward curve, a pivoted gate provided with two arms one longer than the other, the long arm bearing against the 75 rim of the wheel and the short arm against the casing, and means for introducing an actuating agent into the space between the crotch of the gate and one side of the abutment. 80

4. In a rotary engine, the combination of a casing having an exhaust-chamber in communication therewith, a main shaft mounted in the casing, a wheel mounted on the shaft, a portion of the rim of said wheel being in 85 the form of a true circle, and the remaining portion of said wheel being in the form of a spiral curve, the spiral curve continuing to a point where it contacts with the rim of the casing, and provided with an abutment ex- 90 tending inwardly from the contacting point at an angle, and connecting with the portion of the rim which is in the form of a true circle, thereby providing an abrupt shoulder, a pivoted gate provided with two arms, one 95 longer than the other, the long arm bearing against the rim of the wheel and the short arm against the casing, and means for introducing an actuating agent into the space between the crotch of the gate and one side of 100 the abutment.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN P. RUNKEL.

Witnesses:

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