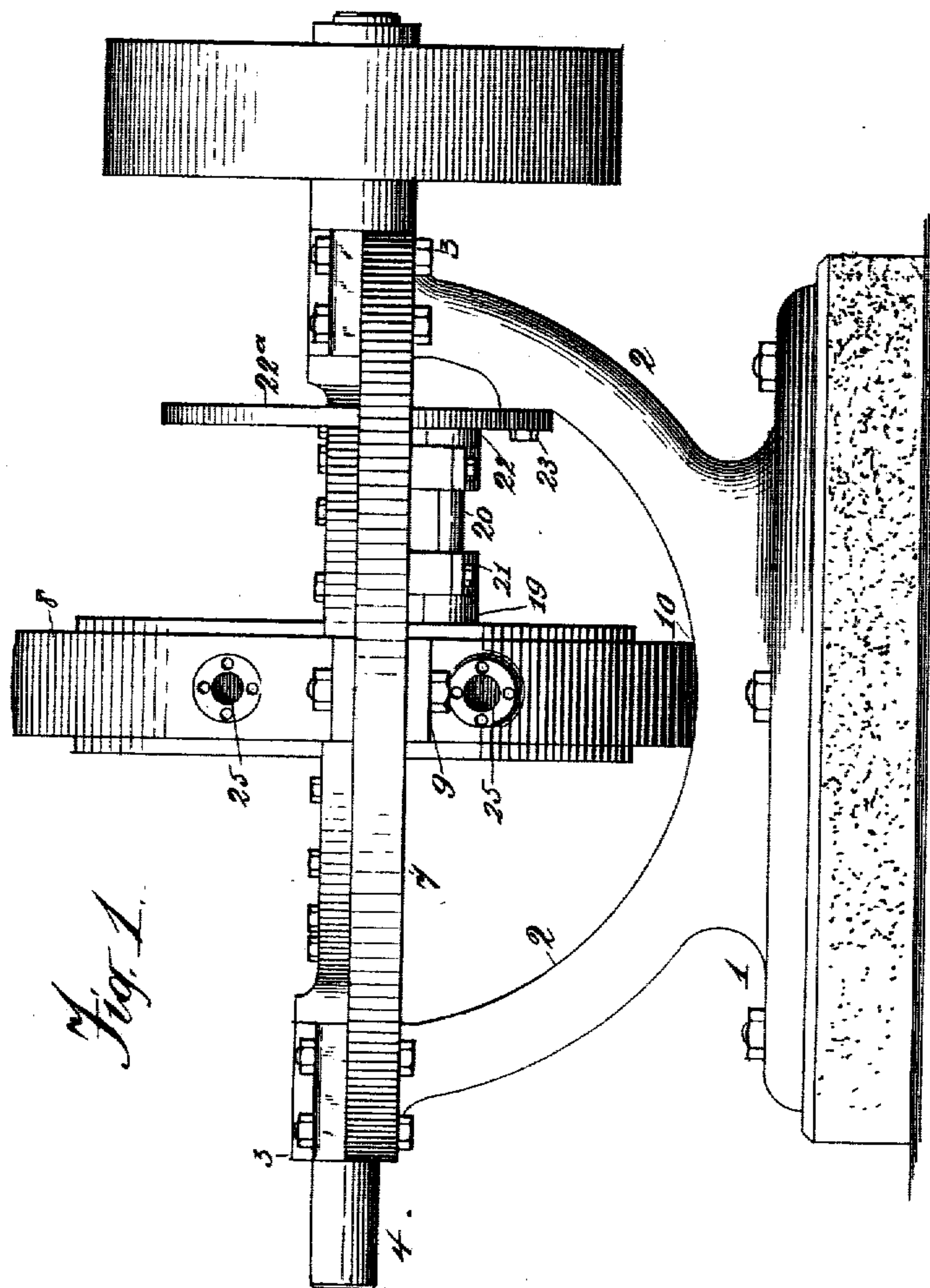


No. 814,018.

PATENTED MAR. 6, 1906.

E. J. CHRISTIE.
ROTARY ENGINE.
APPLICATION FILED OCT. 7, 1904.

4 SHEETS—SHEET 1.



Witnesses

W. F. Kubiček
L. A. St. John

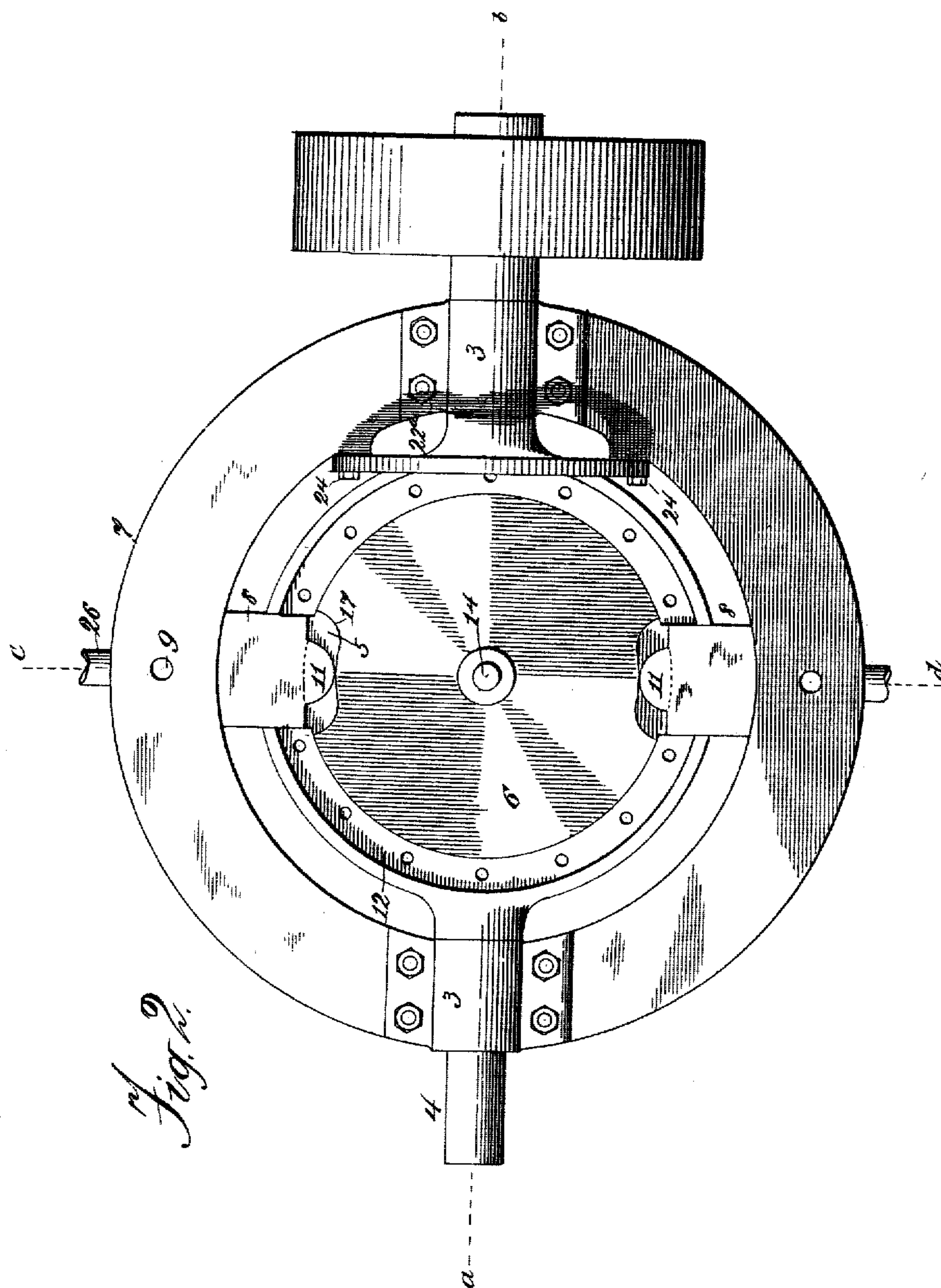
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4 SHEETS—SHEET 2.



Witnesses
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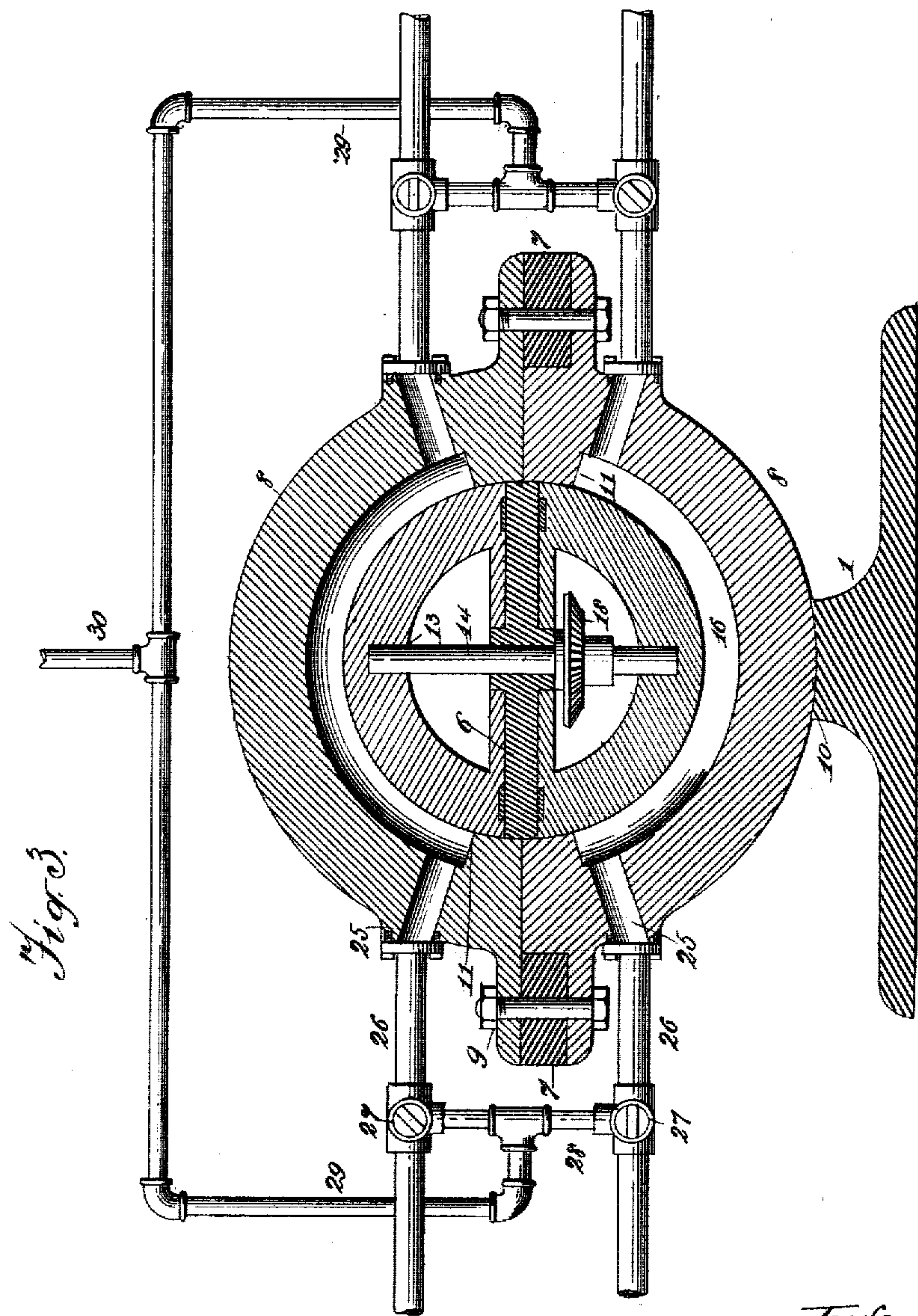
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4 SHEETS—SHEET 3.



Witnesses.

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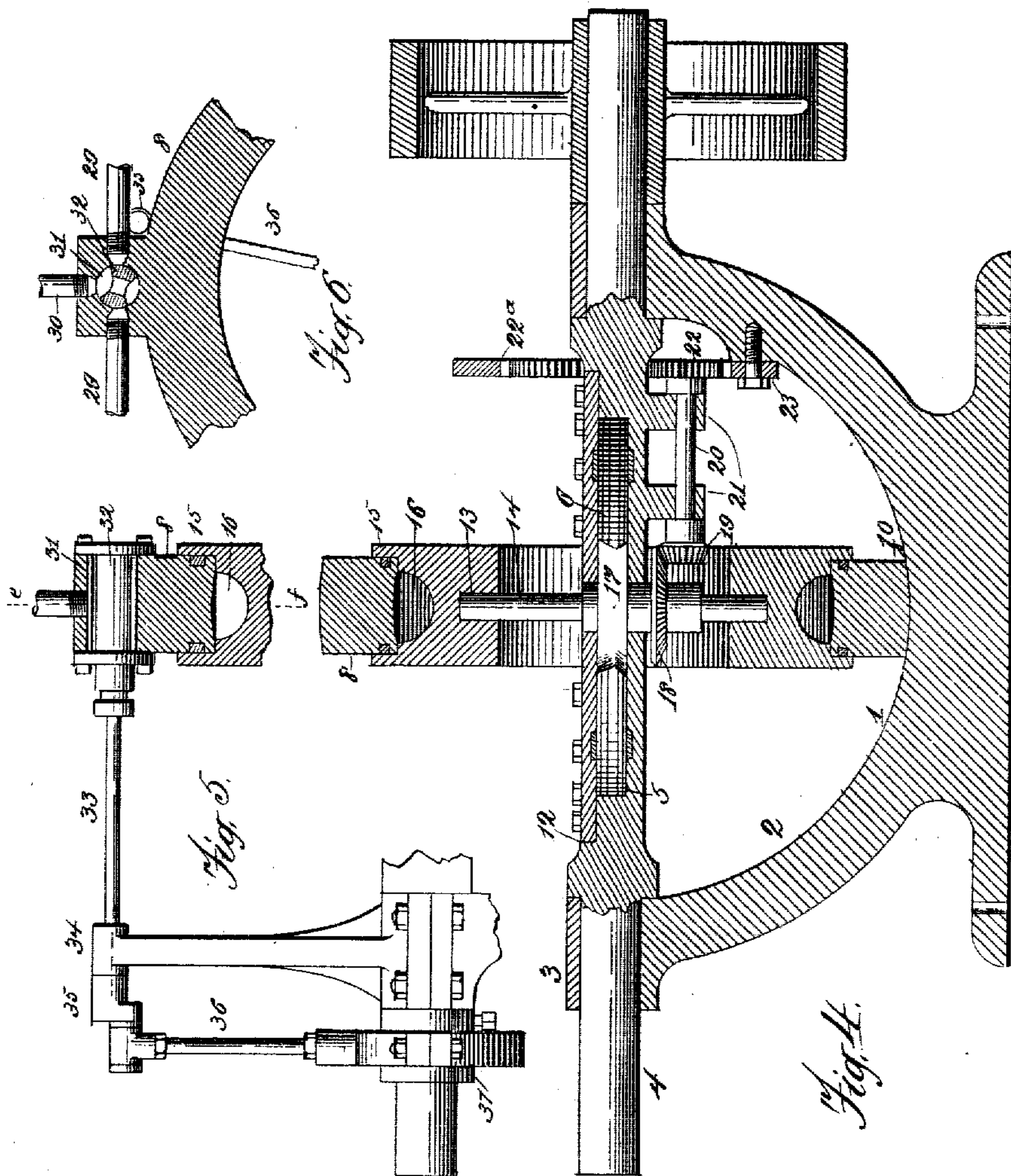
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ROTARY ENGINE.

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4 SHEETS—SHEET 4.



Witnesses

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UNITED STATES PATENT OFFICE.

ELZA J. CHRISTIE, OF MARION, IOWA, ASSIGNOR TO SARAH J. CHRISTIE,
OF MARION, IOWA.

ROTARY ENGINE.

No. 814,018.

Specification of Letters Patent.

Patented March 6, 1906.

Application filed October 7, 1904. Serial No. 227,616.

To all whom it may concern:

Be it known that I, ELZA J. CHRISTIE, a citizen of the United States, residing at Marion, in the county of Linn and State of Iowa, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

The object of this invention is to produce a rotary engine in which a positive circular motion is given to the moving parts and cams or the like interruptive parts are avoided with a view to securing high speed, smooth running, and great efficiency.

The nature of the invention will clearly appear from the description and claims following, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of an engine embodying my improvements without the steam connections. Fig. 2 is a top view of the same. Fig. 3 is a section of the same with steam connections in the line *c d* of Fig. 2. Fig. 4 is a section of the engine in the line *a b* of Fig. 2. Fig. 5 is a fragmentary view illustrating an auxiliary cut-off partly in the same section as Fig. 4. Fig. 6 is a section through the cut-off valve in the line *e f* of Fig. 5.

The engine embodies the principle of a rotating member connected with or forming a part of the main shaft, a circular steam-chest in continuous engagement therewith, and another member against which the pressure of the steam is exerted mounted in said rotating member in a plane parallel to its axis and made to positively revolve in said plane. The peculiar manner in which this principle is practically applied will now be described.

In the drawings, 1 is a base-casting having diverging arms 2 provided with bearings 3 to take the main shaft 4. In practice this main shaft is preferably a casting and in the middle expands to form a circular seat 5 for a disk 6 mounted to revolve therein. For convenience this casting may be called the "driver." The base-casting terminates at the top in a ring 7, which greatly strengthens the curved arms 2, but is mainly useful as a convenient support and means of attachment for the annular steam-chest 8, bolted in halves thereto at 9 and preferably resting on the base at 10. At opposite points this steam-chest ring is provided with inwardly-projecting abutments 11, which form a double

backing for the steam, as will be shown presently.

Fitted to the steam-chest ring is an annular steam-receiver forming a part of the driver. One half of it is a component part of the same casting as that containing the main shaft, the other and corresponding half being bolted to it in an annular recess 12 formed therein. These parts form bearings at 13 for the shaft 14, to which the disk 6 is secured. At the outside they have annular flanges 15 to fit nicely against the sides of the steam-chest ring and are provided with a circumferential groove 16, which for convenience, in milling to a steam fit on the abutments may be semicircular in cross-section, as shown.

At opposite sides the steam-disk 6 is provided with gaps 17 of suitable size to permit the disk to pass the abutments while revolving continuously, the length of the gaps depending on the width and length of the abutments and the speed of revolution of the disk as compared with the driver. A positive rotation is imparted to the disk by a system of gears. (Illustrated in Figs 1, 2, and 4.) To the disk-shaft is secured a bevel-gear 18, which meshes with a bevel-pinion 19, secured to a shaft 20, mounted in bearings 21 at one side of the driver. At the outer end of this shaft is a spur-pinion 22, meshing with an internal gear 22^a in the form of a ring bolted to the base at 23 and 24. The ratio must of course be such as to bring the gaps in the disks in register with the abutments as the driver and disk revolve in planes perpendicular to each other.

In the steam-chest ring, each side of the abutments are steam-ports 25, communicating with pipes 26, which in an engine adapted for reverse movement may be either steam-pipes or exhaust-pipes at will, according to an arrangement shown in Fig. 3. In this each pipe is provided with a three-way valve 27, connecting in pairs at each end by a cross-pipe 28 and each communicating by a pipe 29 with a common steam-pipe 30. In Fig. 3 it will be understood that the diagonal valves permit the flow of live steam to the engine, while those parallel with the pipes allow for free exhaust.

The engine is shown on the dead-center. In this position steam admitted to it would of course blow straight through it; but if the

driver be turned a few degrees the disk will pass the abutments and cut across the groove 16, its outer edge running in close contact with the curved inner face of the ring 8. A pressure-chamber is thus formed between the abutment and the advancing disk at each side of the engine, and the pressure of steam therein serves of course to revolve the driver. An engine composed of these simple elements would operate, though not with the best efficiency, as there would be leakage each time the disk passed the abutments. With a view, however, to showing the engine "reduced to the lowest terms" and claiming it in its simplest form this construction has been shown in the principal figures of the drawings. In Figs. 5 and 6, however, is illustrated a simple cut-off designed to prevent this leakage by cutting off the admission of steam while the disk is passing the abutments. At some suitable place—the top of the steam-chest ring, for example—is formed a valve-seat 31, and in this is fitted a valve 32, preferably of the oscillating type. The stem 33 of this valve passes through an outer bearing 34, and its crank 35 connects by a suitable rod 36 with an eccentric 37 on the main shaft. By properly setting the eccentric on the shaft the valve may be made to open only when the disk is intermediate of the abutments. By shifting the eccentric on the shaft the engine would be reversed, the three-way valves being correspondingly shifted.

No attempt has been made herein to show detail of steam-packing, link mechanism for reversing, or other purely-mechanical features, the aim being to set forth in simple form what is believed to be a rotary engine of a novel type.

In order to theoretical perfection it is to be noted that the steam-chest ring should be the equatorial section of a hollow sphere and the disk which fits it inside should be the corresponding section of a solid sphere.

The engine is more especially designed for steam, but might be driven by compressed air, gas, or other expansive vapor.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine, the combination with suitable bearings, of a steam-chest ring forming the equatorial section of a hollow sphere, a driver fitted to revolve therein, and provided with a circumferential steam-recess adjacent to the steam-chest ring, and with an externally-accessible steam-disk or valve seat to take a centrally-mounted valve or steam-disk in an expanded part of the driver transverse to the ring, a valve or steam-disk mounted to turn in said seat, and means for revolving the same.

2. In a rotary engine, the combination with a suitable base and bearings, of a rotary driver provided with a circumferential steam-

recess, a steam-chest ring in contact therewith, and provided with oppositely-disposed abutments fitting said recess, a disk having oppositely-disposed gaps to pass said abutments carried by the driver and adapted to intercept the steam in said recess at points intermediate of the abutments, and means for giving positive rotation to the disk in a plane transverse to that of the driver.

3. In a rotary engine, the combination with a suitable base and bearings, of a rotary driver having a central ring with a circumferential steam-recess, and a transversely-expanded portion forming a seat for a steam-disk, a steam-chest ring in contact with said driver-ring, and provided with abutments fitting said recess, a steam-disk carried by the driver, and adapted to cut across said recess, with peripheral gaps to permit it to pass the abutments, and means for revolving it in a plane transverse to that of the driver.

4. In a rotary engine, the combination with a suitable base and bearings, of a rotary driver having a cylindrical middle portion with circumferential steam-recess therein, a steam-chest ring fitted thereto, and having abutments fitting said recess, a disk carried by the driver, having peripheral gaps to permit it to pass the abutments, and adapted to cut across and close said recess, a fixed gear concentric with the axis of the driver, and gearing connecting the same and the disk, whereby it is positively revolved in a plane transverse to that of the driver.

5. In a rotary engine, the combination with a rotary driver, of a steam-chest ring forming the equatorial section of a hollow sphere, in continuous contact with said driver, and a disk carried by the driver, the disk being the corresponding section of a solid sphere, and means for revolving the disk on an axis central to the ring and parallel with its sides.

6. In a rotary engine, the combination of a rotating driver having a cylindrical central portion with a circumferential steam-recess therein, a ring inclosing the same, abutments on said ring fitting said recess, steam-ports adjacent to the abutments, a disk mounted in the driver in a plane transverse to the ring and having peripheral gaps for the passing of the abutments, the said disk being adapted to cut across the recess and contact with the ring between the abutments, means for imparting rotary motion to the disk as the driver revolves, an auxiliary cut-off valve, and means for operating the same to open after the gaps in the disk have passed the abutments.

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

ELZA J. CHRISTIE.

Witnesses:

F. J. KUBICEK,
J. M. ST. JOHN.