(No Model.) 5 Sheets—Sheet 1.

C. S. IRISH.

ROTARY ENGINE.

No. 467,416. Patented Jan. 19, 1892.

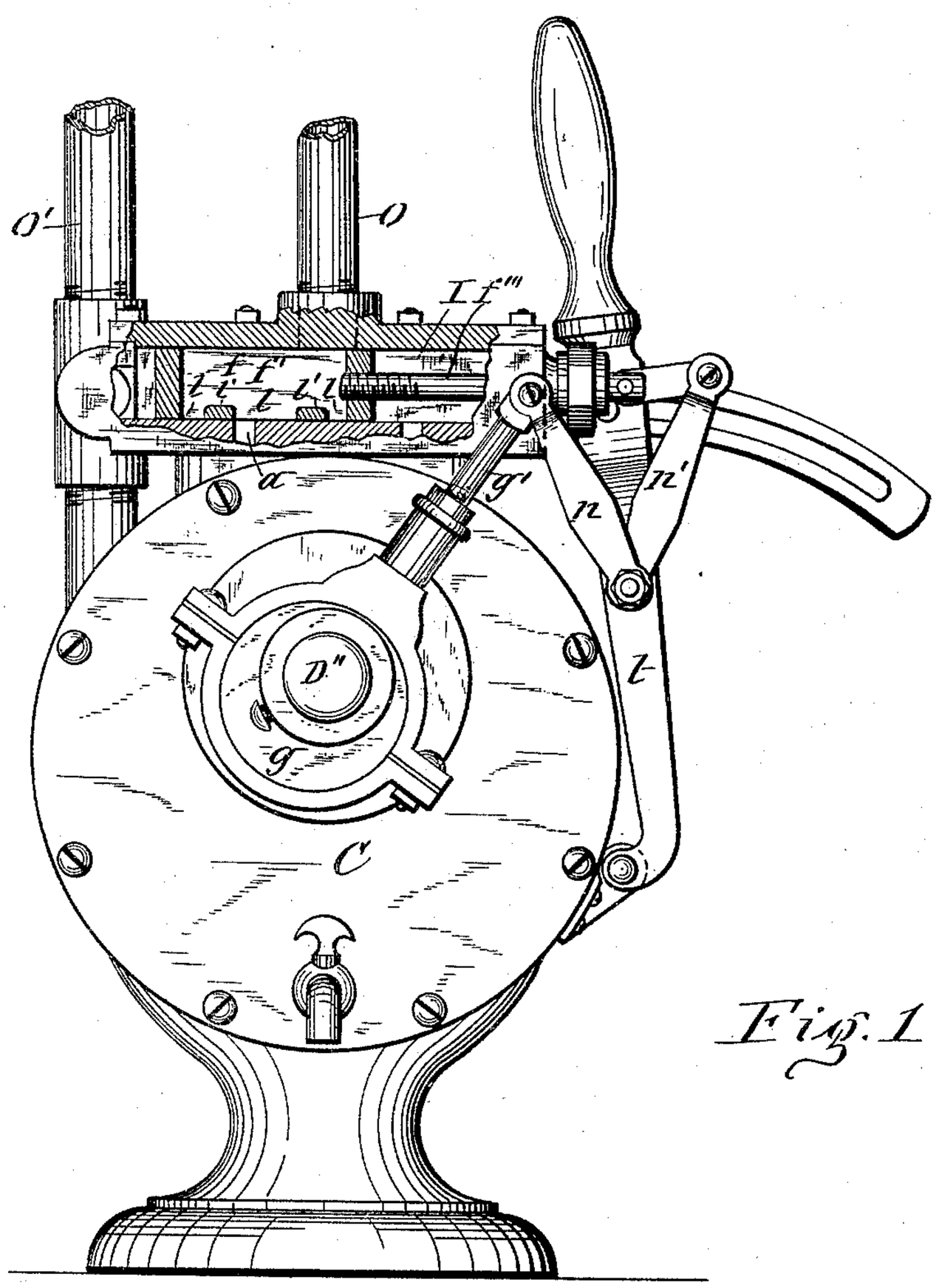


Fig. 1

WITNESSES:

C. L. Bendixon

J. J. Laasy

INVENTOR:

Charles S. Irish

By Duell, Laase & Duell

his ATTORNEYS.

(No Model.)

5 Sheets—Sheet 2.

C. S. IRISH.

ROTARY ENGINE.

No. 467,416. Patented Jan. 19, 1892.

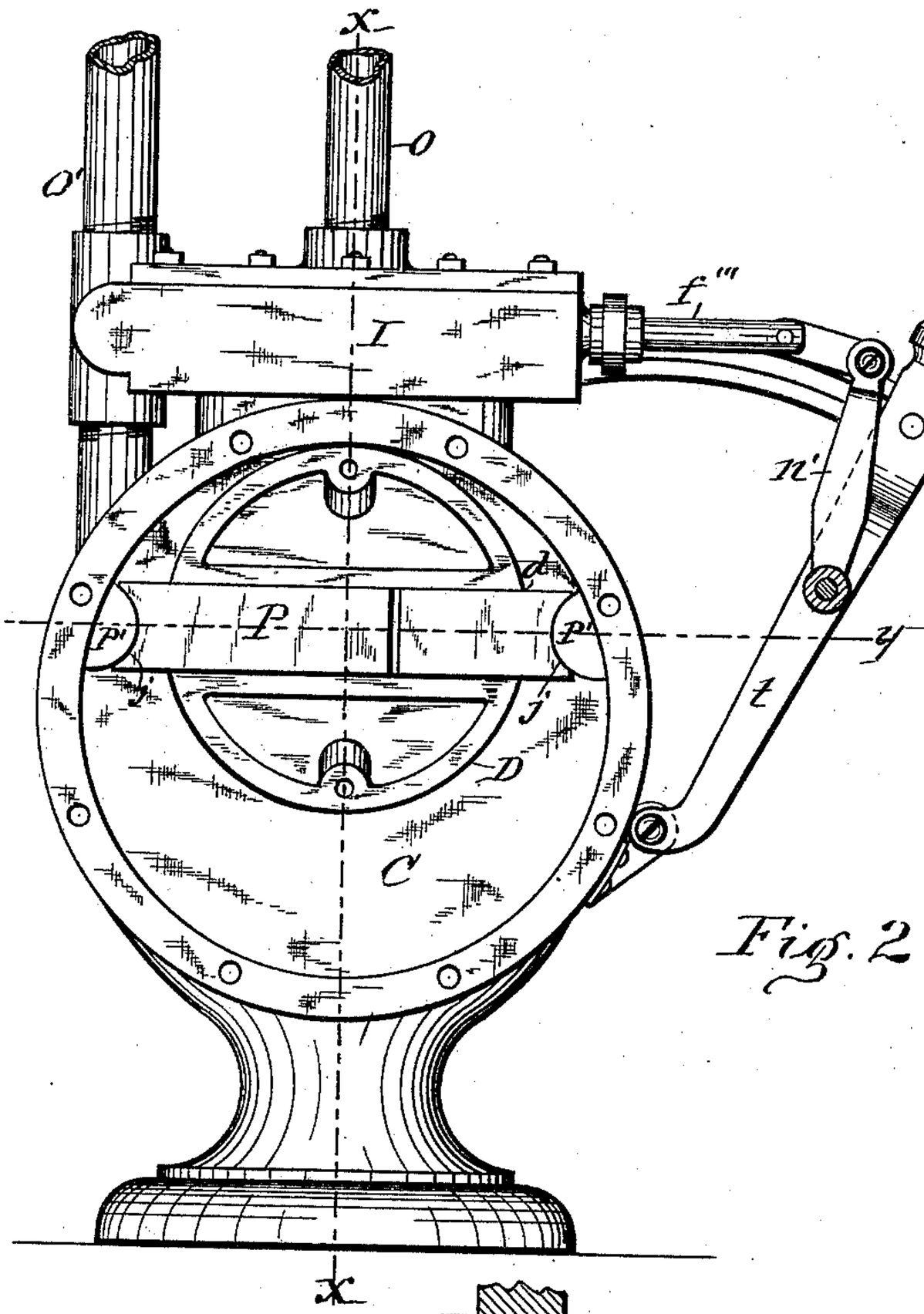
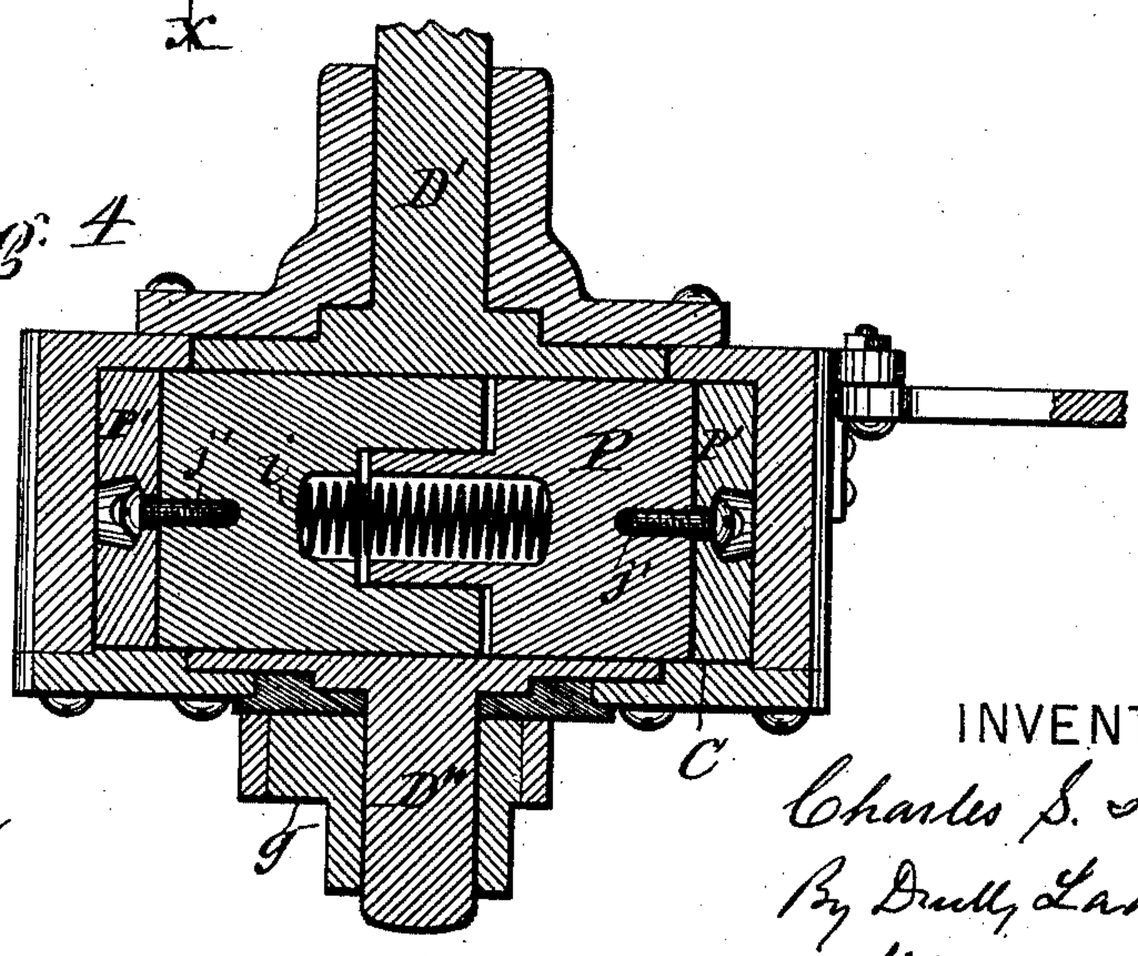


Fig. 2

Fig. 4



WITNESSES:

C. L. Bendixon

J. J. Saass.

INVENTOR:

Charles S. Irish

By Duell, Lacey & Duell

his ATTORNEYS.

(No Model.) 5 Sheets—Sheet 3.

C. S. IRISH.

ROTARY ENGINE.

No. 467,416. Patented Jan. 19, 1892.

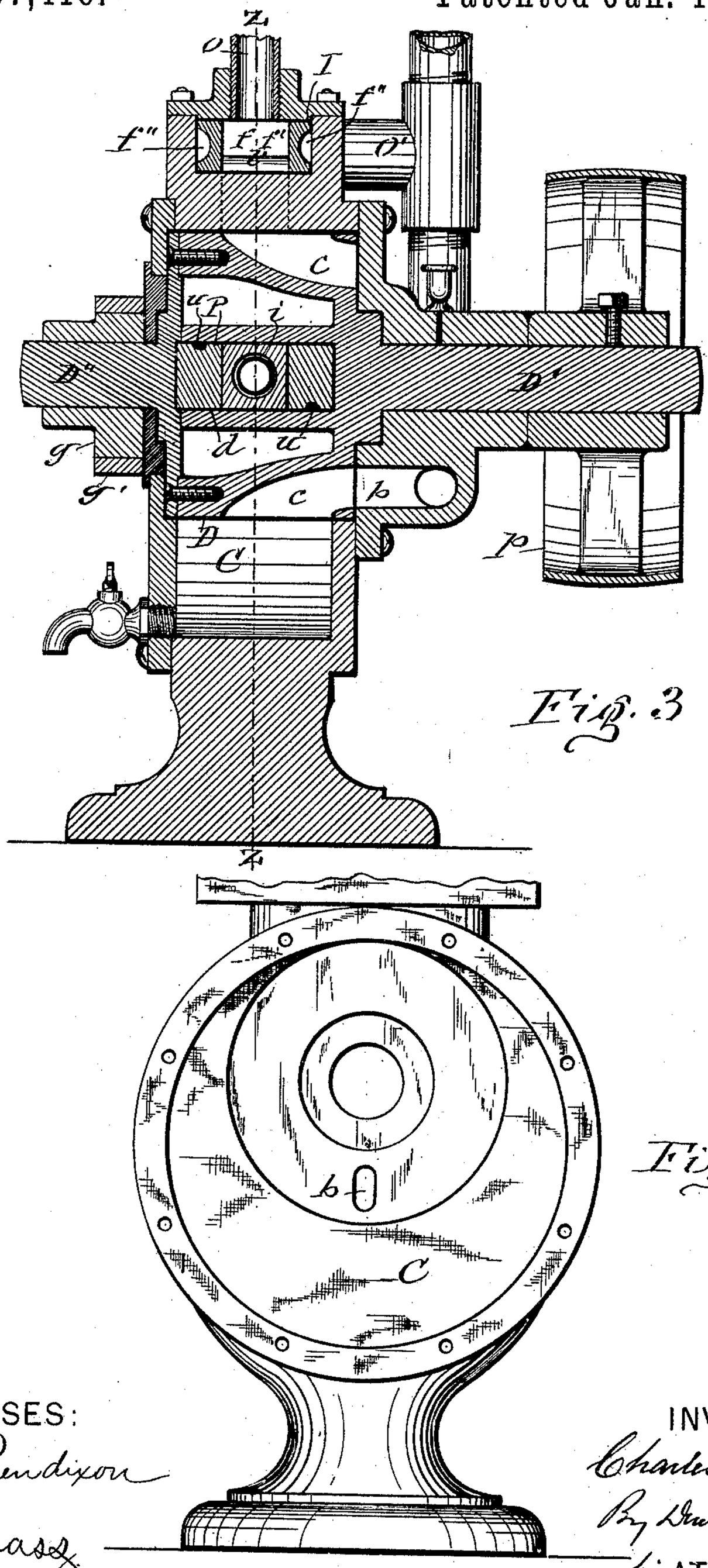


Fig. 3

Fig. 5

WITNESSES:

C. L. Bendixon

J. J. Laass

INVENTOR:

Charles S. Irish

By Duell, Laass & Bond

his ATTORNEYS.

(No Model.) 5 Sheets—Sheet 4.

C. S. IRISH.

ROTARY ENGINE.

No. 467,416. Patented Jan. 19, 1892.

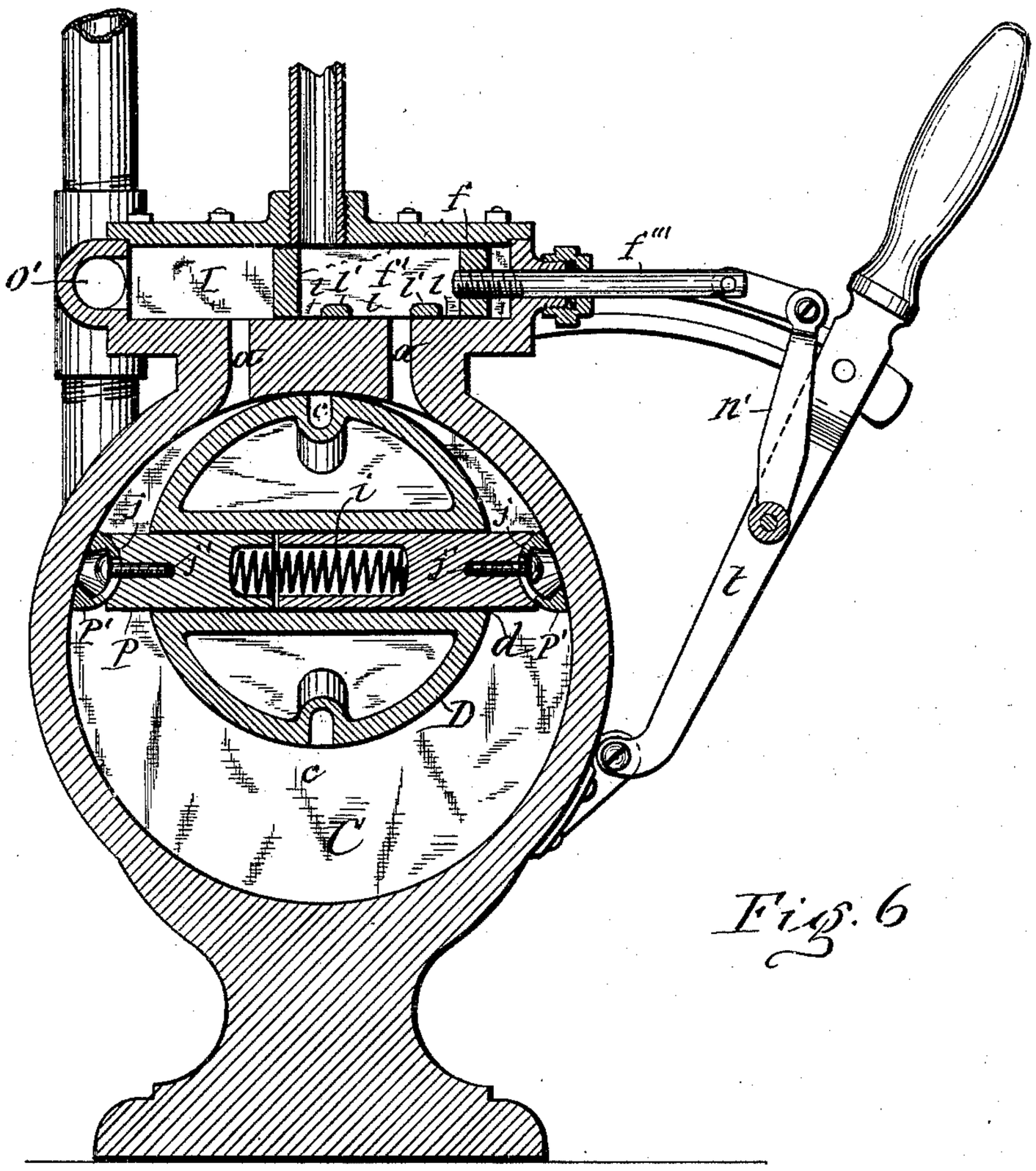


Fig. 6

WITNESSES:

C. L. Bendixon

J. J. Saasz.

INVENTOR:

Charles S. Irish

By Duell, Laass & Duell

his ATTORNEYS.

(No Model.) 5 Sheets—Sheet 5.

C. S. IRISH.

ROTARY ENGINE.

No. 467,416. Patented Jan. 19, 1892

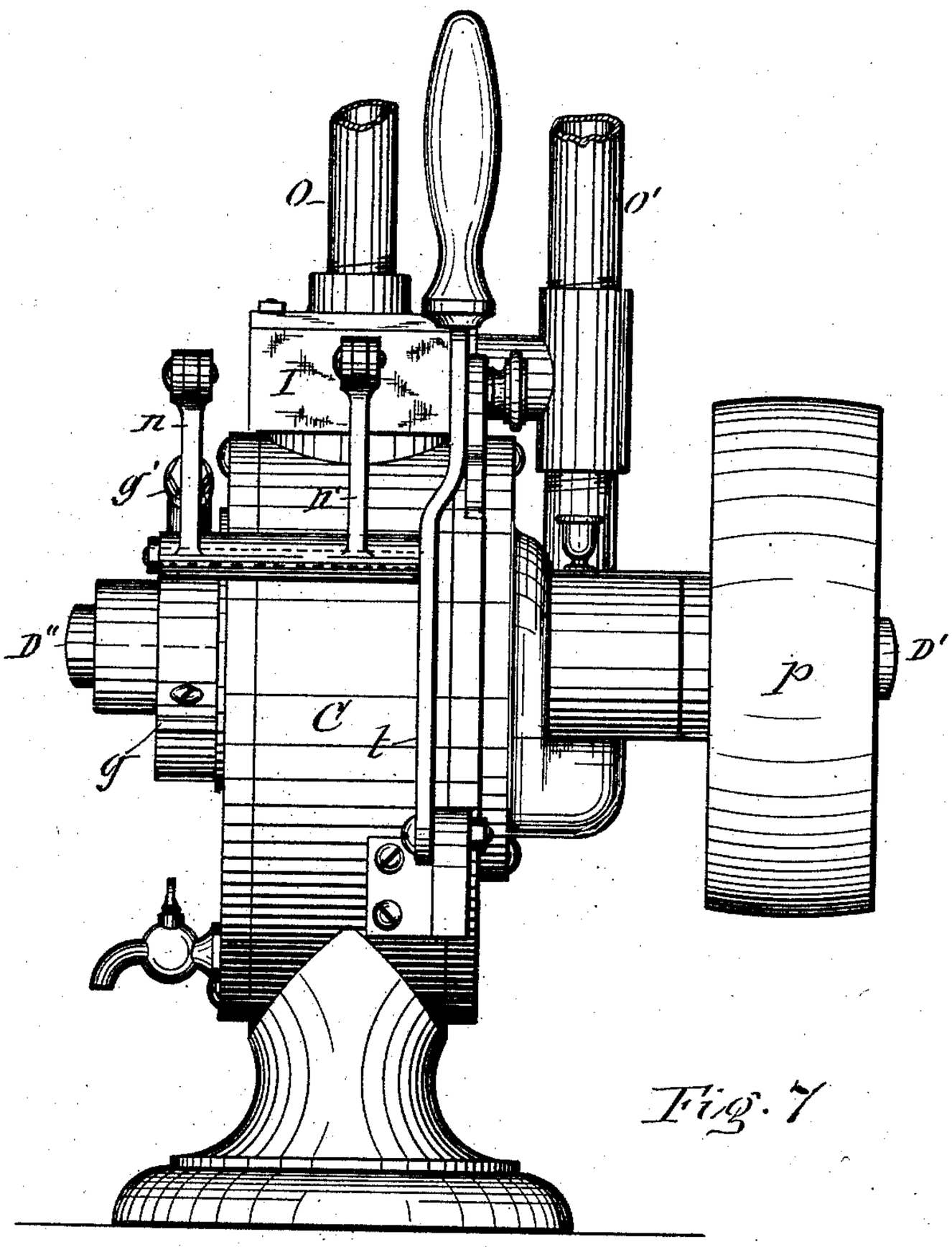


Fig. 7

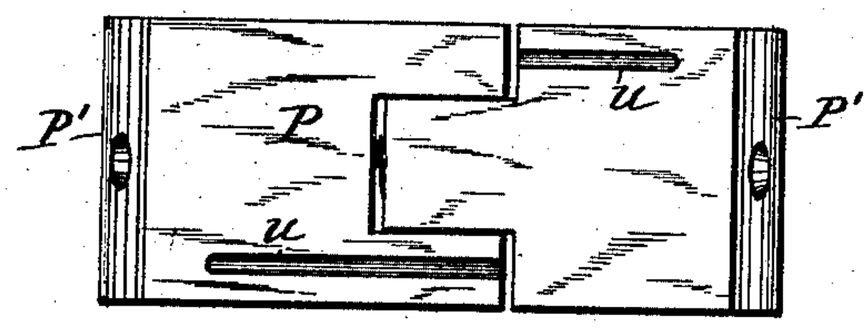


Fig. 8

WITNESSES:
C. L. Benbyson
J. J. Laasy

INVENTOR:
Charles S. Irish
By Duell, Laas & Duell
his ATTORNEYS.

UNITED STATES PATENT OFFICE.

CHARLES S. IRISH, OF JORDAN, NEW YORK.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 467,416, dated January 19, 1892.

Application filed August 18, 1891. Serial No. 403,023. (No model.)

To all whom it may concern:

Be it known that I, CHARLES S. IRISH, of Jordan, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Rotary Engines, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to the class of rotary engines in which a rotary piston-head is arranged eccentrically in the cylinder and the piston is seated radially movable in said piston-head; and it consists in an improved construction and combination of parts, as hereinafter described, and specifically set forth in the claims.

In the annexed drawings, Figure 1 is a side view of an engine embodying my invention. Fig. 2 shows the same with the front head of the cylinder removed to expose the interior of said cylinder. Figs. 3 and 4 are transverse sections, respectively, on lines *x x* and *y y*, Fig. 2, with both heads on the cylinder. Fig. 5 is a side view of the interior of the cylinder without the piston-head. Fig. 6 is a sectional view on line *x x z z*, Fig. 3. Fig. 7 is a front elevation of the engine, and Fig. 8 is a plan view of the piston.

Similar letters of reference indicate corresponding parts.

C represents the steam-cylinder, which is provided with the steam-port and exhaust-port *a a* in its peripheral wall.

D denotes the piston-head, which is of cylindrical shape and much smaller in diameter than the interior of the cylinder and in such a position as to bring the periphery of the piston-head in contact with the peripheral wall of the cylinder C at a point midway between the ports *a a*. Said piston-head is formed with a diametric groove *d*, extending completely through the periphery thereof, and in said groove is seated, radially movable, the piston P, which is divided transversely to render it extensible, and has a spring *i* interposed at its joint to force the piston-sections outward and maintain them in contact with the peripheral wall of the cylinder.

To provide the piston-sections with side bearings of greater length than those afforded by the sides of the channel in the piston-head and free from friction, I join said sections by means of a tongue in the center of one section entering a corresponding groove or recess in the other section, as shown in Fig. 4 of the drawings. The ends of the piston are provided with oscillatory packing-blocks P′ P′, which have their backs formed semicircular in cross-section and are seated in correspondingly-shaped grooves *j j* in the ends of the piston, in which they are retained by means of bolts *j′ j′*, passing through transverse slots in the blocks and entering screw-threaded sockets in the piston. By seating the said packing-blocks in grooves, as aforesaid, said blocks are protected from pressure of steam, which has a tendency to interfere with the free movement of said blocks, and besides this the blocks fit themselves to their seats during the rocking movement of the blocks.

One of the heads or end walls of the cylinder C is provided with an exhaust-port *b*, which is located back of the piston-head and at a point nearly diametrically opposite the steam-port *a*, or exactly diametrically opposite that portion of the piston-head which is in contact with the peripheral wall of the cylinder C.

In the periphery of the piston-head and in a line at right angles to the piston P are exhaust or relief channels *c c*, which extend through the end of the piston-head and in such positions as to register with the port *b* during the rotation of the piston-head.

I represents the steam-chest, in which is seated the slide-valve *f*, the stem *f‴* of which extends through one end of the steam-chest. This valve is formed with a steam-chamber *f′*, extending vertically through its center, and with exhaust-passages *f″ f″* in its outer sides. The walls of the valve fit steam-tight to the bottom and top of the interior of the steam-chest, and to the cover of the steam-chest, directly over the steam-chamber *f′* of the valve, is attached the steam-pipe O. The exhaust-pipe O′ communicates with one end of the steam-chest. By the peculiar construction of the valve I render the same steam-balanced. The steam-chamber *f′* of the valve is of such a length and the ports *l l* and bridges *l′ l′* in said chamber are so spaced as to allow the steam to pass through both ports *a a* when the valve is set central over said ports, and thus the motion of the engine is

arrested. By setting the valve nearer to one end of the steam-chest the port *a* nearest to said end is made to serve as the steam-port for admitting steam to the cylinder C, while the other port *a* is uncovered by the valve and caused to emit the exhaust-steam from the cylinder. Therefore by shifting the valve from one end of the steam-chest to the opposite end thereof the motion of the engine is reversed, and by placing the valve central in the steam-chest the motion of the engine is stopped, as before stated. For shifting the valve, as aforesaid, I employ a lever *t*, fulcrumed on the exterior of the engine at any suitable point and connected to the valve-stem *f'''*, as hereinafter described. The piston-head has its shafts D' D'' extending through the heads of the cylinder C, and to one of said shafts is connected the driving-pulley *p*, and to the other shaft is rigidly secured the eccentric *g*. The rigid attachment of the latter effectually prevents the rattling thereof. On an arm projecting from the side of the lever *t* are loosely mounted two rock-arms *n n'*, which are united, so as to cause them to move in unison. The rock-arm *n* is connected to the eccentric-rod *g'*, and the other rock-arm *n'* is connected to the valve-stem *f'''*, and by these means motion is transmitted from the shaft to the valve.

The peculiar construction of the valve *f* and its arrangement in relation to the exhaust-port of the cylinder permits the aforesaid rigid attachment of the eccentric *g* to the shaft of the engine, which is an essential feature of my improved engine.

In the operation of the described engine the lever *t* is to be set so as to carry the fulcrum of the rock-arms *n n'* either toward or from the steam-chest, and thus cause the valve *f* to play in one end portion of the steam-chest, according to the direction in which the engine is to work. The steam passes from the steam-chest through one of the ports *a*, and by its pressure on the end of the piston in front of the said port the piston-head D receives rotary motion. The steam is retained back of the piston until the piston-head has made three-fourths of a revolution, and then the relief port or channel *c* in the lower half of the piston-head registers with the port *b* and allows the steam to escape. Soon after the piston has passed beyond its vertical position the upper end of the piston receives the pressure of the steam entering the cylinder through one of the ports *a*, and thus the piston-head *d* is kept in motion. The other port *a* emits from the cylinder any steam that may have been entrapped back of the piston and the relief-channel *c* has passed over the port *b*.

To distend the piston so as to hold it steam-tight against the inner side of the peripheral wall of the cylinder C during the operation of the engine, I provide the piston with steam-channels *u u*, extending from the joint thereof part way toward opposite ends, as shown in Fig. 8 of the drawings. Said channels are such lengths that only one at a time can communicate with the interior of the cylinder, and therefore the steam is admitted to the joint of the piston alternately from opposite ends. The admission of the steam between the inner ends of the piston-sections forces the same outward and holds them steam-tight against the peripheral wall of the cylinder.

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

1. The eccentrically-pivoted piston-head D, provided with the diametric groove *d*, the piston P, sliding in said groove, and exhaust-channels *c* in a line at right angles to the piston, the cylinder C, provided with steam-inlet ports *a* near the point of contact of the peripheries of the piston-head and cylinder, and the exhaust-port *b*, nearly diametrically opposite the port *a*, substantially as described and shown.

2. In combination with the steam-chest, the valve *f*, formed with the steam-chamber *f'* in its center and exhaust-passages *f''* in its sides, the steam-pipe O, communicating with said steam-chamber, and the exhaust-pipe O', communicating with the end of the steam-chest, substantially as set forth.

3. In combination with the cylinder, rotary piston-head, and steam-chest, the exhaust-pipe O', communicating with said steam-chest, the valve *f*, formed with the steam-chamber *f'* in its center and exhaust-passages *f''* in its sides, the steam-pipe communicating with said steam-chamber, the eccentric *g*, rigidly attached to the shaft of the piston-head, the reversing-lever *t*, and the rock-arms *n n'* on said lever, connected, respectively, to the eccentric-rod and valve-stem, substantially as described and shown.

In testimony whereof I have hereunto signed my name this 12th day of August, 1891.

CHARLES S. IRISH. [L. S.]

Witnesses:

MARK W. DEWEY,

C. L. BENDIXON.