No. 829,853. PATENTED AUG. 28, 1906.

T. DAVIS.

ROTARY ENGINE.

APPLICATION FILED FEB. 16, 1906.

3 SHEETS—SHEET 1.

Fig. 2.

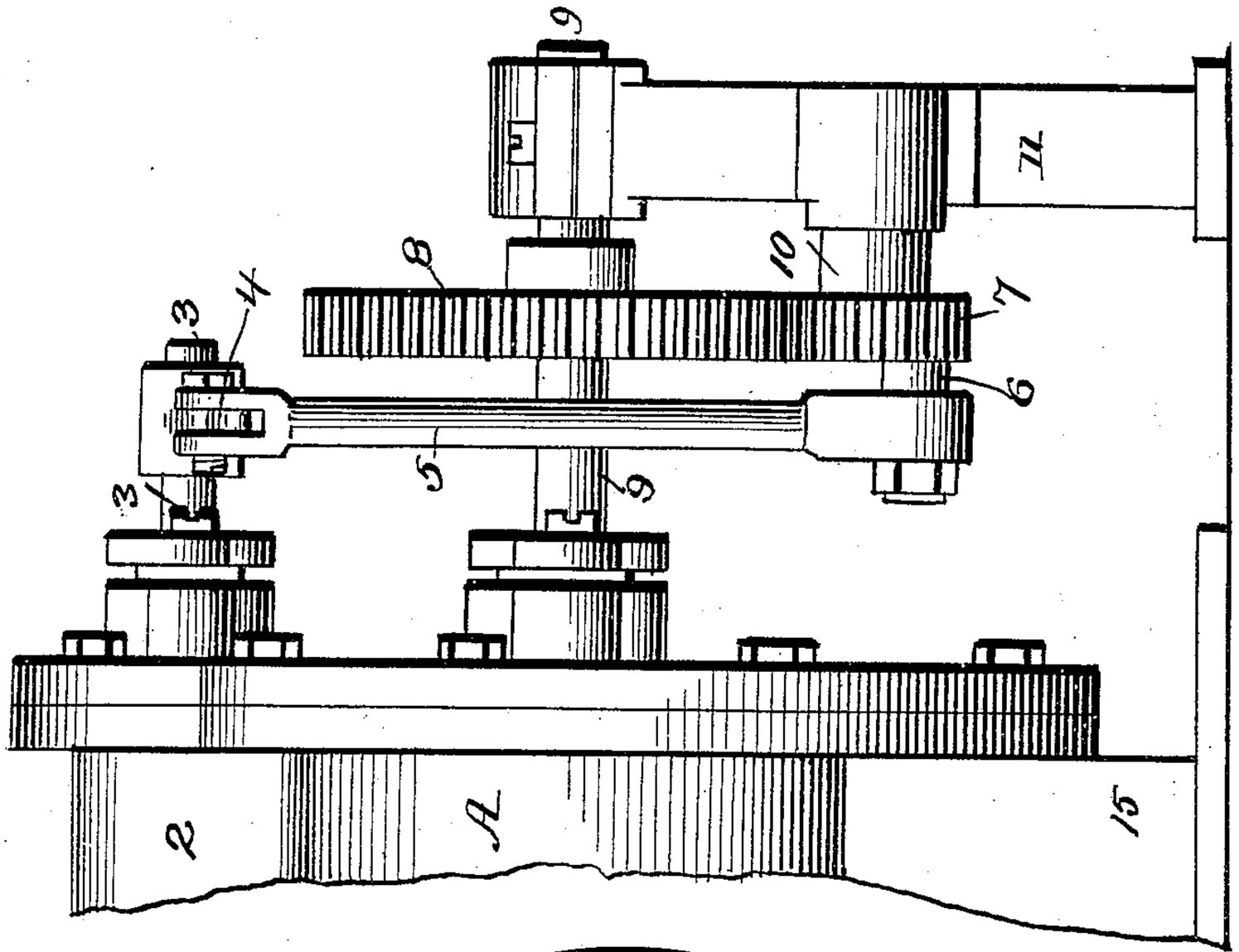
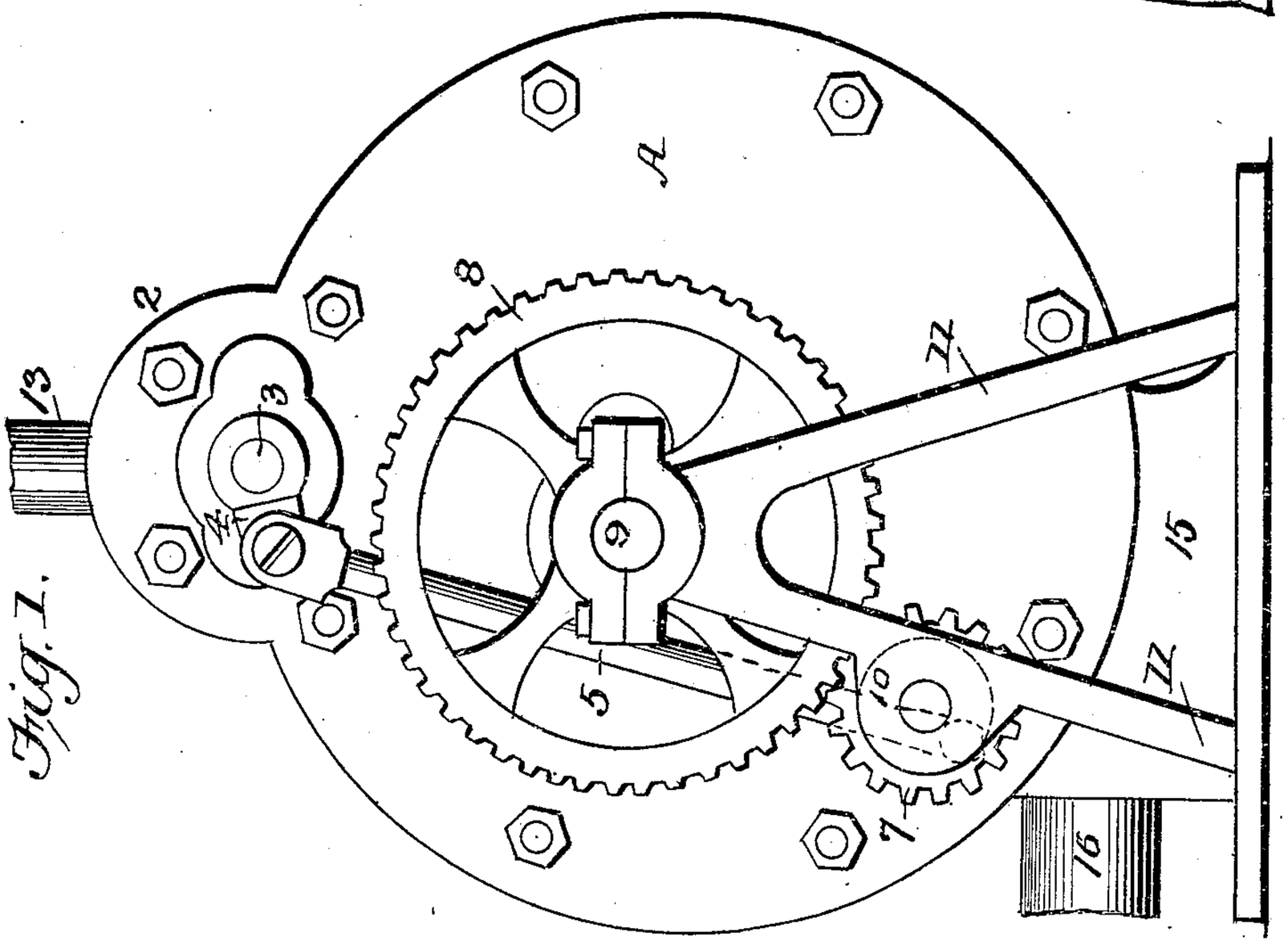


Fig. 1.



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Thomas Davis

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ATTORNEYS

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3 SHEETS—SHEET 2.

Fig. 4.

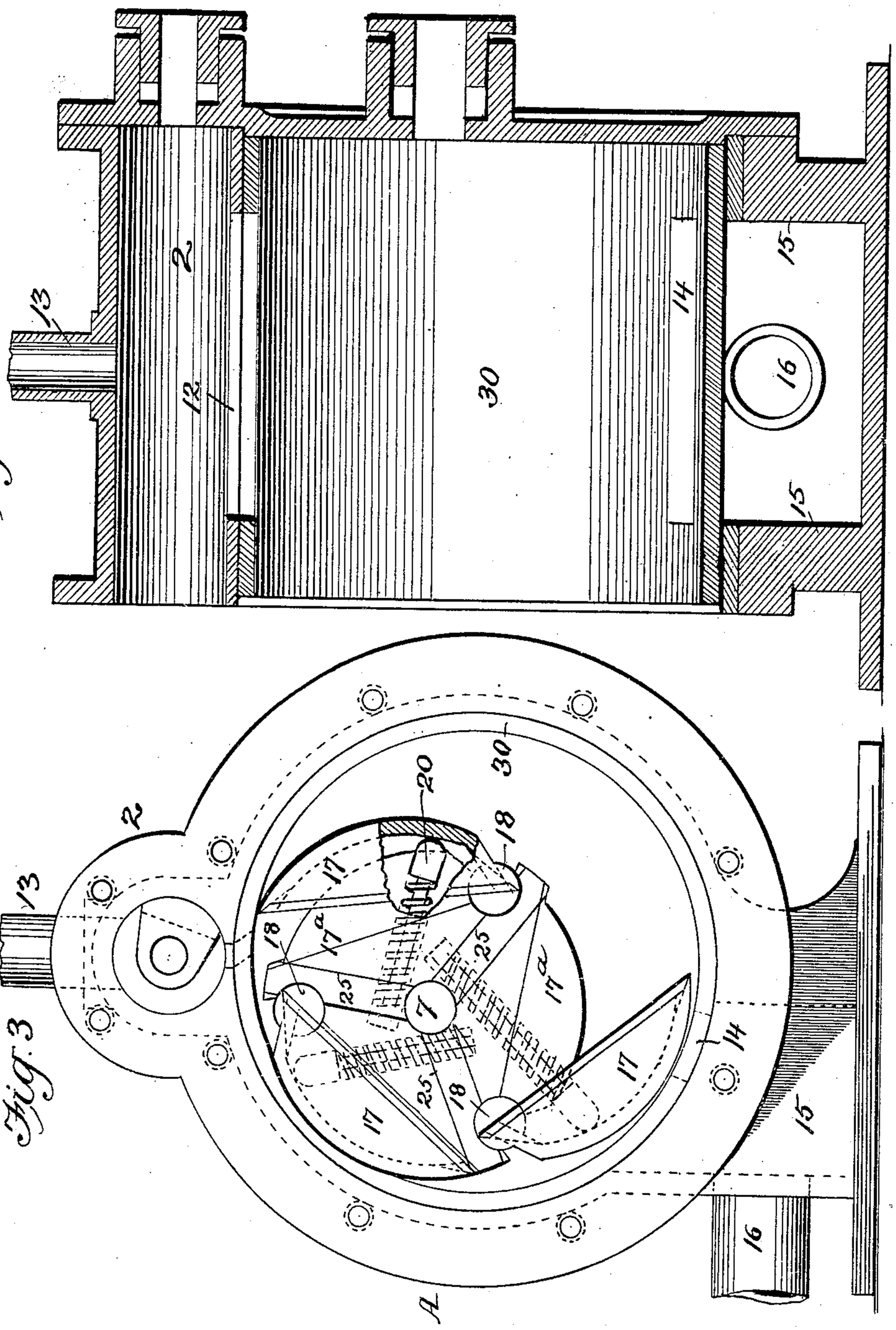

Fig. 3

A

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3 SHEETS—SHEET 3.

Fig. 5.

Fig. 6.

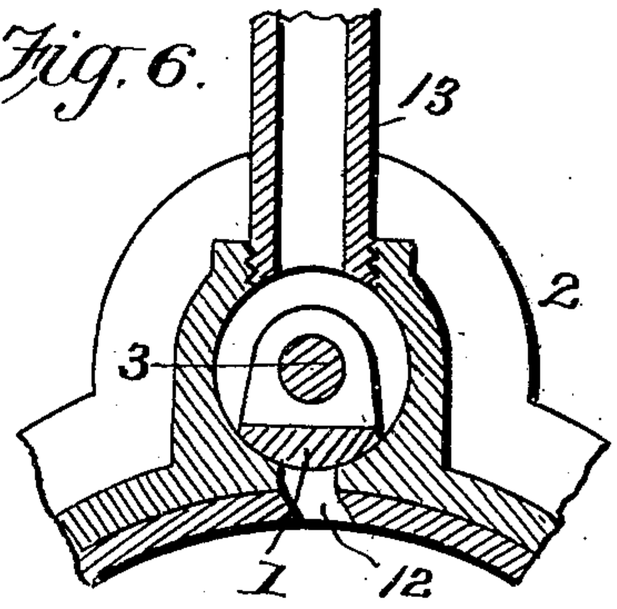


Fig. 7.

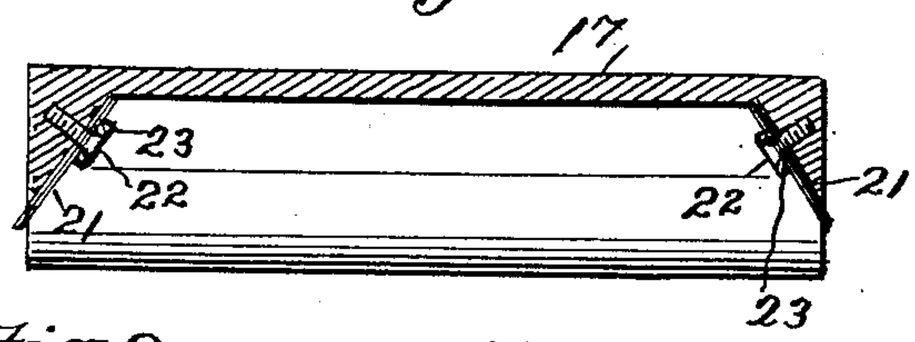


Fig. 8.

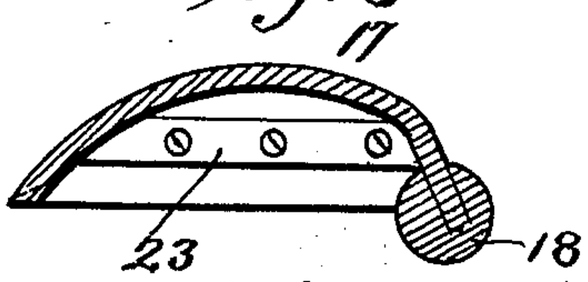


Fig. 9.

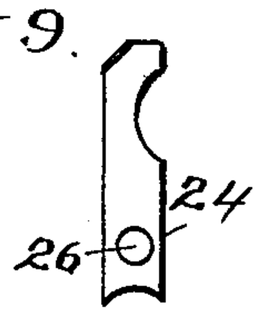


Fig. 10.

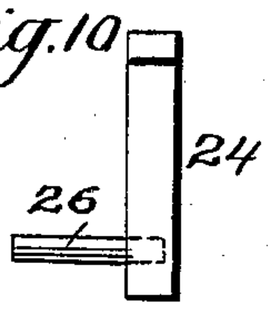


Fig. 11.

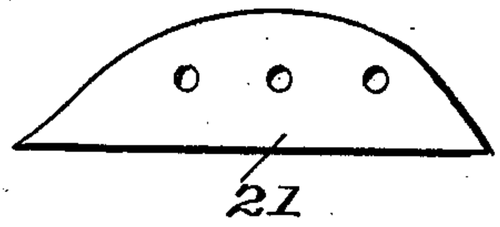


Fig. 12.

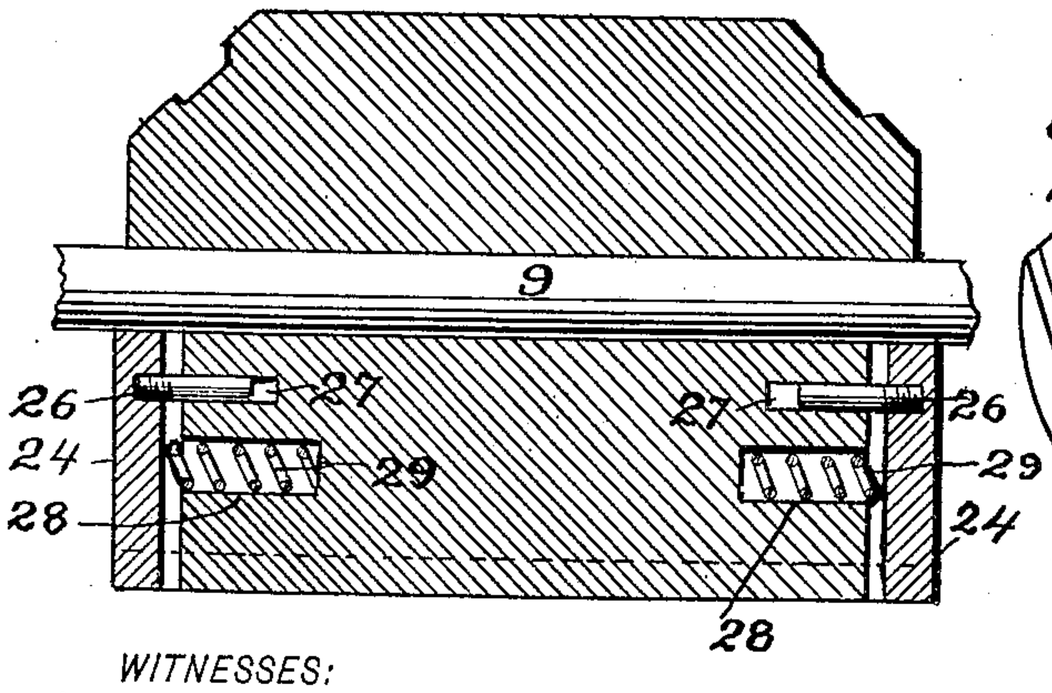
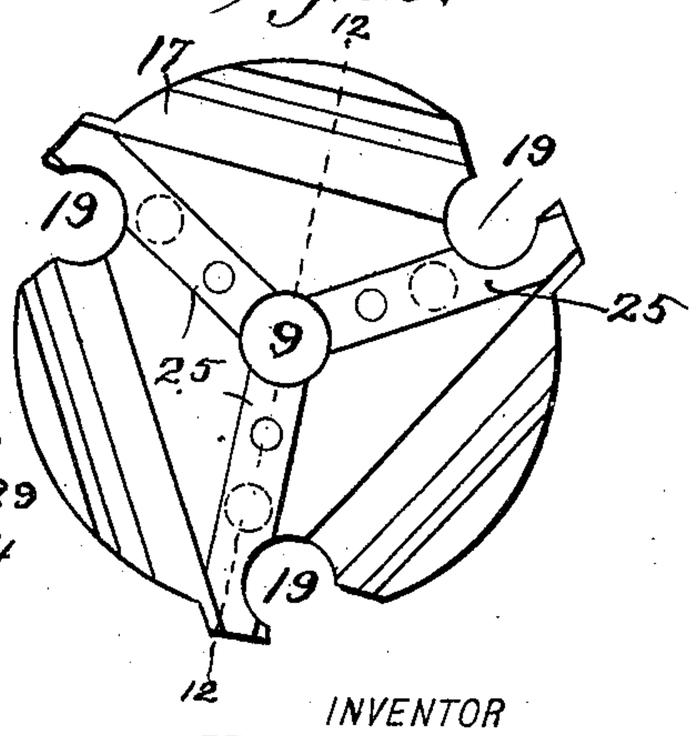


Fig. 13.



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UNITED STATES PATENT OFFICE.

THOMAS DAVIS, OF NEW HAVEN, CONNECTICUT.

ROTARY ENGINE.

No. 829,853. Specification of Letters Patent. Patented Aug. 28, 1906.

Application filed February 16, 1906. Serial No. 301,376.

To all whom it may concern:

Be it known that I, THOMAS DAVIS, a citizen of the United States, and a resident of New Haven, in the county of New Haven and State of Connecticut, have made certain new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention is an improvement in rotary engines such as are adapted for use of steam or compressed air, and it is more particularly an improvement upon the engine for which I have received Letters Patent No. 803,406.

My present improvements relate to the valve mechanism controlling the admission of steam or air to the piston-cylinder, to the antifriction bushing or lining for the cylinder, also to the spring-pressed packing for the ends of the piston and to elastic or spring packing for the ends of the blades which are pivoted to and revolve with the piston.

The details of construction, arrangement, and operation are as hereinafter described, and illustrated in the accompanying drawings, in which—

Figure 1 is an end view of my improved engine. Fig. 2 is a side elevation of a portion thereof. Fig. 3 is mainly an end view, the head of the cylinder being removed to show the piston and its attached parts and a portion of one of the blades which is pivoted to the cylinder being broken away. Fig. 4 is a central vertical longitudinal section of the cylinder and steam-chest, one of the heads being removed. Fig. 5 is a side view of the oscillating valve controlling admission of the motor fluid to the cylinder. Fig. 6 is a vertical cross-section of the steam-chest or valve-chamber. Figs. 7 and 8 are different sections of one of the blades pivoted to and revolving with the piston proper. Figs. 9 and 10 are different side views of packing applied to the ends of the rotary piston. Fig. 11 is a side view of spring-packing applied to the ends of the pivoted piston-blades. Fig. 12 is a longitudinal section of the piston. Fig. 13 is an end view of the piston proper, the several attachments being removed.

The casing A of the engine is practically cylindrical and provided on its upper side with a swell or eccentric portion 2, in which is arranged a valve 1, (see Figs. 5 and 6,) the same being keyed upon a shaft 3, extending longitudinally of the chamber and projecting at one end of the same, where it is provided with a crank-arm 4. Such crank-arm is connected by a rod or link 5 with the eccentric wrist-pin 6 (see Fig. 2) of a spur-pinion 7, that meshes with a large spur-gear 8, mounted on the piston-shaft 9. The pinion-shaft 10 is journaled in a pedestal 11, (see Fig. 2,) and the adjacent end of the piston-shaft 9 is also journaled in the same pedestal.

As indicated in Figs. 1 and 3, the piston-shaft is arranged eccentrically to the cylinder through which it passes. The valve 1 is approximately segmental in form and is adapted to cover and uncover an oblique steam-port 12, formed in the cylinder, and thus connecting the interior of the same with the cylindrical valve-chamber. Steam is admitted through the pipe 13 and passes into the cylinder whenever the valve uncovers the port 12. This occurs three times during each rotation of the piston, the latter being provided with three hinged or pivoted blades upon which the steam acts by impact and pressure.

It will be seen that the valve receives a circular reciprocating or oscillating motion. It is shown in Fig. 6 closing the port 12, and in Fig. 3 it is in such position that the port is uncovered. The exhaust takes place through the port 14 on the lower side of the cylinder into a chamber 15, which communicates with a lateral pipe 16. (See Figs. 3 and 4.) As in my previous invention, the several blades or wings 17 are connected with cylindrical heads or shafts 18, which are inserted and adapted to oscillate in corresponding grooves 19, (see Fig. 13,) formed equidistantly at three points in the periphery of the piston proper. In the present invention the blades 17 are provided with segmental end portions, and the blades are therefore practically in cap form and fit over corresponding protuberant portions 17^a of the piston. (See Fig. 3.) The blades are normally pressed outward, so that their free ends work in contact with the inner side of the cylinder-lining by means of spring-actuated plungers 20.

I provide the ends of the blades with a metal packing 21, composed of very thin sheet-metal plates, preferably spring brass or steel, the same being essentially segmental in form, as indicated in Fig. 11. Several of these members are preferably employed, the same being placed one upon the other in contact and their outer and longer edges projecting slightly beyond the end of a blade, as indicated in Fig. 7. The inner sides of the ends

of the blades are beveled or inclined, as indicated in Fig. 7, and the packing-plates 21 are secured to such beveled portion by means of screws 22. I preferably apply a thicker metal plate 23 (see Fig. 8) over the inner edges of the packing-plates for holding them more securely and rigidly in place. It will be understood that their outer edges work in easy spring contact with the ends or heads of the cylinder A and that their angle enables them to slide easily over the surface or with comparatively little friction while forming a steam-tight joint. It will be seen that by means of this spring-packing it is unnecessary that the ends of the blades proper should work in close frictional contact with the heads of the cylinder, whereby considerable friction and wear are avoided.

In order to provide due extension of the ends of the packing 21, the ends of the blades are grooved at the outer edge and the ends of the cylindrical heads or shafts 18 are also similarly grooved, so the spring-leaves touch the cylinder-heads the entire width of the blades, including their cylindrical heads. The ends of the piston proper are also cut away, as indicated in Fig. 12, to allow the blades to fit closely thereon.

I provide packing for the ends of the cylinder proper, the same consisting of bars 24. (See Figs. 9, 10, and 12.) These bars are arranged in radial grooves 25, formed in the ends of the piston proper, as shown in Fig. 13 and as further indicated in Fig. 12. Each bar 24 is provided with a guide-pin 26, which is adapted to slide in a socket or bore 27, formed in the end of the piston near the shaft 9. In a larger bore or socket 28, formed in the end of the piston proper, is arranged a spiral spring 29, which presses outward against the packing-bars 24, and thus holds them in easy frictional contact with the head of the cylinder. Thus the packing-bars 24 are adapted to form a steam-tight closure between the ends of the piston proper and the heads of the cylinder A and practically in conjunction with the blades they divide the steam-chamber into three parts, since they are three in number and no steam can go past them. In other words, as each blade opens to receive steam, as indicated in Fig. 3, a tight chamber is formed into which the steam is received. It is apparent that such chamber is formed without excessive friction and wear of the parts.

I provide the cylinder with a bushing 30, (see Figs. 3 and 4,) the same being insertible and removable, and thus made renewable at will. Its purpose is to save friction and wear of the cylinder-casting, thereby prolonging the life or use of the latter. It also relieves friction with the piston attachments to a considerable degree. The same is provided with a slot in its upper side corresponding with the steam-port 12 and at its lower side with a port 14, that coincides with the exhaust-port before described. As will be understood by reference to Fig. 4, the bushing is made of slightly less length than the cylinder, so that provision is made for receiving the thickened portion of the cylinder-heads which abut the ends of the bushing or lining. In one side of the inner wall of the cylinder-lining there is formed a chamber, or, in other words, the cylinder-lining is formed on a circle eccentric to and smaller than the circle of the main body of the cylinder. Thus such eccentric portion is concentric with the shaft 9 of the piston and with the outer sides of the pivoted blades 17 when closed, as will be understood by reference to Fig. 3. This feature is illustrated and described in my aforesaid patent.

What I claim is—

1. The combination, with a cylinder, and means for controlling the admission of steam thereto, of a rotary piston arranged eccentrically therein and provided with a series of pivoted blades having their ends provided with spring-packing comprising spring-leaves whose outer edges work in contact with the heads of the cylinder.

2. The combination, with a valve-chest and cylinder, and a rotary piston proper arranged eccentrically in the cylinder, of a series of blades pivoted to and revolving with the piston, the same having their ends provided with one or more spring-leaves which are arranged at an angle to the heads of the cylinder so that their projecting edges work in elastic contact therewith, substantially as described.

3. The combination, with a valve-chest and cylinder, and a rotary piston proper arranged eccentrically in the latter, of one or more blades pivoted to and revolving with the piston, and spring-packing applied to said blades, the same comprising elastic plates arranged upon and secured to the outwardly-inclined end portions of the blades, the edges of the plates projecting beyond the ends proper of the blades and extending the entire width of the latter, substantially as described.

4. In a rotary engine, the combination, with a cylinder and a rotary piston arranged eccentrically therein, of a series of blades pivoted to the periphery of the piston and extending across the same lengthwise, and having movable spring-leaf packing-strips applied to their ends and projecting into contact with the ends of the cylinder, as described.

5. In a rotary engine of the class indicated, the combination, with the rotary piston proper having its ends provided with radial grooves, of a packing comprising bars arranged in such grooves and having guide-pins working in bores or sockets of the piston proper, and springs pressing outwardly

against said bars for holding them in easy but close contact with the heads of the cylinder as the piston revolves, substantially as described.

6. In a rotary engine of the class indicated, a cylinder having an antifriction-bushing which is insertible and removable and provided with slots for admission and exhaust of the motor fluid, such bushing being shorter than the body of the cylinder, and the heads of the latter provided with an inwardly-projecting portion which abuts the end of the bushing, substantially as described.

THOMAS DAVIS.

Witnesses:
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GEORGE V. SMITH.