

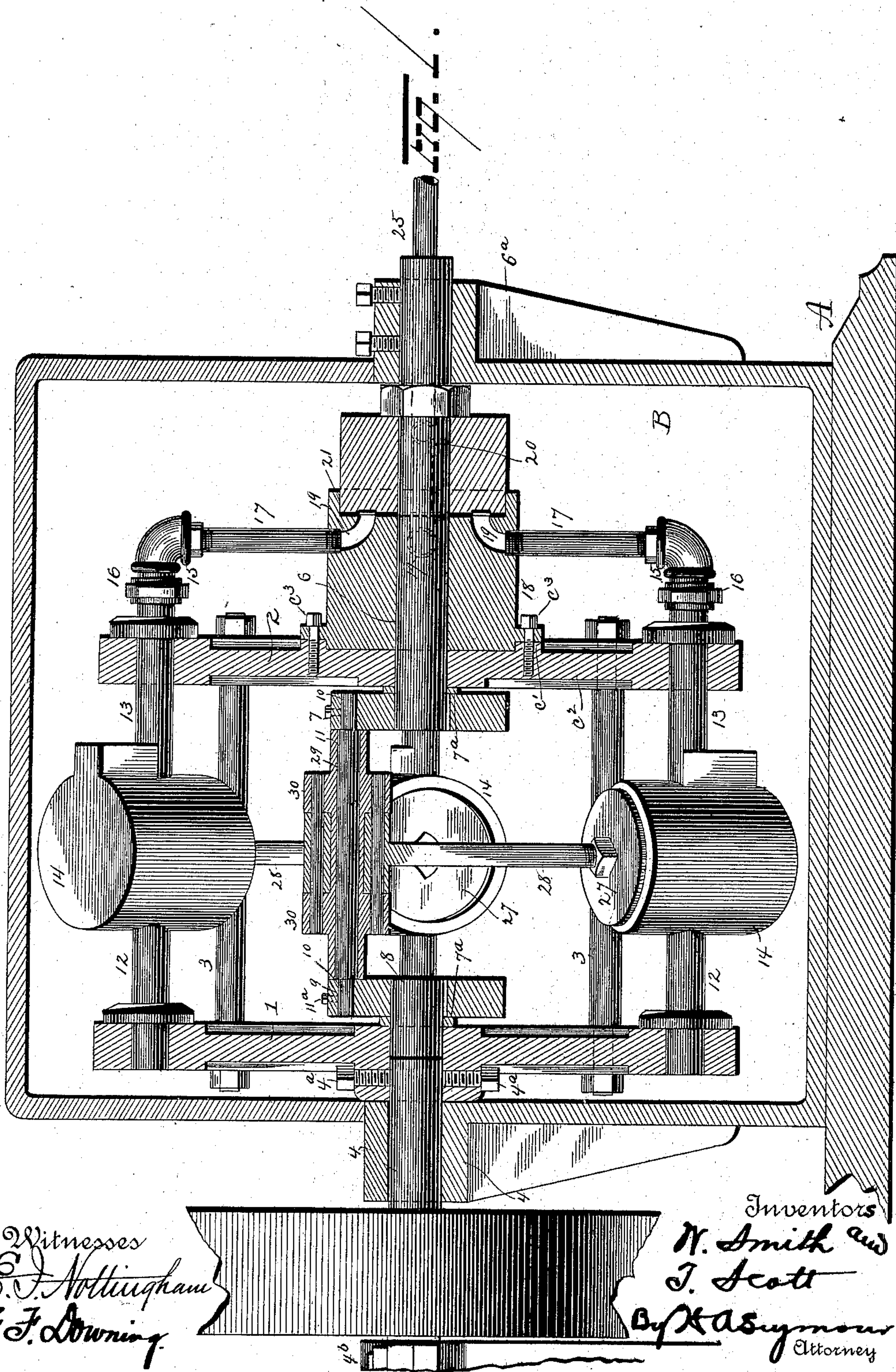
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3 Sheets—Sheet 1.

W. SMITH & T. SCOTT.
ROTARY STEAM ENGINE.

No. 565,641.

Patented Aug. 11, 1896.



Witnesses
E. J. Nottingham
G. F. Downing

Inventors
N. Smith and
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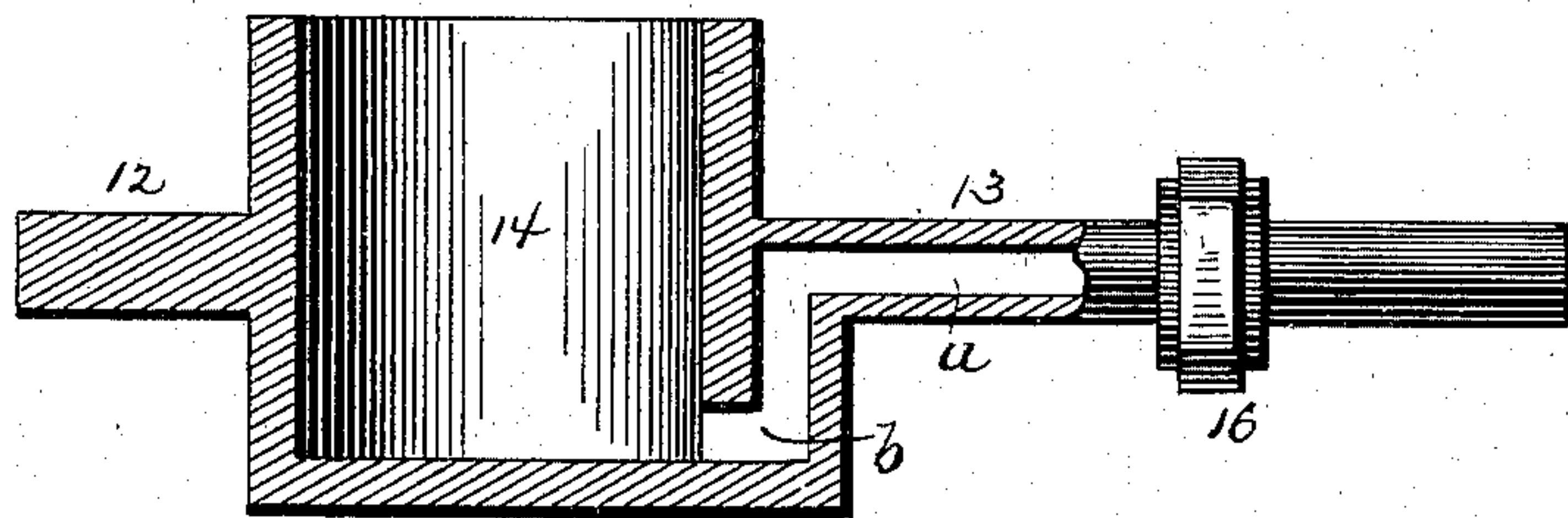
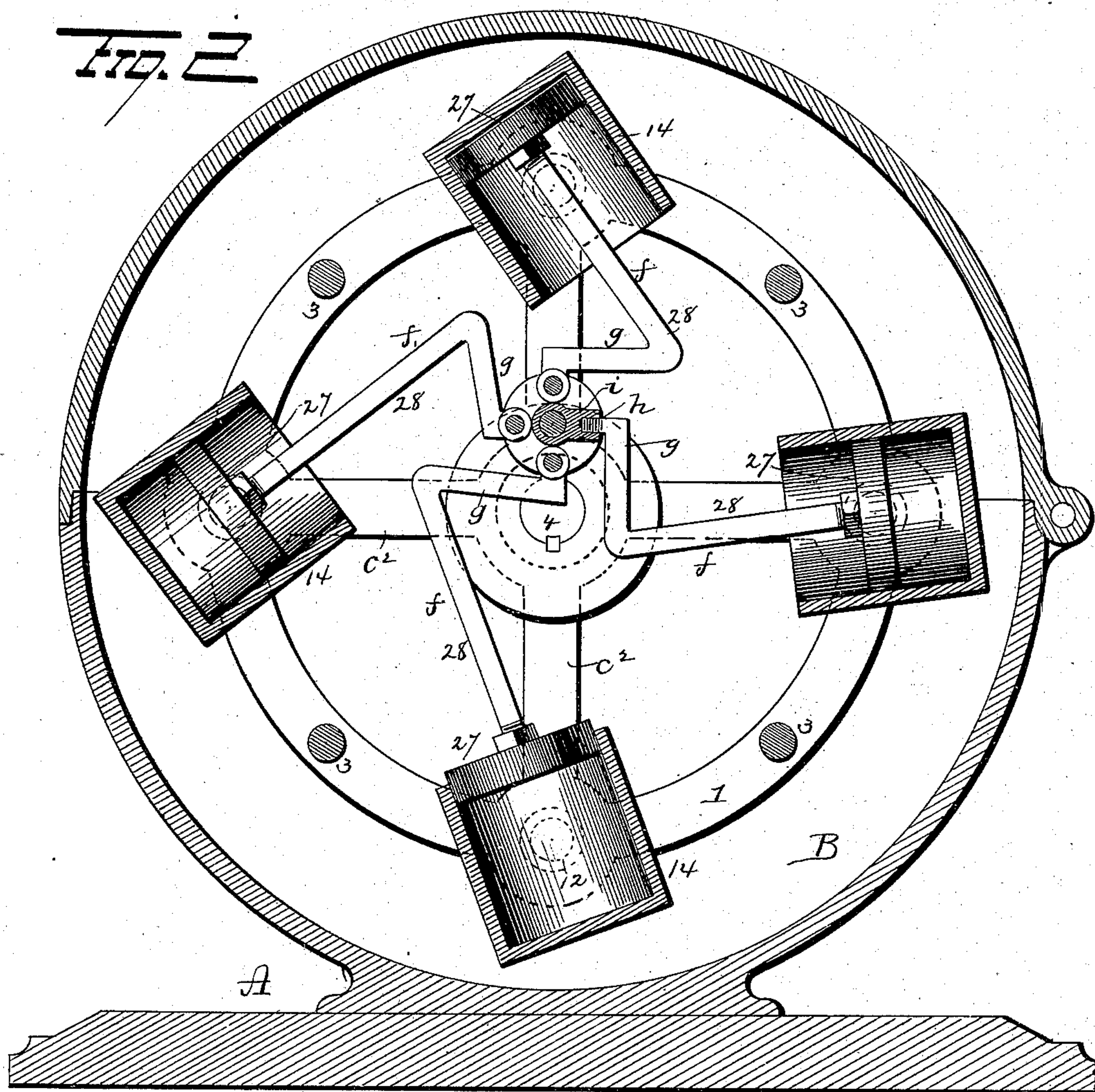
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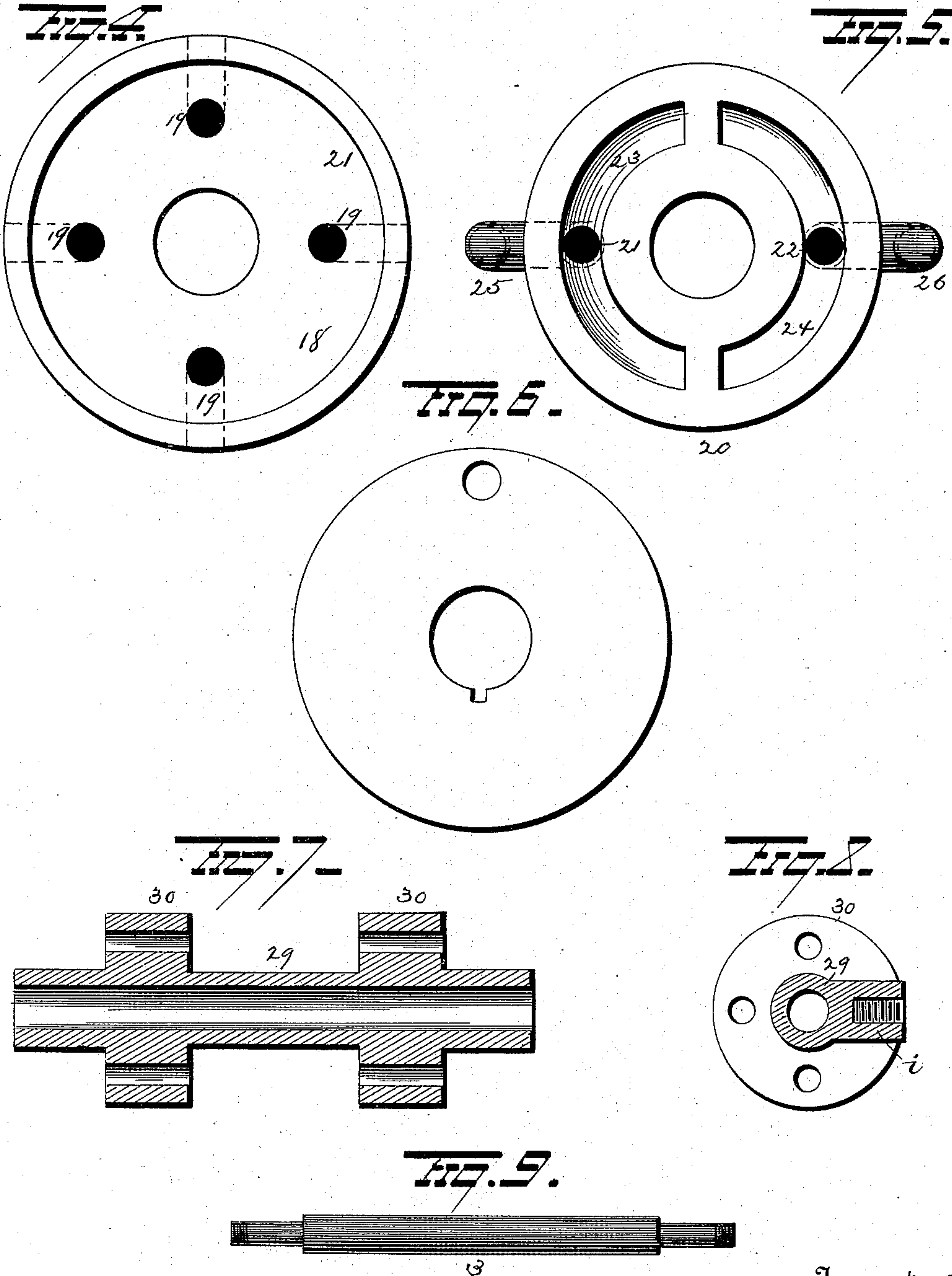
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UNITED STATES PATENT OFFICE.

WILLIAM SMITH AND THOMAS SCOTT, OF TARKIO, MISSOURI, ASSIGNORS
OF ONE-HALF TO KER D. DUNLOP, OF SIBLEY, IOWA.

ROTARY STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 565,641, dated August 11, 1896.

Application filed July 16, 1895. Serial No. 556,167. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM SMITH and THOMAS SCOTT, residents of Tarkio, in the county of Atchison and State of Missouri, have invented certain new and useful Improvements in Rotary Steam-Engines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to an improvement in steam-engines, and more particularly to rotary steam-engines such as employ reciprocating pistons, the object of the invention being to produce an engine which shall be so constructed and arranged as to be compact and at the same time possess a high degree of efficiency.

A further object is to construct a rotary steam-engine in such manner that a comparatively small amount of steam need be employed for actuating it and causing it to exert considerable power.

A further object is to produce a rotary steam-engine which shall be simple in construction, occupy a small amount of space, and one which shall be effectual in all respects in the performance of its functions.

With these objects in view the invention consists in certain novel features of construction and combinations and arrangements of parts, as hereinafter set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional view illustrating our invention. Fig. 2 is a cross-section. Figs. 3, 4, 5, 6, 7, 8, and 9 are views illustrating details.

A represents an engine-bed, and B a casing mounted thereon and adapted to inclose the engine. The frame of the engine proper comprises two wheels or rings 1 2, connected together and properly spaced apart by means of a series of connecting rods or bars 3. The wheel 1 is made with a hub through which the end of a shaft 4 partially projects, and to said shaft the hub of the said wheel 1 is secured by means of screws 4^a or in any other suitable manner. The shaft 4 is mounted in bearings 4^b at the top of a standard 5 and in bearings 4^c, secured to one end of the casing B. The wheel 2 is mounted loosely on a

fixed shaft 6, the outer end of which is secured to a bracket 6^a, secured to the casing B. To the inner end of the fixed shaft 6 a disk 7 is keyed and separated from the wheel 2 by means of a washer 7^a. A short shaft 8 is mounted in the hub of the wheel 1, its outer end abutting against the inner end of the revoluble shaft 4, and on the inner end of said short shaft a disk 9, similar to the disk 7, is keyed. The disks 7 9 at points immediately over the shafts 6 8 are made with perforations 10 for the reception of the respective ends of a crank arm or pin 11, which are secured in said perforations by means of set-screws 10^a. Thus it will be seen that the wheels 1 2 of the engine-frame are revolubly mounted and that the disks 7 9 and the crank-arm 10 carried thereby are fixed for a purpose hereinafter explained.

Each ring 1 2 of the engine-frame is made with a series of perforated bosses or enlargements for the reception of the trunnions 12 13 of a series of oscillatory cylinders 14, there being preferably four of such cylinders provided, and each having a single head. The trunnion 12 of each cylinder may be made solid, as shown in Fig. 3, but the trunnion 13 is made tubular to form a duct *a*, which communicates at one end with a duct *b*, leading into the rear or outer end of the cylinder. A pipe 15 is connected with each tubular trunnion 13 by means of a union or expansion joint 16, and with each of said pipes 15 one end of a smaller pipe 17 communicates. The other end of each pipe 17 communicates with ducts in a casting or block 18, which, in effect, constitutes a steam-chest.

The casting 18 is mounted loosely on the fixed shaft 6 and provided with perforated lugs *c*, adapted to aline with similar lugs *c'* on arms *c*² of the wheel 2, and through these lugs bolts *c*³ are passed, whereby to secure the casting or steam-chest 18 to the frame of the engine and cause it to rotate therewith.

The casting or steam-chest 18 is made with a series of four angular ducts 19, one end of each duct being made to communicate with one of the small pipes 17, leading to the hollow trunnions of the cylinders, whereby to conduct live steam to the latter or exhaust-steam therefrom as the engine revolves, the

inlet and outlet of steam being controlled by means of a valve 20. The valve 20 is made in the form of a block or casting and is secured to the fixed shaft 6, one end of said valve or block being made to enter a recess 21 in the casting or steam-chest 18. The block or valve 20 is made at diametrically opposite points with ducts 21 22, which communicate at one end in semicircular slots 23 24, respectively, made in the inner face of the said block or valve 20. With the duct 21 a live-steam-inlet pipe 25 communicates, and with the duct 22 an exhaust-steam pipe 26 is connected. From this construction and arrangement of parts it will be seen that as the engine revolves the steam-chest or casting 18 will revolve with it and the valve 20 will remain stationary, so that as the ends of the ducts 19 pass the slot 23 in the valve live steam will be caused to pass to the pistons successively, and as said ducts 19 pass the slot 24 in the valve the exhaust from the successive cylinders will be permitted to escape.

Within each cylinder a piston 27 is located, and to each piston one end of a piston-rod 28 is secured, each piston-rod being made angular in form—viz., comprising arms or members *f g*, projecting at an angle from each other, so that when the engine is in operation the cylinders will be disposed at an angle or be inclined in the direction of rotation of the engine when live steam enters between the cylinder-head and piston. A sleeve 29 is mounted loosely on the crank arm or pin 11, and between its ends is provided with perforated flanges 30, to which the arms or members *g* of three of the piston-rods 28 are pivotally connected. The arm or member *g* of the fourth piston-rod is made with a screw-threaded shank *h* to enter a screw-threaded boss *i*, projecting from the sleeve 29.

It is evident that when steam is admitted in a cylinder between the head thereof and the piston the pressure of the steam will tend to force the cylinder and pistons in opposite directions, and as the pistons are connected with the fixed crank-arm 11 the cylinder will be forced forward, carrying the revoluble frame with it, and, on account of the angular form of the piston-rod, the cylinder will oscillate, so that its head will be projected in the direction of rotation of the engine. The various cylinders and pistons will act successively in this manner and cause the continuous rotation of the frame in which the cylinders are mounted, the steam being supplied to and exhausted from said cylinders in the

manner hereinbefore explained. It is evident that as the frame in which the cylinders are mounted revolves and that as the crank-arm with which the pistons are connected is stationary the revolution of the said frame will cause the necessary reciprocatory motion of the pistons relatively to the cylinders. The valve mechanism above described is so arranged that the cylinders will take steam at upper center and exhaust when it passes lower center of crank.

In an engine constructed and arranged as above described, having a capacity of fifteen-horse power, the piston movement is two and a half inches. Thus an engine with four or six inch cylinders, seven-inch leverage, and two and a half inches piston movement only requires three-fourths of an inch steam-pipe, and will develop fifteen-horse power.

Our improved engine has no dead-centers and is effectual in all respects in the performance of its functions.

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a rotary steam-engine the combination with a revoluble frame and a fixed crank, of a series of oscillatory cylinders mounted in said frame, a piston in each cylinder, a piston-rod connected with each piston, a sleeve mounted loosely on the crank and having flanges, a socketed boss on said sleeve, and a shank on one of the piston-rods to enter said socketed boss, the other piston-rods being pivotally connected with said flanges, substantially as set forth.

2. In a rotary steam-engine, the combination with a revoluble frame comprising two rings connected together, of a shaft secured to one of said rings, a fixed shaft on which the other ring is loosely mounted, a disk secured to the fixed shaft, a short shaft mounted loosely in said first-mentioned ring, a crank-arm secured at its ends to said disks, a sleeve on the crank-arm, cylinders carried by the revoluble frame, pistons in said cylinders, and connections between said pistons and the sleeve on the crank-arm, substantially as set forth.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

WILLIAM SMITH.
THOMAS SCOTT.

Witnesses:

THOMAS J. MARLIN,
FRANK H. HOPKINS.