2 Sheets--Sheet 1.

JAMES E. HANGER.

Improvement in Rotary Engines.

No. 126,806. Patented May 14, 1872.

Fig. 1.

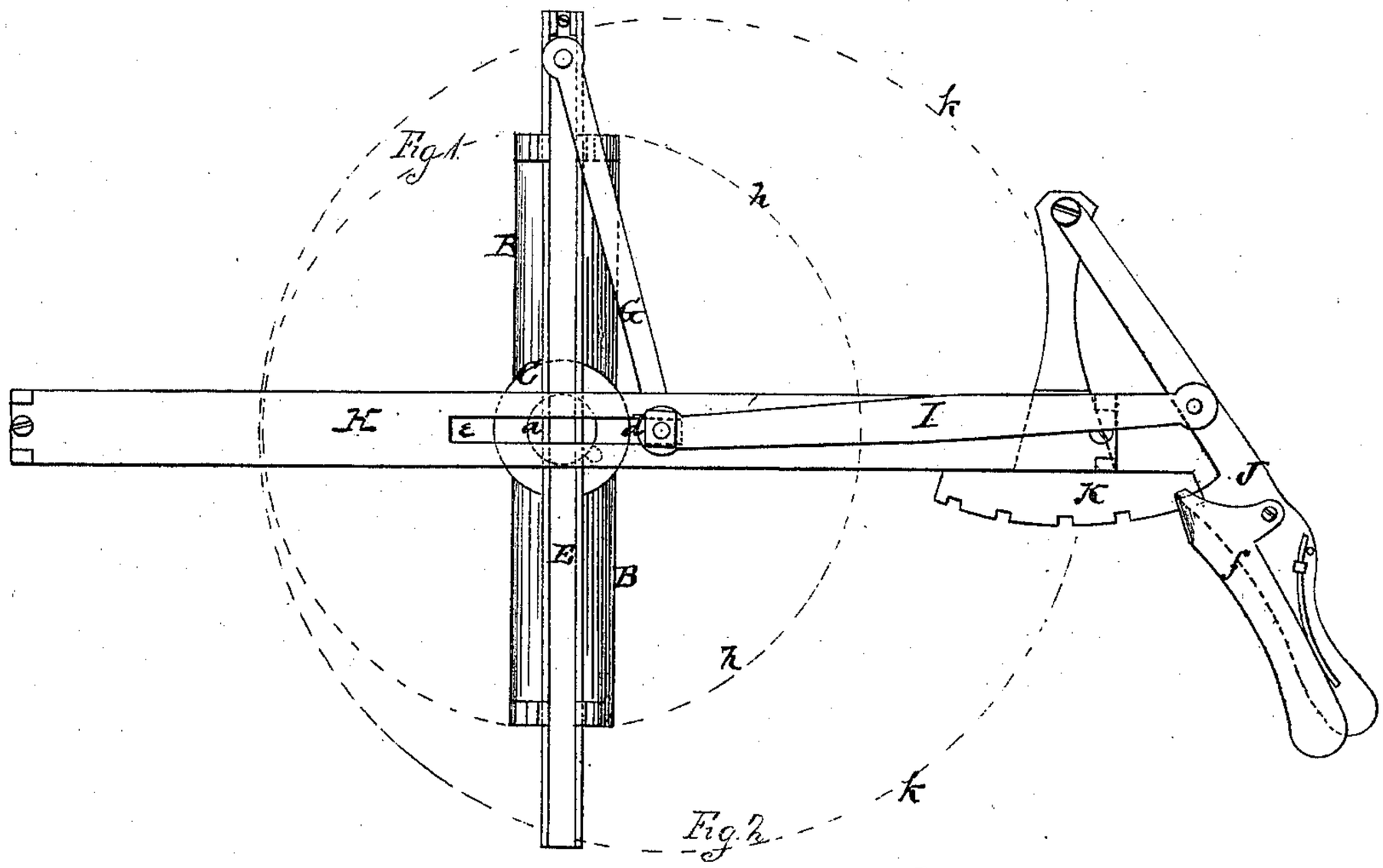
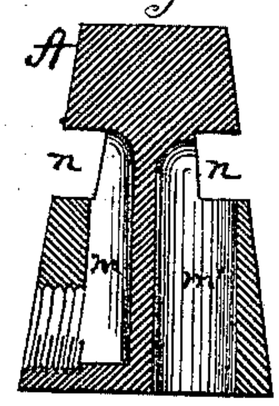


Fig. 2.

Fig. 3.



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2 Sheets--Sheet 2.

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Fig. 4

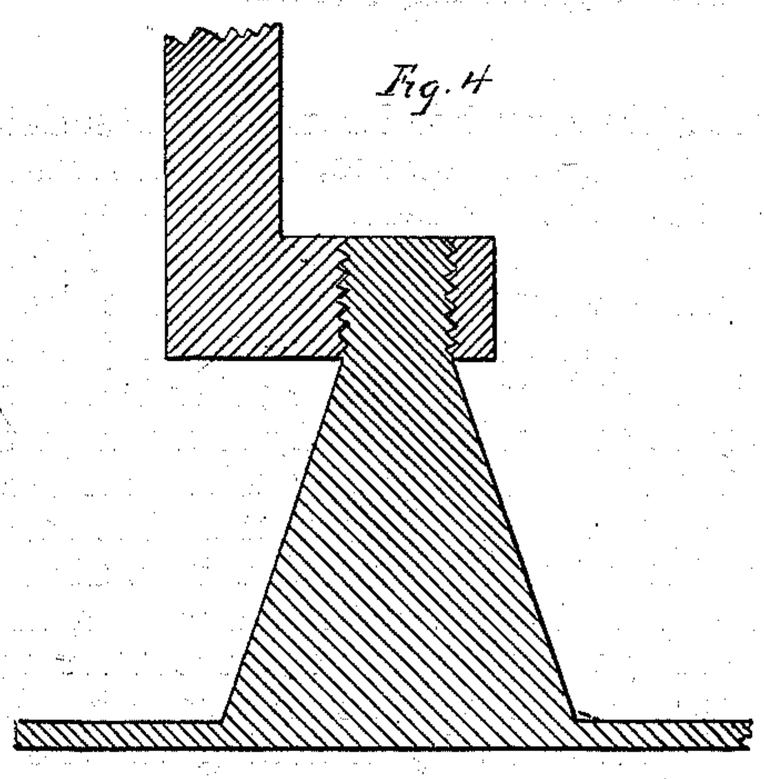

Fig. 5.

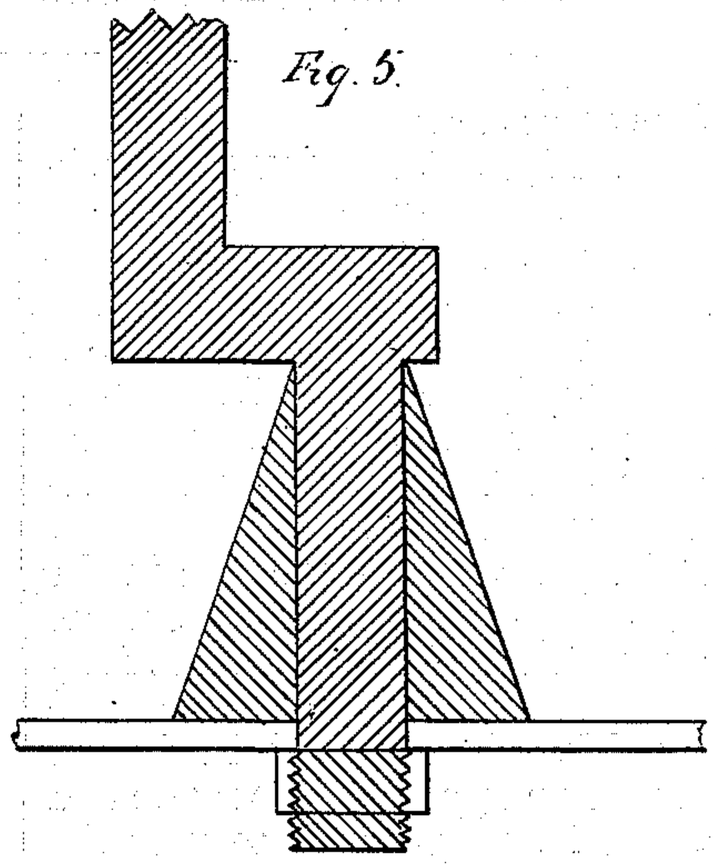

Fig. 6.

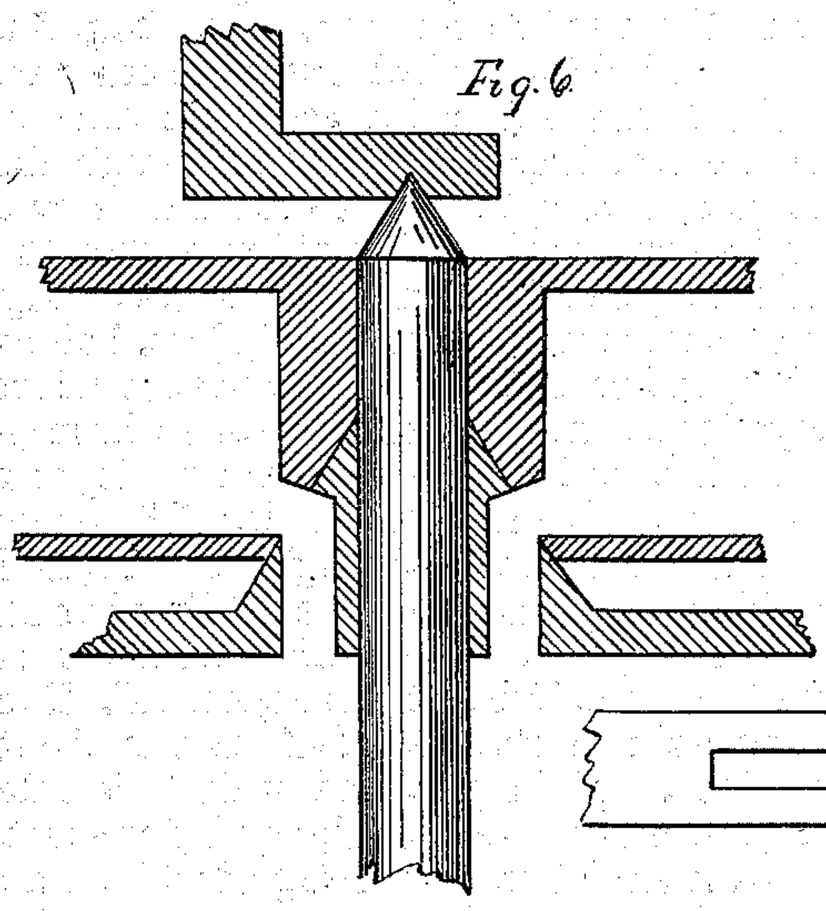

Fig. 7.

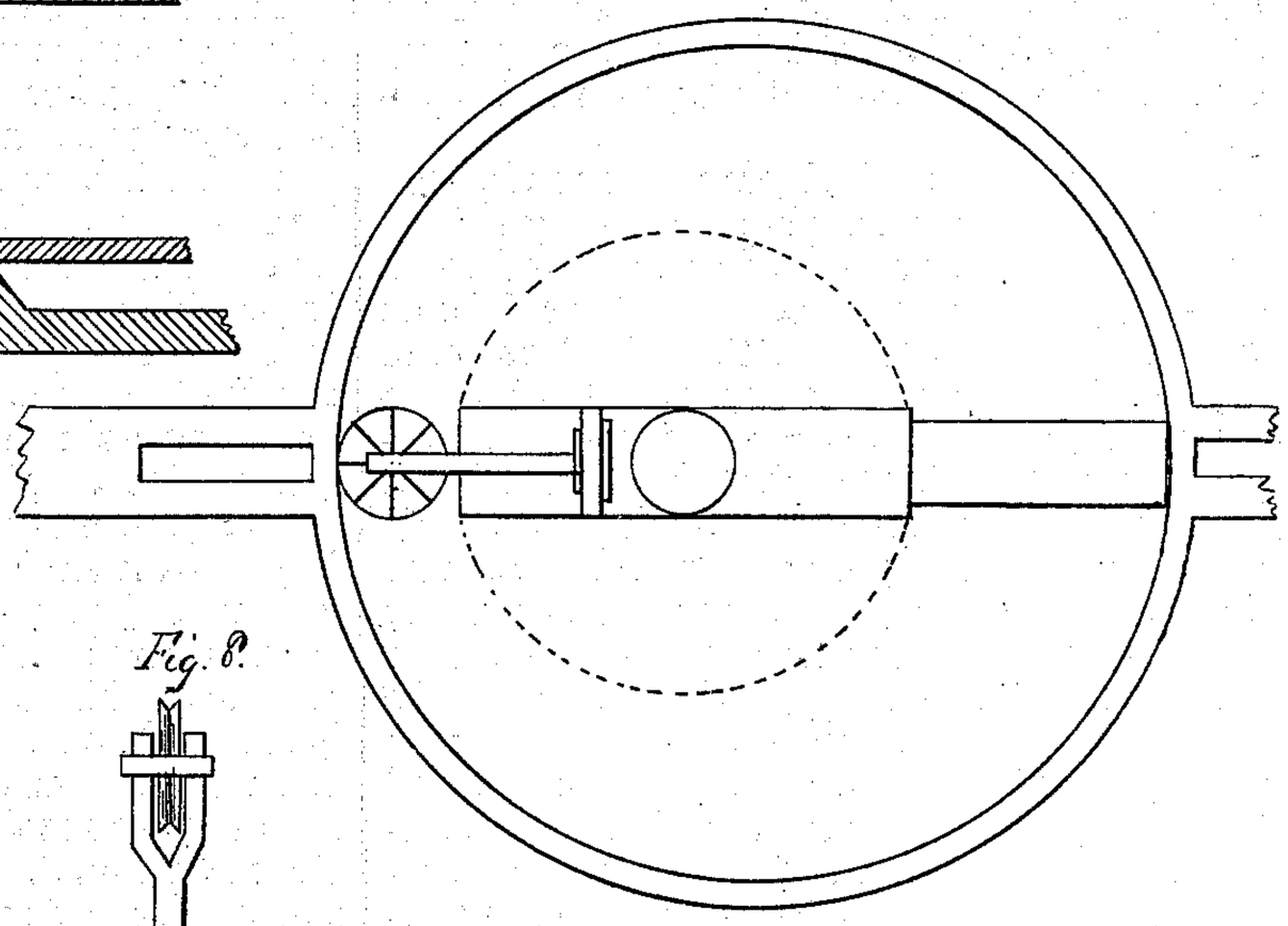

Fig. 8.

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UNITED STATES PATENT OFFICE.

JAMES EDWARD HANGER, OF RICHMOND, VIRGINIA.

IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. 126,806, dated May 14, 1872.

To all whom it may concern:

Be it known that I, J. E. HANGER, of Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Rotary Engines; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing and to the letters of reference marked thereon making a part of this specification.

The nature of my invention consists in the construction and arrangement of an eccentric rotary engine, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawing, in which—

Figure 1 is a front elevation of my engine; Fig. 2 is a longitudinal vertical section of the same; and Fig. 3 is an enlarged section of the axis. Figs. 4, 5, 6, 7, and 8 are views showing certain modifications of some parts of my engine.

A represents a conical trunnion or axis, upon which the cylinders revolve and through which the steam or air is admitted and allowed to escape. *a* is a round washer attached to the axis A by two screws to hold the cylinders on to take up lateral motion or wear. B B are two fac-simile cylinders, and are representatives of any number of like cylinders attached to a common hub. C is the hub of the cylinders, and has a conical bearing to fit the axis A. The hub has also a port, *b*, for each cylinder B, opening to the center, each port acting as induct and educt during the revolution of the cylinders. D D are two piston-heads and rods operating in the cylinders B B, and connected together by a sliding bar, E, working in a dovetail at the outer end of each cylinder. G is an eccentric rod attached by one end to the sliding bar E and by the other to an eccentric or slide, *d*, which moves in a slot, *e*, in the front frame-piece H. I is a horizontal rod, which connects the eccentric *d* with a hand-lever, J. The hand-lever J, with pawl *f*, moves on the reverse rack-segment K for change of motion. The dotted circle *h*, in Fig. 1, represents the circumference of the cylinders, and the circle *k*, the circumference of the sliding bar E. The distance of the eccentric *d* from the center determines the length of stroke, and when moved beyond reverses the motion. Fig. 4 is a section of conical trunnion and eccentric axle, in which the trunnion is solid with the frame, and the axle is screwed eccentrically to the smaller end of trunnion. The other end of the axle can be screwed to the front frame-piece; or, where not practical to use such frame-piece, it can be provided with a nut or bolt to fasten the eccentric rod on, or it can be a male or female center to receive the end of a main shaft, which is turned by the eccentric rod. A balance or band-wheel can be used in place of the eccentric rod by attaching the sliding bar E to the rim or arm by a bolt. Fig. 5 is section of a hollow conical trunnion separate from the frame and solid eccentric axle in which the eccentric axle passes through the trunnion, and is held fast to the frame by a nut on the outer side. The other end of the axle is arranged as described in Fig. 4. Fig. 6 is a section of part of the cylinders, hollow trunnion, and eccentric, in which the cylinders are keyed to a shaft. This shaft passes through the trunnion, and can be the main shaft, or a band-wheel can be attached to it. The other end of the shaft passes through the hub, and is provided with a slot for the sliding bar E, and a male center. The hollow trunnion is received into the hub as before specified. The eccentric axle is screwed fast to the front frame-piece, and is provided with a female center to receive the end of the cylinder-shaft. Fig. 7 is an elevation of a design in which an eccentric circular track is used in place of the eccentric rod and sliding bar. This track is provided with two slots, and so arranged that it can be moved back and forth for a change of motion. The outer end of each piston-rod is forked to receive a small groove-wheel, as shown in Fig. 8. On each side of the fork is a small projection to work into slides attached to each cylinder. In the trunnion A there are two parallel axial ports, *m m'*, one for induction and the other for eduction, the latter being the larger. Each port opens into a slot, *n*, made across and on opposite sides of the trunnion. Both slots are parallel to a plane common to the centers of the trunnion and eccentric, and correspond exactly with the port *b* in the central end of each cylinder, so

that as the cylinders revolve on the trunnion the steam has free ingress to and egress from the cylinders. Each slot *n* is cut nearly to the center of the trunnion, leaving only a surface on each side sufficient to form a perfect cut-off while the cylinders are passing from the induction to the eduction, and vice versa, or when the common plane passes through the centers of the cylinders. In this position a two-cylinder engine is on a dead center. In a four or more cylinder engine there are no dead centers. Just after a cylinder passes the cut-off furthest from the eccentric, and when the piston is nearest the central end of the cylinder, the steam begins to be admitted and its action on the piston in connection with the sliding bar and eccentric lever revolves the cylinders a half revolution when it reaches the second cut-off, at which point the piston is at the outer end of the cylinder. Then, after it passes the second cut-off, the steam is permitted to escape during the other half revolution, and the piston, by the action of the eccentric lever and sliding bar, is drawn to the central end again. When one begins to receive its opposite cylinder begins to exhaust, and each continue during a half revolution, minus the cut-off. In a two-cylinder engine the momentum carries the cylinder over the dead centers.

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

1. A central hub, C, in combination with two or more radial cylinders, B, each having a piston and piston-rod, and the piston-rods for two opposite cylinders connected by a sliding bar, E, arranged substantially as and for the purposes herein set forth.

2. In combination with the eccentric *d* and lever G, the connecting-rod I, lever J, pawl *f*, and rack K, substantially as and for the purposes herein set forth.

3. The combination of the trunnion A, hub C, cylinders B B, pistons D D, sliding bar E, lever G, eccentric *d*, slotted frame-piece H, rod I, and lever J, all constructed and arranged to operate substantially as and for the purposes herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 9th day of February, 1872.

JAMES E. HANGER.

Witnesses:

B. TAYLOR MCCUE,

JAS. A. WILSON.