

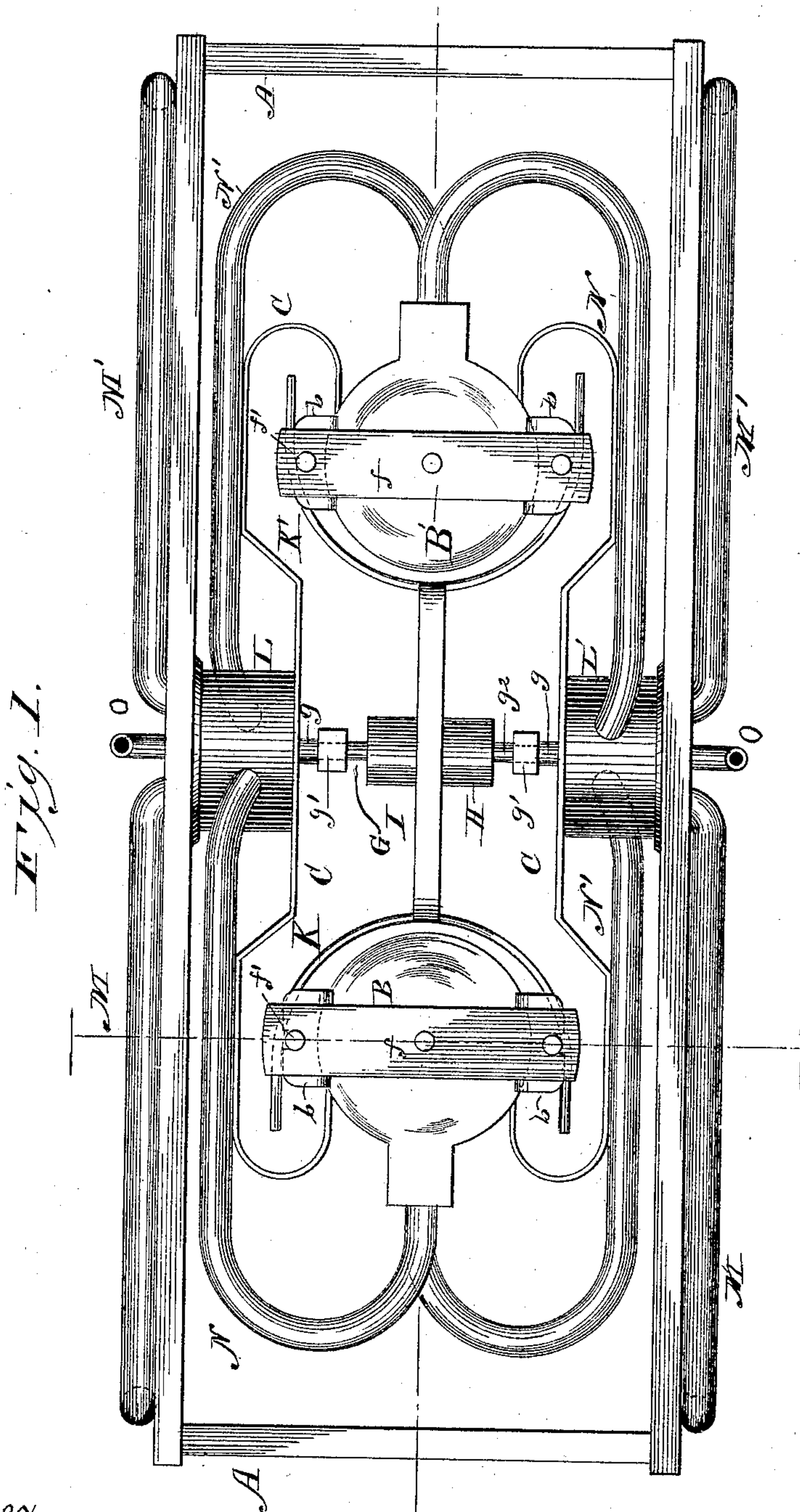
(No Model.)

4 Sheets—Sheet 1.

B. B. BOWER.
ROTARY ENGINE.

No. 436,867.

Patented Sept. 23, 1890.



Witnesses

E. J. Newman
Louis G. Julihn.

Inventor

Byron B. Bower

By his Attorneys

By His Attorneys
Baldwin, Davidson & Wright.

(No Model.)

4 Sheets—Sheet 2.

B. B. BOWER.
ROTARY ENGINE.

No. 436,867.

Patented Sept. 23, 1890.

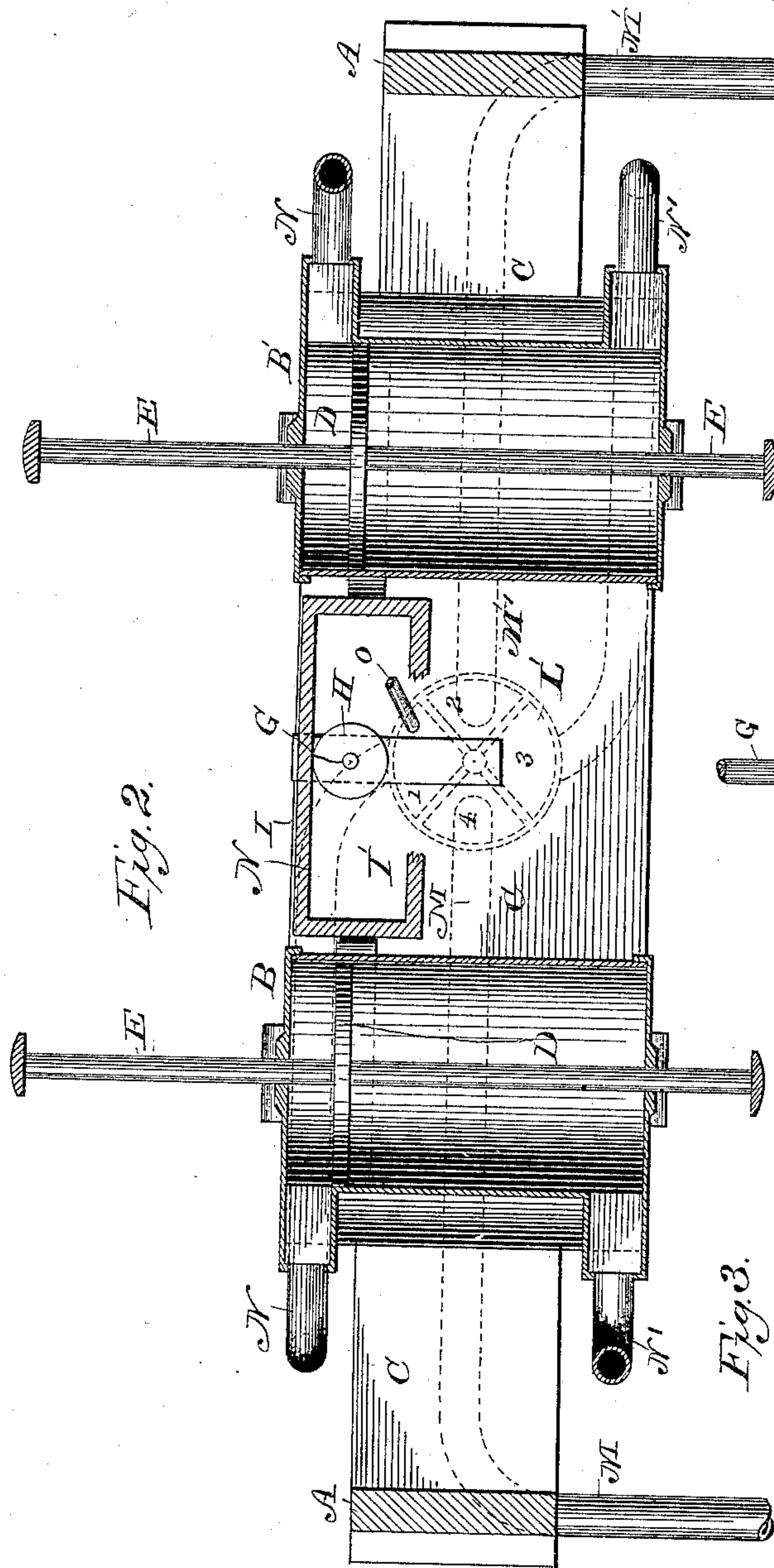


Fig. 2.

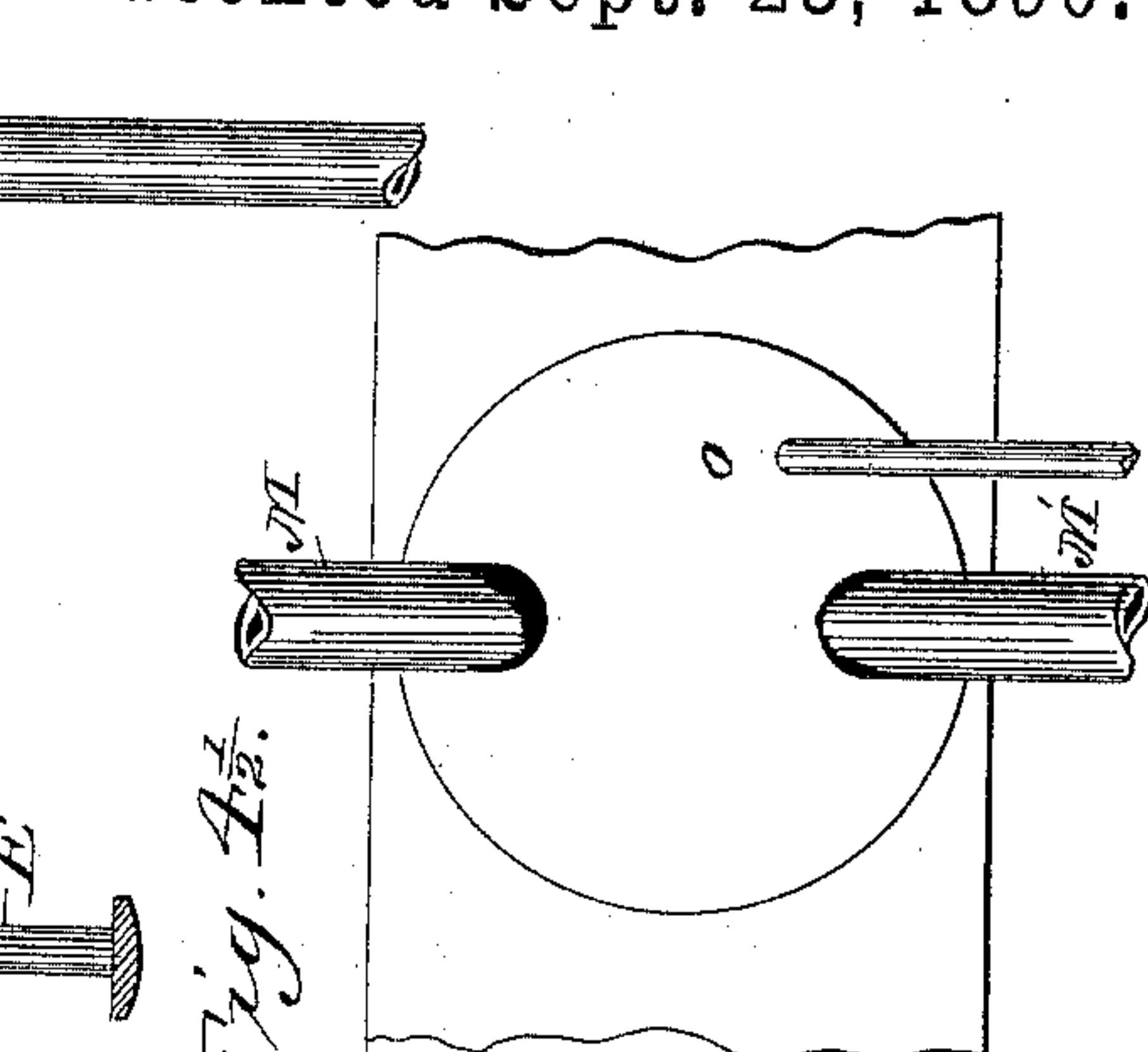


Fig. 4a.

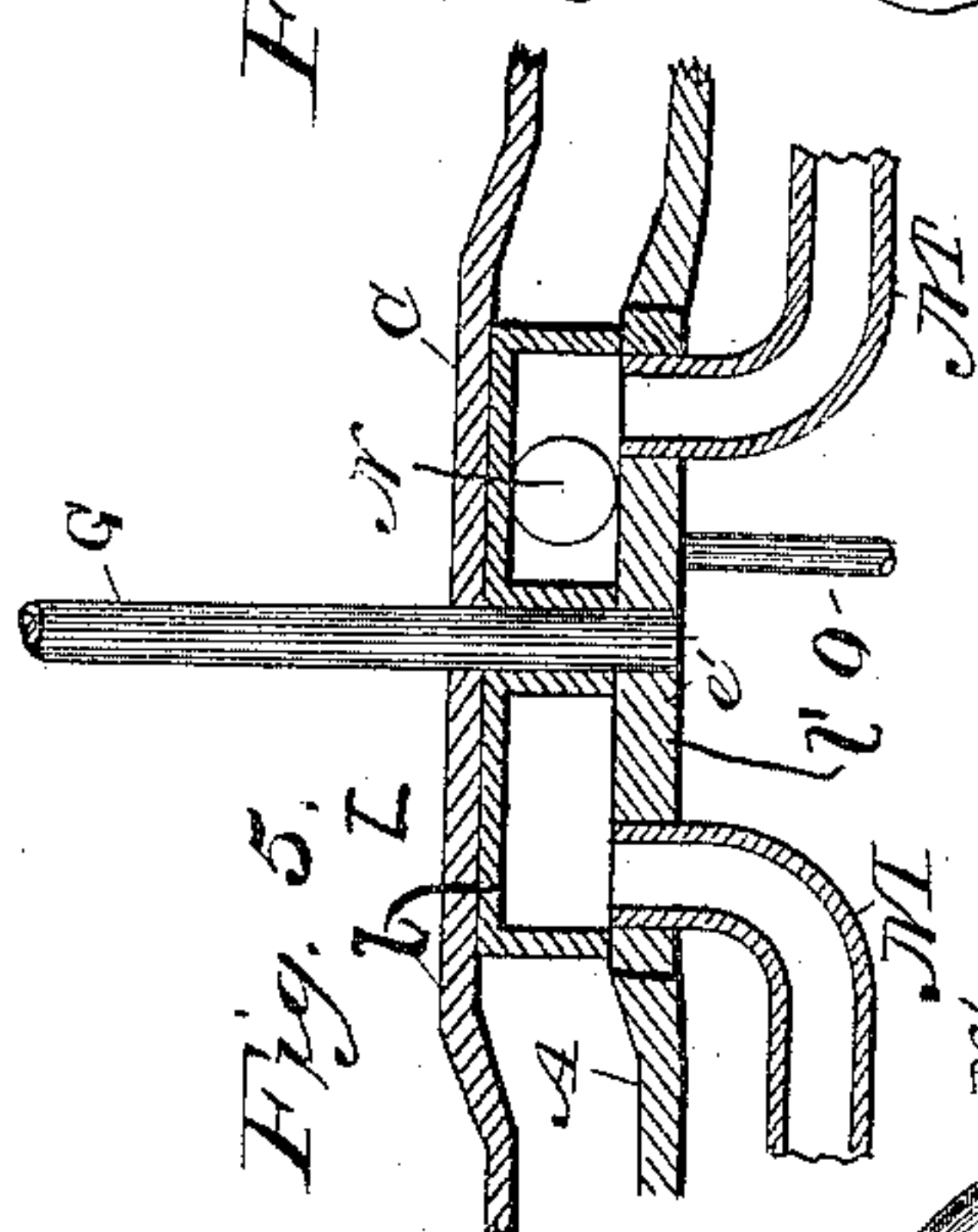


Fig. 5.

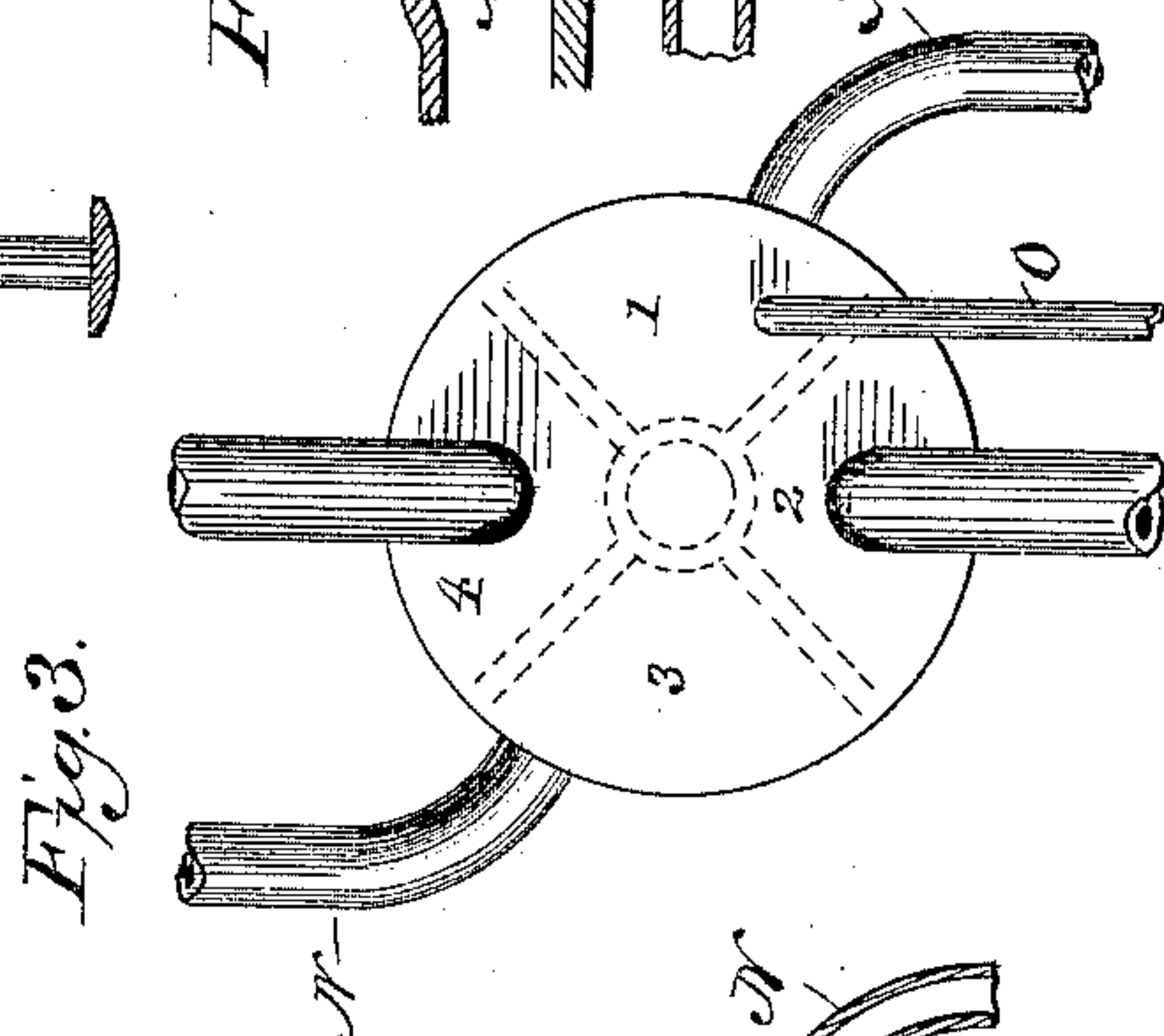


Fig. 3.

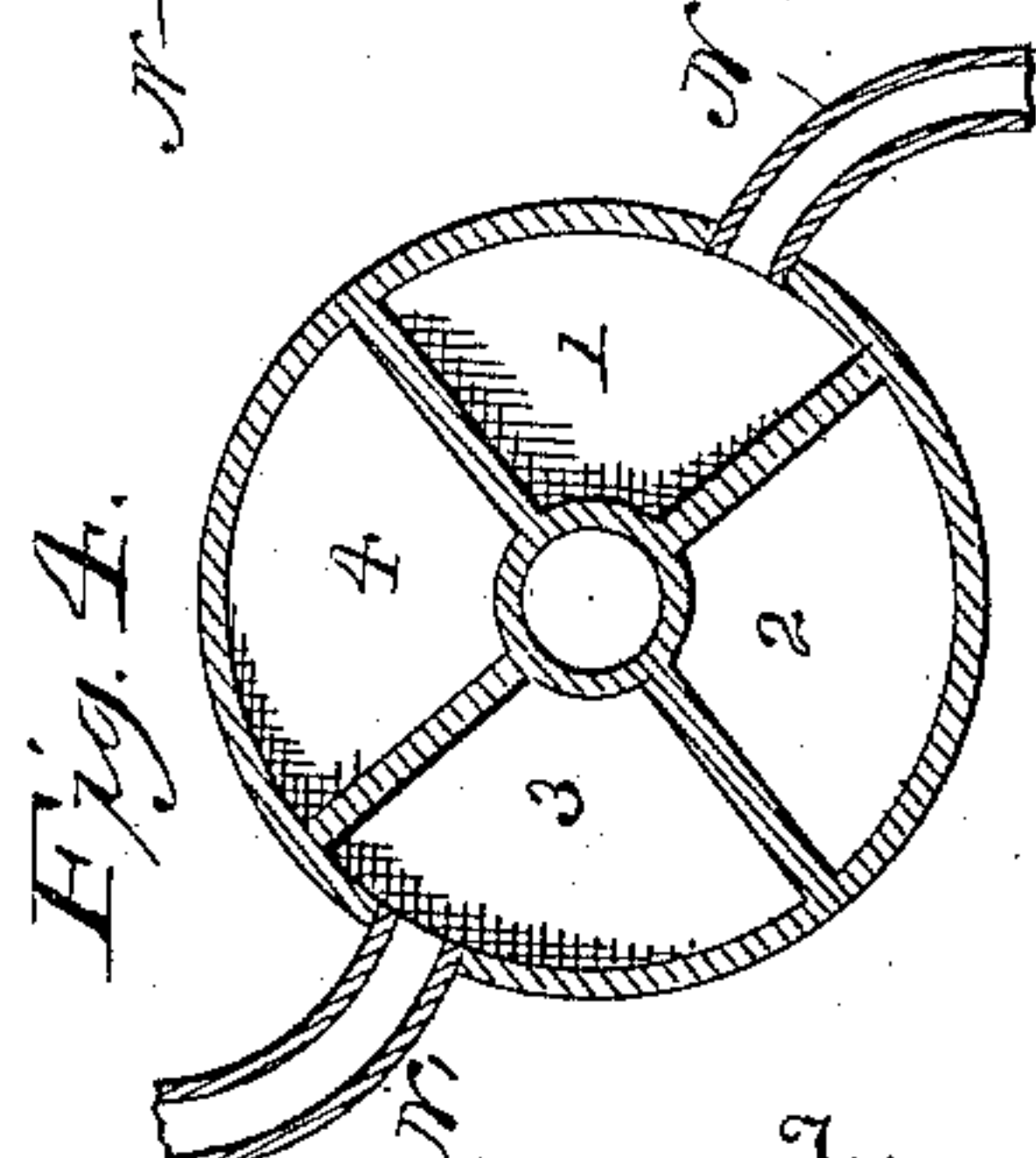


Fig. 4.

Witnesses

H. C. Newman,
E. S. Newman.

Inventor
Byron B. Bower,
By his Attorneys
Baldwin, Davidson & Wright.

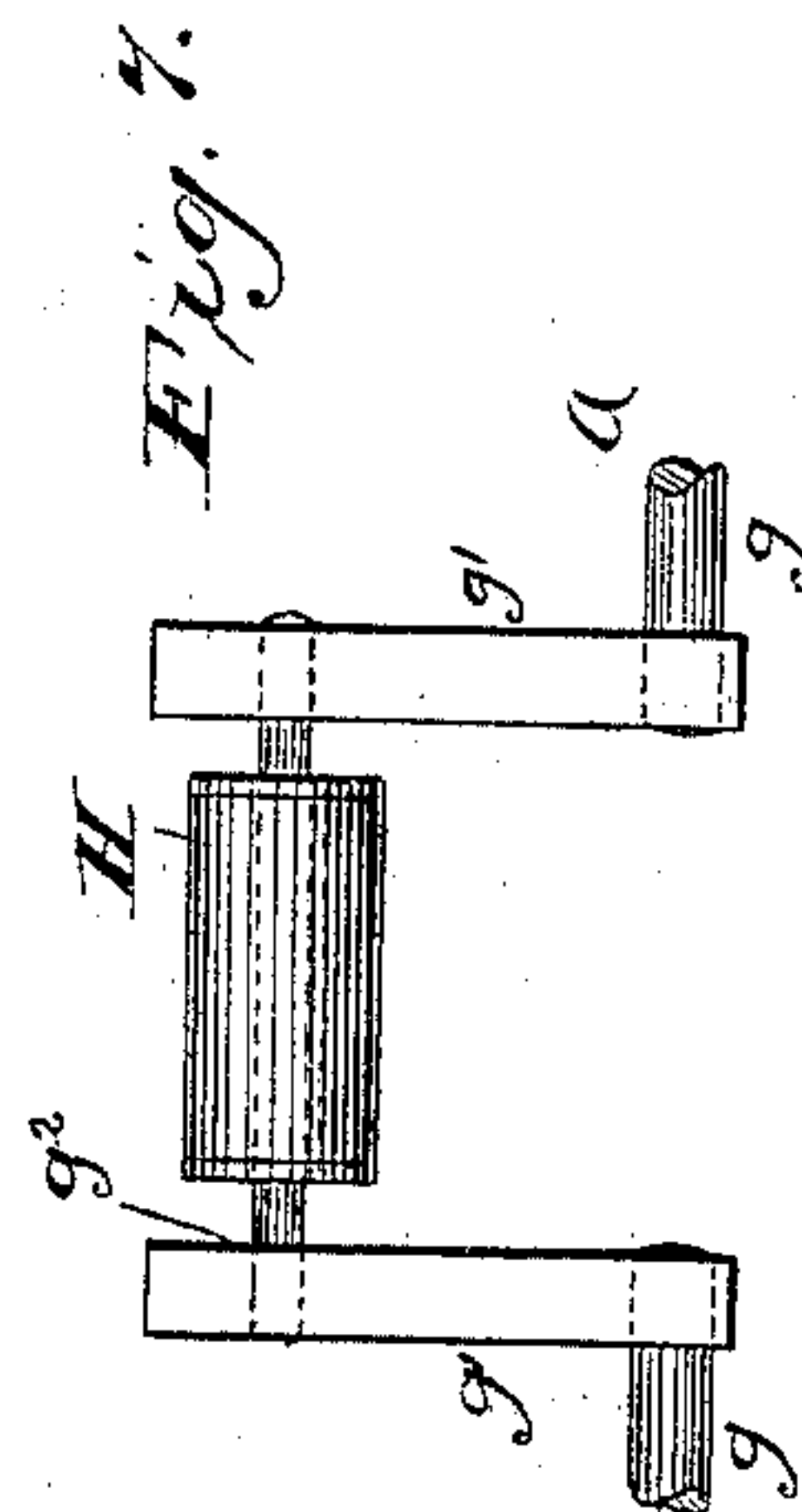
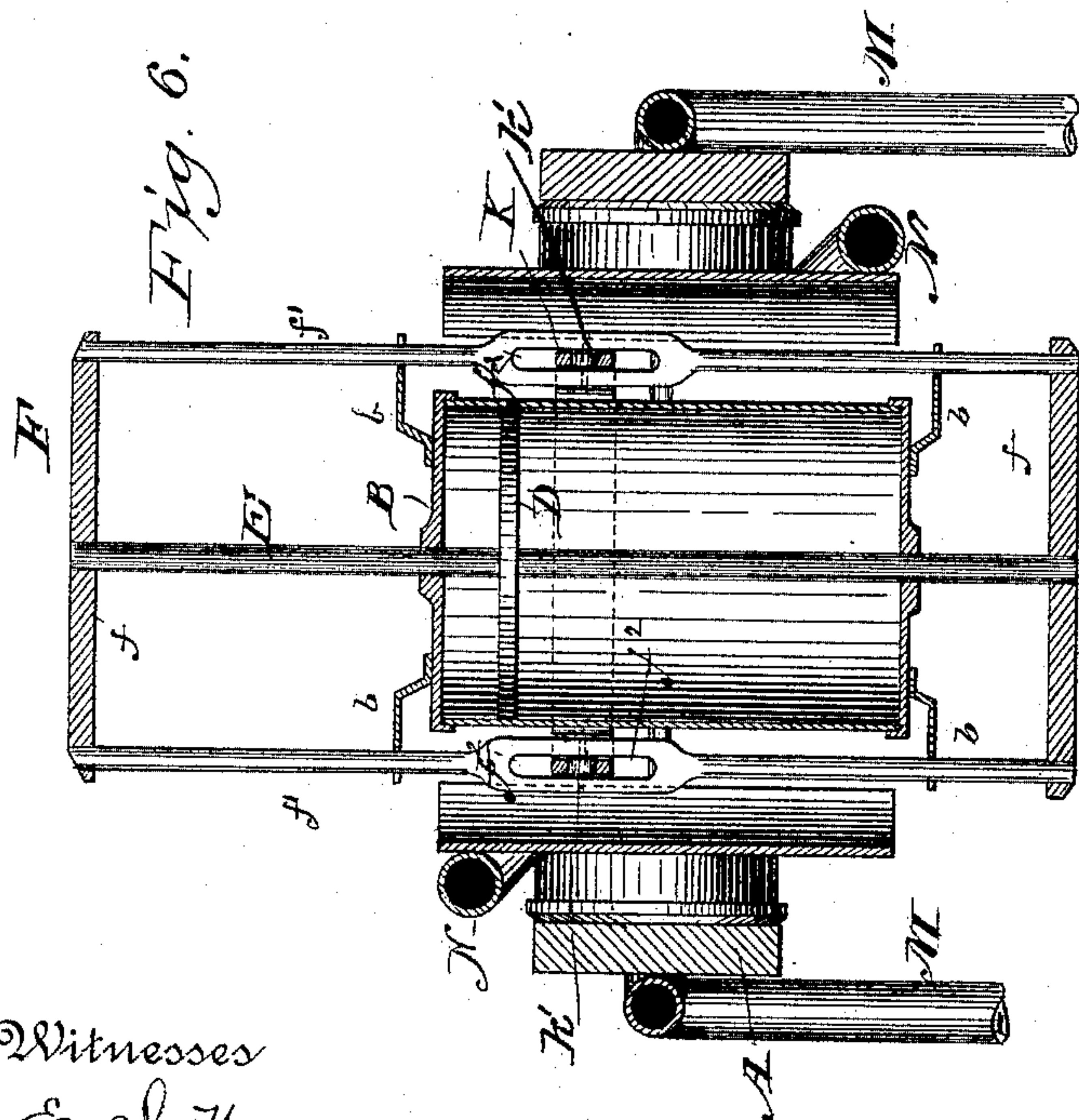
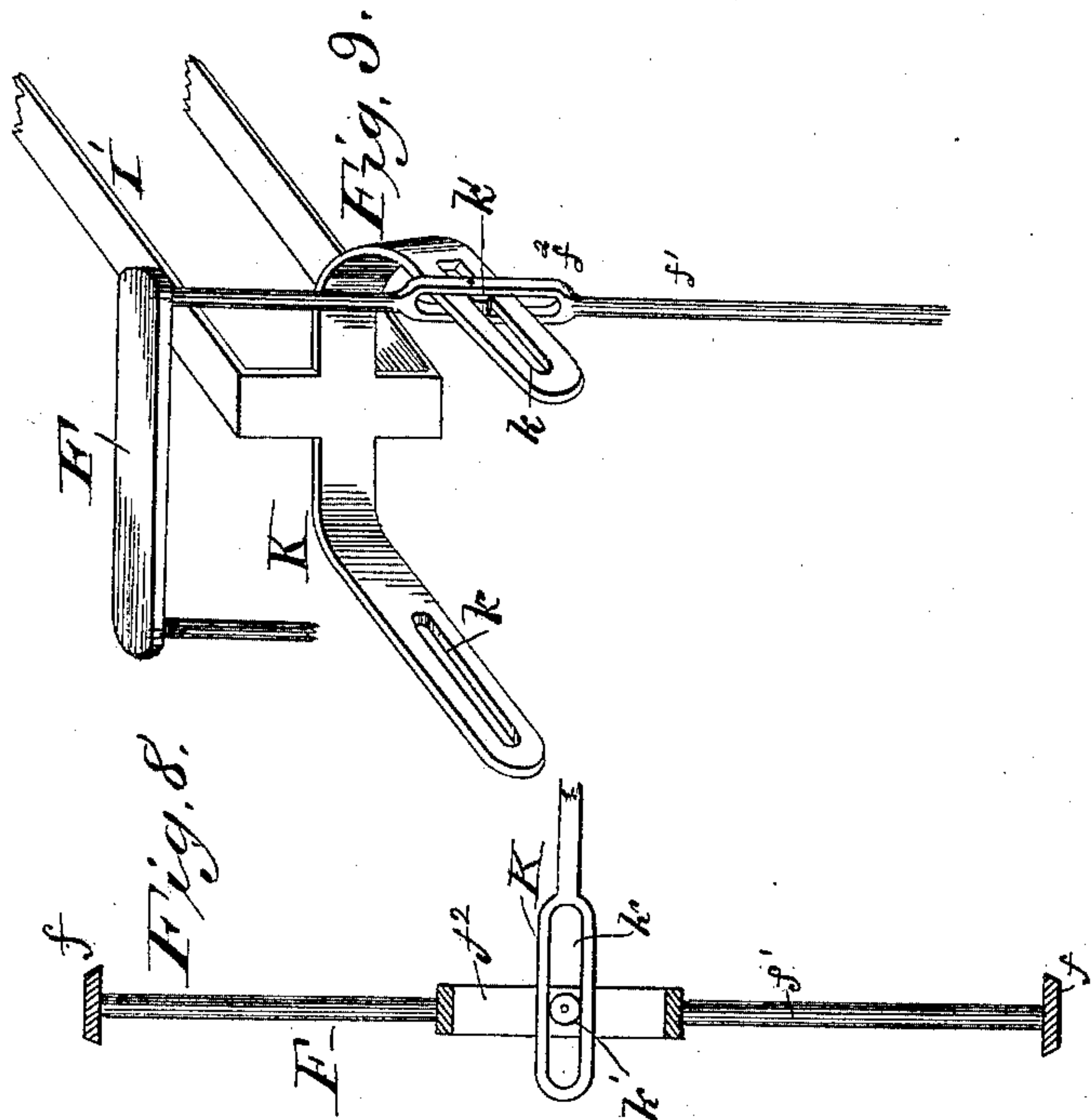
(No Model.)

4 Sheets—Sheet 3.

B. B. BOWER.
ROTARY ENGINE.

No. 436,867.

Patented Sept. 23, 1890.



Witnesses
E. J. Newman.
Louis G. Julihn.

Inventor
Byron B. Bower.

By his Attorneys
Baldwin, Davidson & Wright.

UNITED STATES PATENT OFFICE.

BYRON B. BOWER, OF BAINBRIDGE, GEORGIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 436,867, dated September 23, 1890.

Application filed September 4, 1889. Serial No. 322,915. (No model.)

To all whom it may concern:

Be it known that I, BYRON B. BOWER, a citizen of the United States, residing at Bainbridge, in the county of Decatur and State of Georgia, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

The object of my invention is to provide a rotary engine of an improved construction and operating in an improved way.

My invention consists in certain novel organizations of instrumentalities, combinations of devices, and details of construction hereinafter fully described.

In general outline one form of my apparatus consists of a main supporting-frame, a pair of cylinders connected by a suitable frame and provided with pistons and piston-rods, frames secured to the piston-rods, and a forked yoke connecting the frames to which the piston-rods are secured and through which extends a stationary eccentric or crank axle. As the piston-rods reciprocate in the cylinders, the yoke rides on the eccentric axle and causes the cylinders to be revolved bodily with their frame about the axle. The cylinders are provided with ports for the admission and exhaust of steam or similar fluids, and suitable valves and pipes are provided to admit of the proper working of the apparatus.

In the accompanying drawings, Figure 1 is a plan view of one form of my rotary engine. Fig. 2 is a longitudinal section with some of the parts in elevation; Fig. 3, a detail view of one of the valves and the connecting-pipes; Fig. 4, another detail view of the valves with the cap or plate of the casing removed. Fig. 4½ is a view of the stationary outside plate of valve-casing, showing also the stationary pipes; Fig. 5, a longitudinal section through the valve, showing how it is connected with the frame, and showing also some of the pipes. Fig. 6 is a vertical central section through one of the cylinders, showing also the piston, piston-rod, its frame, the main supporting-frame, and the pipes. Fig. 7 is a detail view of the eccentric axle, which operates the pistons. Fig. 8 is a detail view showing the connection between one of the piston-frames and the frame-connecting yoke. Fig. 9 is a per-

spective view showing the same more clearly. Fig. 10 is a perspective view showing a modification. Fig. 11 shows a plan view of the same slightly modified.

I will first describe the apparatus shown in plan in Fig. 1 and more in detail in other figures of the drawings. The main frame A may be of any suitable construction. It is preferably rectangular, as shown, and surrounds the cylinders B B', which are located on each side of the center of the frame and supported by a frame C. Each cylinder is provided with a piston D, having a piston-rod E extending through its heads or ends, and each rod is provided with a frame F, shown as consisting of cross-pieces *f* at top and bottom, connected by vertical rods *f'*. Midway between the cylinders is located an axle G, which carries a roller H. The axle is so constructed as to hold the roller eccentric from the journals, and preferably consists of end pieces *g*, secured to the frame A, laterally-projecting arms *g'*, and a connecting-bar *g*², on which the roller H is mounted and is free to revolve. A forked yoke I passes over the roller H and forms a connection between the piston-frames F. This yoke is preferably constructed with forked ends K K', preferably semicircular, extending around the inner sides of the cylinders and connected with the piston-frames, as shown in Figs. 6, 8, and 9 particularly. By referring to these figures it will be seen that the upright rods *f'* of the piston-frames are enlarged and slotted at *f*², and the ends K K' of the forked yoke are slotted at *k*. Through the slots *k* extend anti-friction rollers *k'*, journaled in the enlarged portions *f*² of the piston-frames. The forked yoke I is provided with a slotted enlargement I', which embraces the roller H on the eccentric axle. The frame C, which supports the cylinders, is secured to the valve-casings L L'. The crank-axle extends through the valve-casings, as shown in Fig. 5, and the frame C and the inner side *l* of the valve-casing are free to revolve about the axles G. The section *l'* of the valve is rigidly secured to the frame A. These parts are shown particularly in Fig. 5.

The valve on each side of the apparatus is constructed with four compartments 1, 2, 3,

and 4. Pipes M M' on each side of the apparatus lead to the valves and enter them outside of the frame A. These are the main pipes for supplying and exhausting steam, and may be used interchangeably. Pipes N N' on each side of the apparatus located within the frame A lead from the valves to the top and bottom, respectively, of the cylinders B B' and are suitably arranged to admit and exhaust steam from the cylinders. The pipes N N' are arranged to revolve with the cylinders and their frame when the apparatus is in operation.

If steam be admitted through the pipes M' it will enter compartments 2 of the valves, and as soon as the machine commences to revolve or moves off of a dead-center the steam will pass thence into compartment 1 of both valves and through pipes N into the top of both cylinders at once and press down the pistons, and any steam in the bottom of the cylinders will exhaust out through pipes N', compartments 3 and 4, and pipes M. This rotates the engine. The motion of the apparatus may be reversed simply by letting in steam by pipes M and exhausting by pipes M' in the manner above described, except that steam enters at compartment 4 and passes out through compartment 1 as soon as it moves off of a dead-center. The valves on both sides of the machine are the identical counterpart of each other, both in their position and operation.

If the machine is on a dead-center, the dead-center pipe o on the side to which it is desired to rotate it should be first used to start the engine.

When the pistons are reciprocated in their cylinders, the forked frames are correspondingly moved, and acting on the crank-axle cause the cylinders and their connecting-frame to revolve on its axle, thus producing the desired rotary motion.

It will be observed that the cylinders and their connected parts are nicely balanced on each side of the apparatus, so that rotary motion may be readily kept up.

The connection between the forked yoke and the piston-frames is such as to allow the yoke to have a slight motion relatively to the frames, and the necessary flexible connection is thus afforded.

On each end of the cylinder brackets b are provided, through which the rods f' extend and in which they are free to move.

The extra pipes O are used to admit steam at the points indicated to start the apparatus should it be on a dead-center.

In Figs. 10 and 11 a slightly-modified form of apparatus is shown. The cylinders B and B' being approximately oval in cross-section, the pistons are of course correspondingly shaped, and are provided with two rods b' b², connected at each end to a frame b³, which extends through suitable brackets b⁴. The cylinders are connected by a frame B², the arms of which are hollow. Rods B³ connect with

the piston-frames and are slotted at B⁴ and embrace the end of the arms B³, which are connected with the valves B⁸, and which are connected with each other by a cross-rod B⁹. Rollers B¹⁰ are provided on the arms B⁵ to work in the slotted enlargements of the rods B³. Steam may be admitted and exhausted from the valves B⁸ through pipes X X' in substantially the same way as that described in connection with the preceding figures of the drawings, and steam is admitted and exhausted to and from the cylinders through the frame-pipes B³. In Fig. 11 the engine is shown as supported on standards B⁶, secured to a bed-plate B⁷. B¹¹ is a cross-piece connecting the rods B³ to cause them to move together.

Having thus described my invention, what I claim is—

1. The combination, substantially as hereinbefore set forth, of the supporting-frame, the centrally-pivoted cylinder-connecting frame, the cylinders at opposite ends thereof, pistons projecting from opposite ends of the cylinders, and the revolving piston-connecting yoke.

2. The combination, substantially as hereinbefore set forth, of the horizontal main supporting-frame, the centrally-pivoted cylinder-connecting frame, cylinders at opposite ends of said frame having their axes parallel and at equal distances from the axis of the frame, the pistons, the parallel piston-rods, the stationary eccentric axle, and connections between the axle and the piston-rods.

3. The combination, substantially as hereinbefore set forth, of the main supporting-frame, the cylinder-connecting frame centrally pivoted therein, cylinders at opposite ends of said frame, the pistons, their rods, piston-rod frames connecting the opposite ends of the pistons, the eccentric axle, and connections between the eccentric axle and the piston-rod frames.

4. The combination, substantially as hereinbefore set forth, of the main supporting-frame, the centrally-pivoted cylinder-connecting frame, cylinders at opposite ends thereof, the pistons, their rods, frames connecting opposite ends of the rods, the eccentric axle, and the piston-connecting yoke, through which the eccentric axle extends and which is forked at each end and connected to the piston-rod frames.

5. The combination, substantially as hereinbefore set forth, of the supporting-frame, the centrally-pivoted cylinder-connecting frame, cylinders at each end thereof, valves on opposite sides of the frame, entrance and exhaust ports leading to the valves on both sides of the apparatus, pipes leading from the valves to the cylinders, the eccentric axle, the pistons, and connections between the eccentric axle and the pistons.

6. The combination, substantially as hereinbefore set forth, of the supporting-frame,

cylinders at each end of the frame, rotating valves formed with two or more compartments on opposite sides of the frames, entrance and exhaust ports on each side of the apparatus leading to the valves, whereby the engine may be rotated in reverse directions, pipes leading from the valves to the cylinders, the eccentric axle, the pistons, and connections between the eccentric axle and the pistons.

7. The combination, substantially as herebefore set forth, of the supporting-frame, the centrally-pivoted cylinder-connecting frame, cylinders at each end thereof, valves on opposite sides of the frames, entrance and exhaust pipes leading to the valves, dead-center pipes on opposite sides of the engine for starting the apparatus in reverse directions, pipes leading to the cylinders, the eccentric axle, the pistons, and connections between the eccentric axle and the pistons.

8. The combination, substantially as herebefore set forth, of the supporting-frame, the cylinders at opposite ends of the frame, the cylinder-connecting frame, the pistons,

the piston-rods, their frames, the stationary eccentric axle, the roller thereon, and the forked yoke through which the roller extends and which extends through slotted openings in the piston-rod frames.

9. The combination, substantially as herebefore set forth, of the supporting-frame, cylinders at opposite ends of the frame, the cylinder-connecting frame, the pistons, and piston-rods, the piston-rod frame having slotted enlargements, the eccentric axle, the forked yoke through which the eccentric axle extends and which is provided with slotted ends extending through the slotted enlargements of the piston-rod frame, and rollers in the piston-rod frames which extend through the slotted openings in the ends of the forked yoke.

In testimony whereof I have hereunto subscribed my name.

BYRON B. BOWER.

Witnesses:

A. N. SMALLWOOD,
C. W. WIMBERLEY.