(No Model.)

3 Sheets—Sheet 1.

J. C. WALKER.

ROTARY ENGINE.

No. 515,631. Patented Feb. 27, 1894.

Fig. 1.

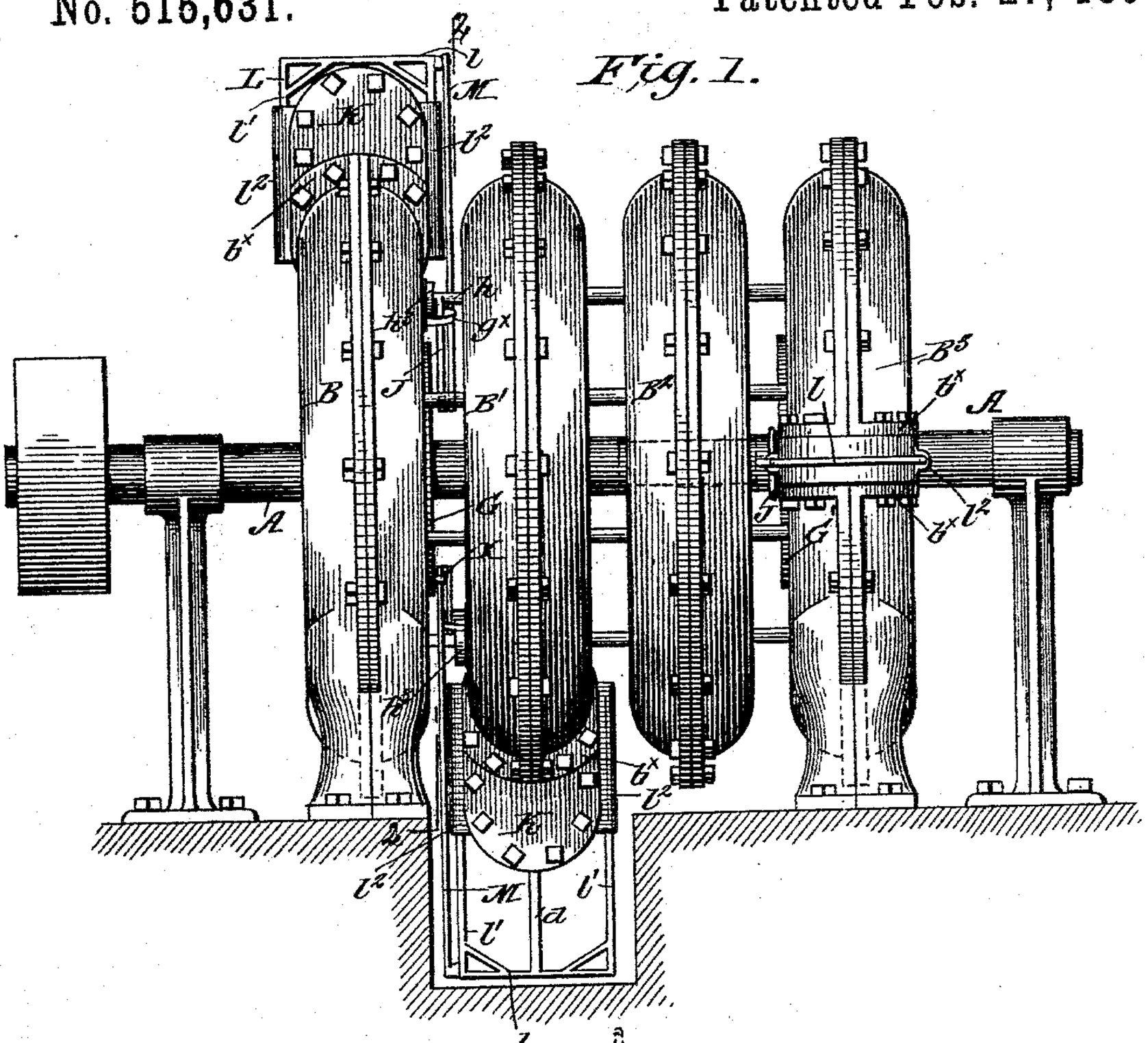
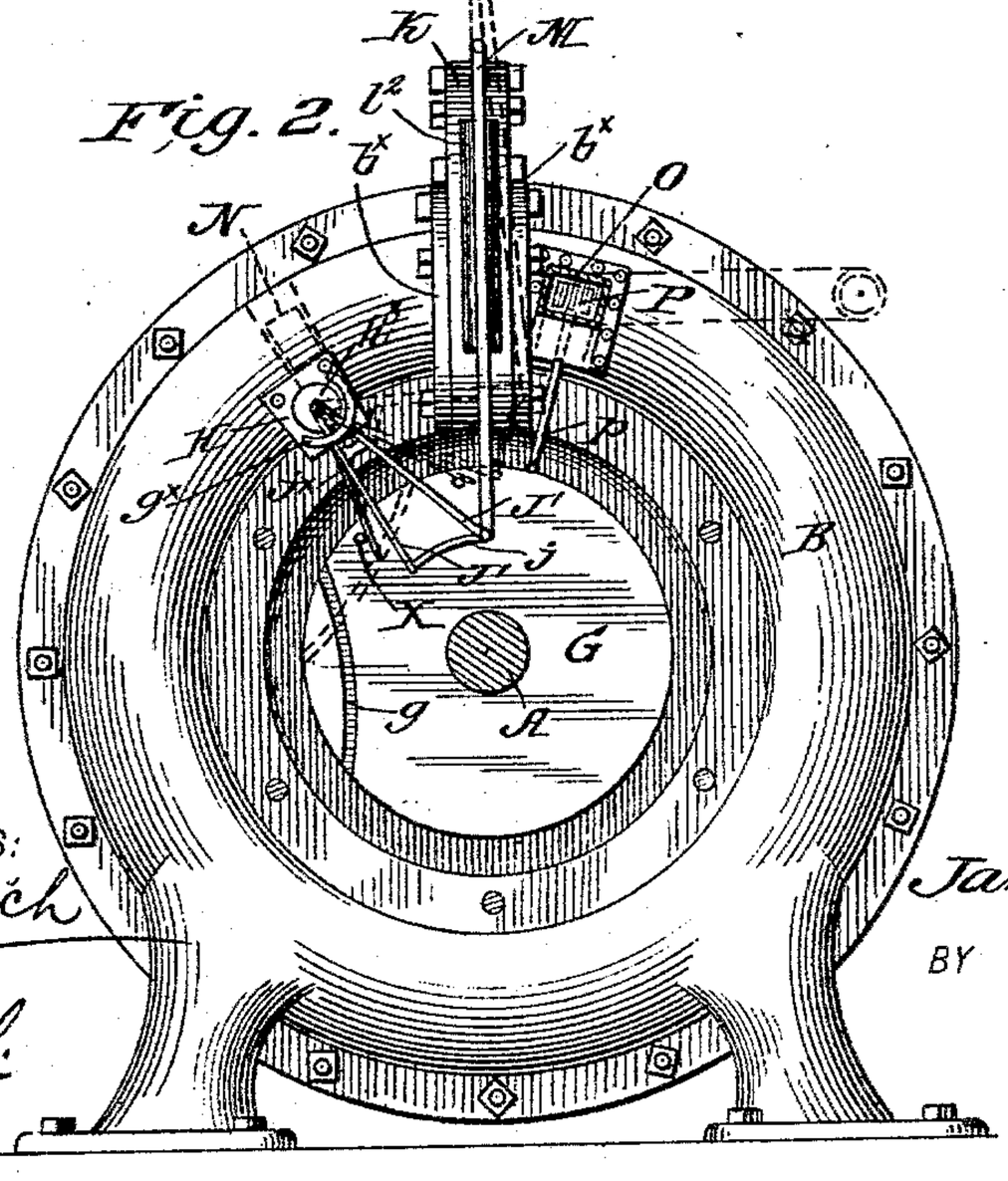


Fig. 2.



WITNESSES:

Fred G. Dieterich

W. D. Bloundel.

INVENTOR

James C. Walker.

BY Munn & Co

ATTORNEYS.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

J. C. WALKER.

ROTARY ENGINE.

No. 515,631. Patented Feb. 27, 1894.

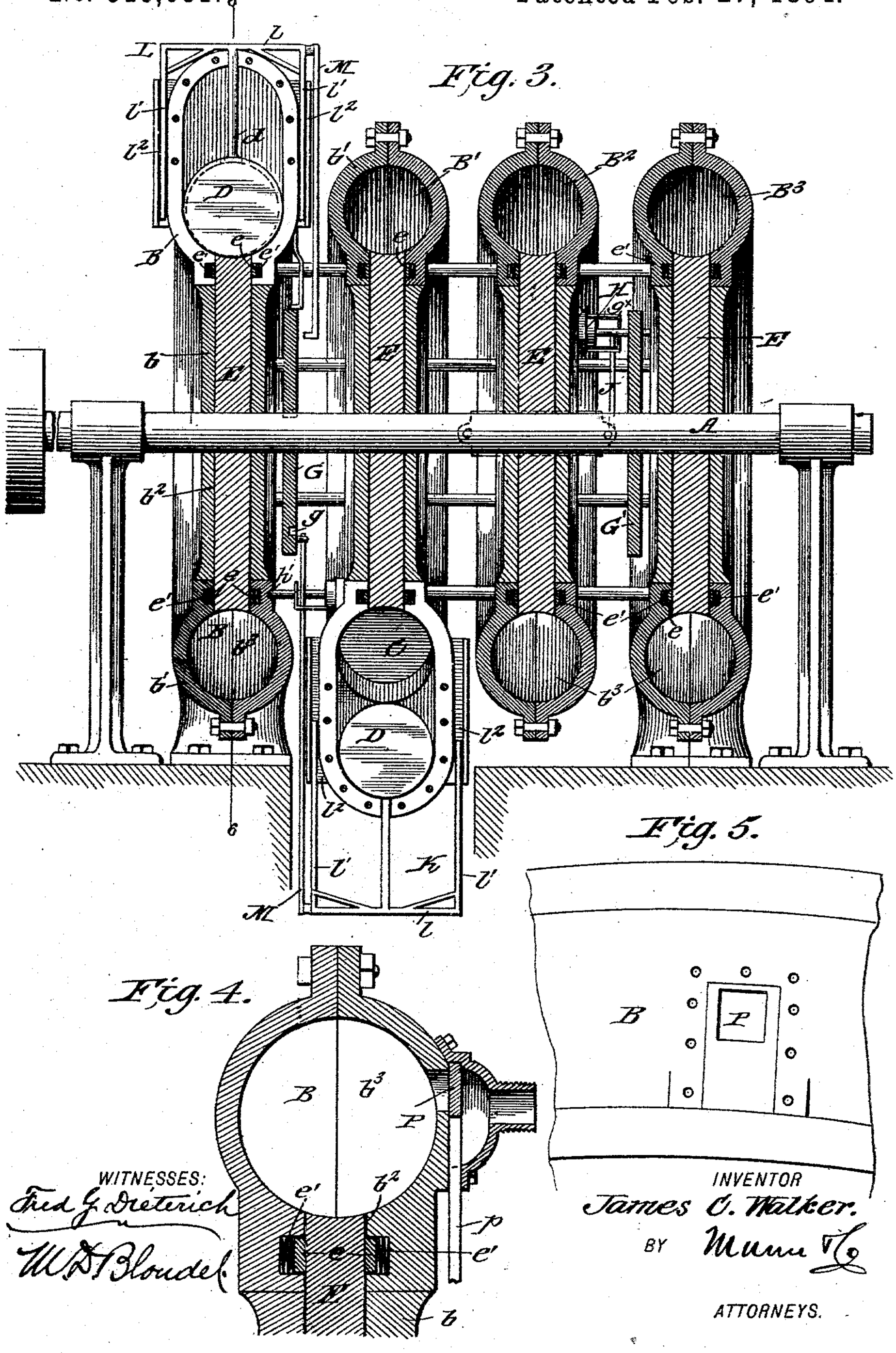


Fig. 3.

Fig. 5.

Fig. 4.

WITNESSES:
Fred G. Dieterich
W. D. Blondel.

INVENTOR
James C. Walker.
BY Munn & Co
ATTORNEYS.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 3.

J. C. WALKER.

ROTARY ENGINE.

No. 515,631. Patented Feb. 27, 1894.

Fig. 6.

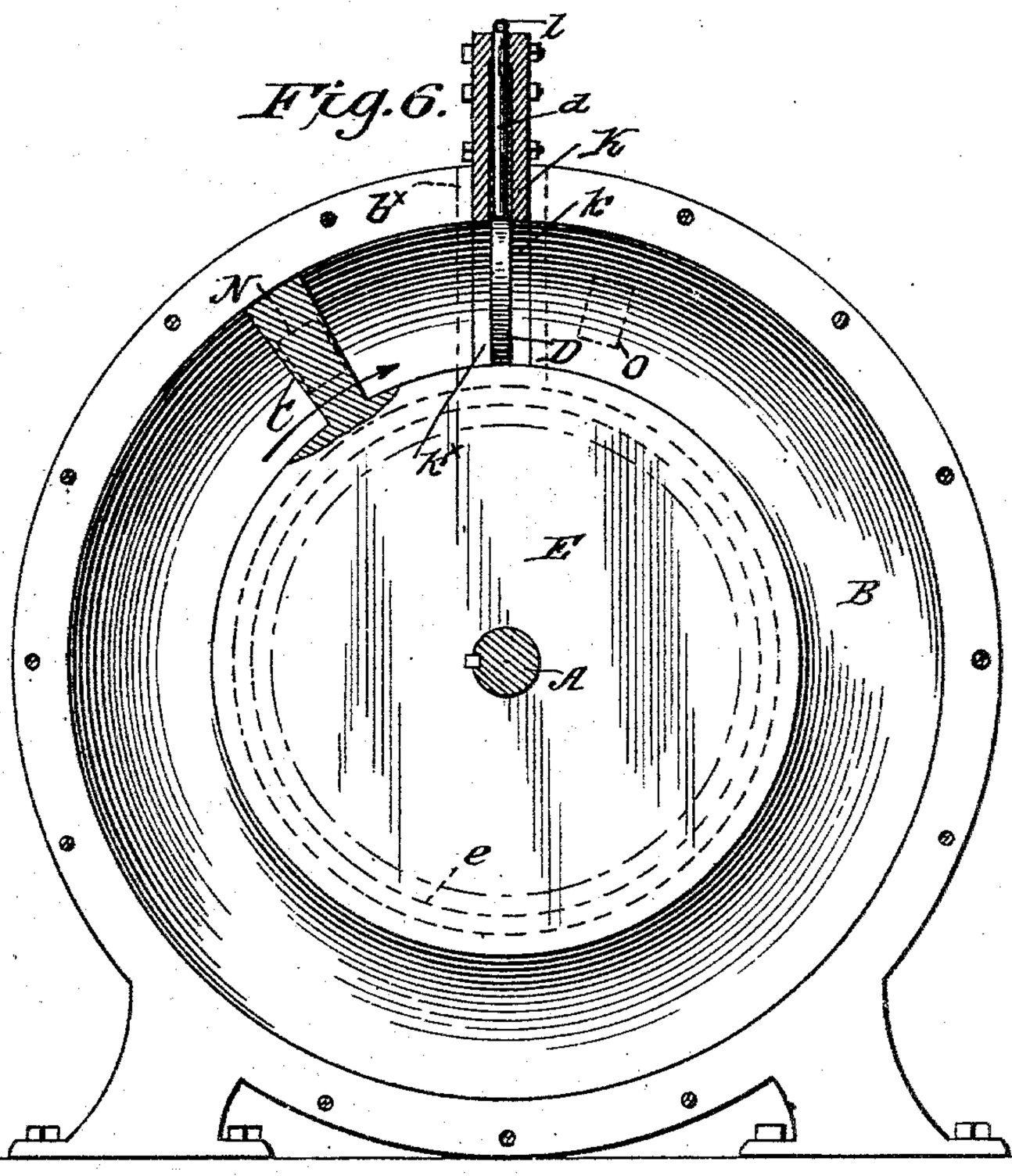
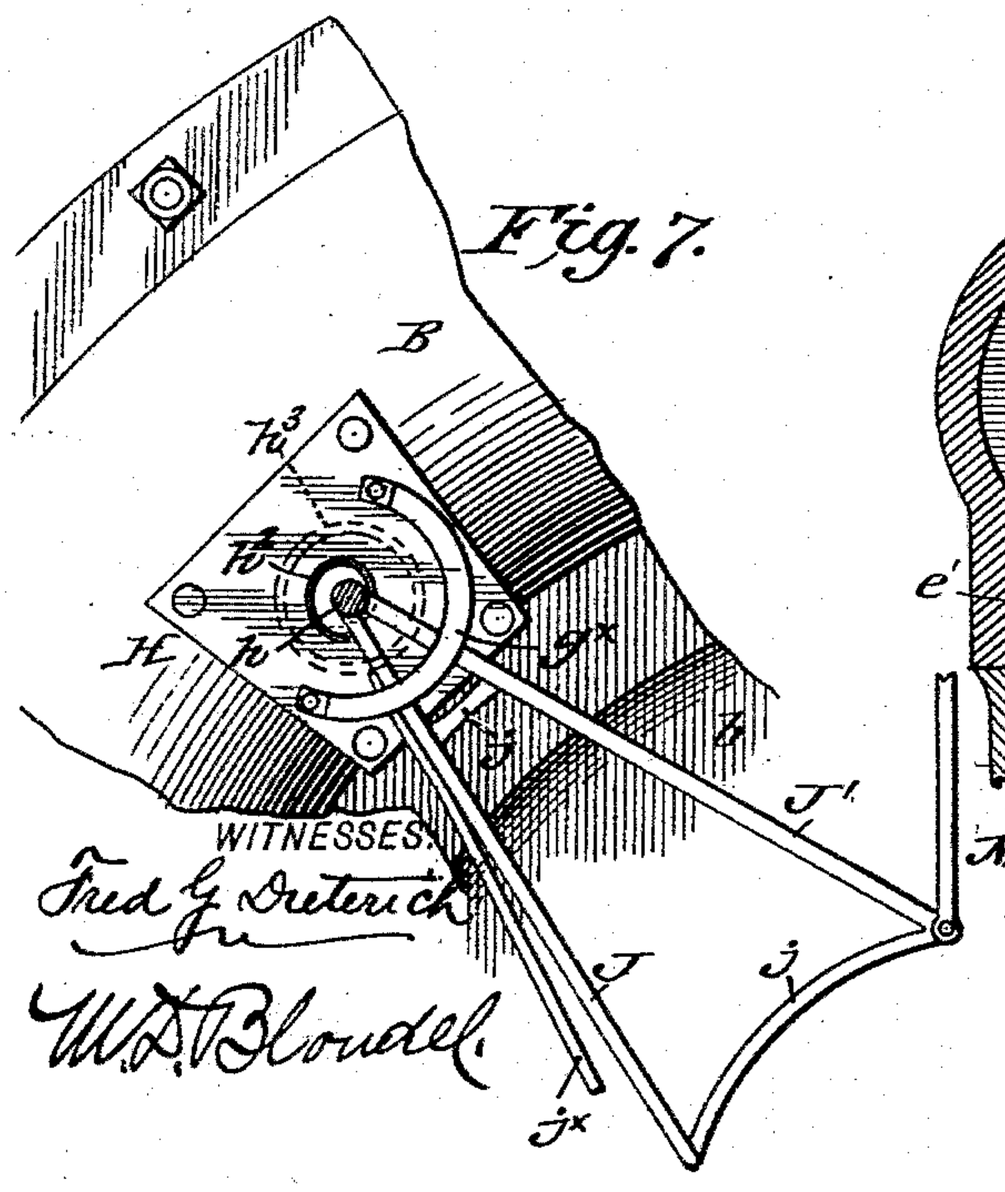
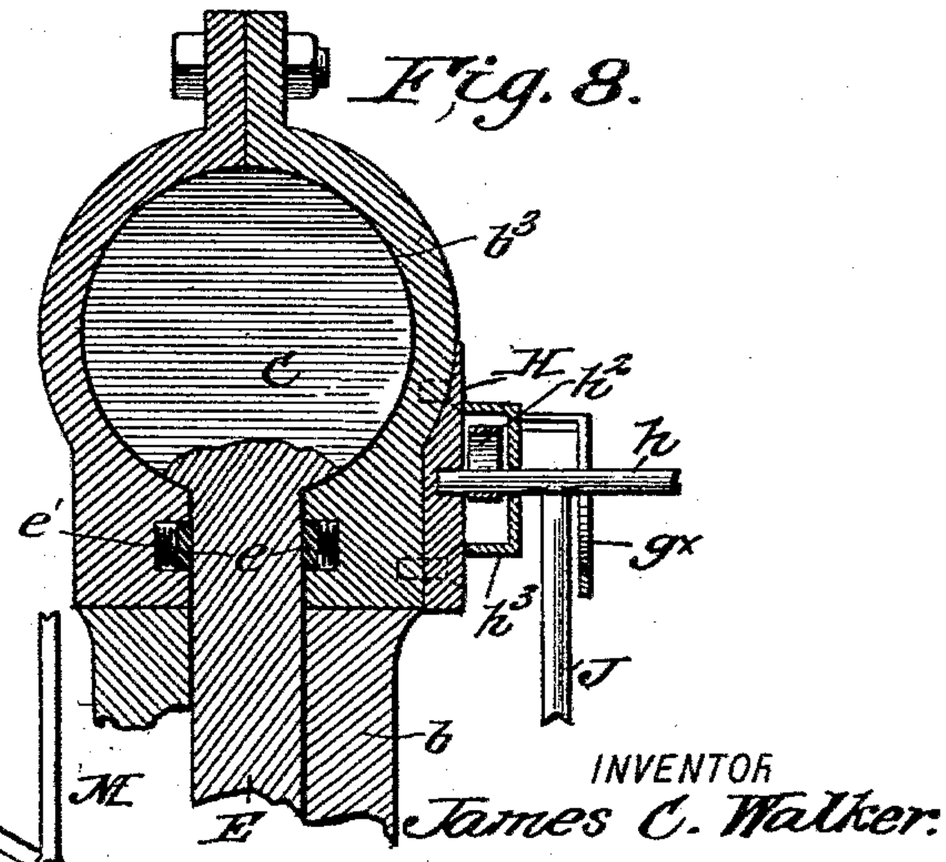


Fig. 7.



WITNESSES:
Fred J. Dieterich
W. D. Blondell

Fig. 8.



INVENTOR
James C. Walker.
BY Munn & Co
ATTORNEYS.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JAMES C. WALKER, OF WACO, TEXAS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 515,631, dated February 27, 1894.

Application filed October 16, 1893. Serial No. 488,283. (No model.)

To all whom it may concern:

Be it known that I, JAMES C. WALKER, of Waco, in the county of McLennan and State of Texas, have invented a new and Improved Rotary Engine, of which the following is a specification.

My invention has for its object to provide a rotary engine which will be of stable construction and effectively serve for its intended purpose.

It has further for its object to provide an engine of this character, in which the full effect of live steam under a full head can be attained at all times on the drive shaft.

With other objects in view, which hereinafter will be particularly referred to, the invention consists in such novel combination and peculiar arrangement of parts as will be first described in detail and then pointed out in the claims, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved rotary engine. Fig. 2 is a sectional front elevation taken on the line 2—2 Fig. 1. Fig. 3 is a vertical longitudinal section of the same. Figs. 4 and 5 are detail views illustrating the steam inlet port construction. Fig. 6 is a vertical transverse section of one of the annular steam chambers taken on line 6—6 Fig. 3. Figs. 7 and 8 are detail views illustrating one of the spring actuated gate shifting arms and its connection with the cylinder casing.

In the practical construction of my improved engine, the main or drive shaft A, is mounted in suitably arranged bearings and provided with the usual band pulley, which shaft passes through the several annular chambers in the manner most clearly shown in Fig. 3. By reference to such figure it will be seen that four independent annular steam chambers B B′ B^2 B^3 are provided, each of which, however, has but a single piston C and sliding abutment D. It should be here stated that the main object in employing four independent steam chambers, is, to provide for a live steam impulse on the shaft at each quarter revolution thereof, to thereby not only gain increased speed and power, but also to obtain from the expansion of the steam in each chamber its full effect, without imparting to the shaft the jerking rotary motion usually incident to engines of this kind, which have two or more live ports discharging into the annular chamber; and to obtain the most effective results, the chambers B B′ have the abutment and inlet port, arranged at diametrically opposite points, the abutments and steam ports in chambers B^2 B^3 being similarly arranged, relatively to each other, but at right angles to the abutments in chambers B and B′.

Referring now more particularly to Figs. 3 and 6 it will be noticed that the steam chambers are fixedly secured, and comprise half sections formed with contracted body portions *b* and semi-circular ends *b′* whereby a contracted space b^2 and an annular piston chamber b^3 is provided.

Keyed to the shaft A is a series of disks E one for each steam chamber, which snugly fit the spaces b^2 and have a steam tight connection therewith, through the medium of the packing rings *e* which fit the annular recesses *e′* as clearly shown and such disks just reach the inner perimeter of the steam space b^3; and to each of such disks a single piston C is secured, which is shaped to fit the steam chamber as most clearly shown in Fig. 3.

Upon the shaft A between each pair of steam chambers is fixedly secured a solid disk G, in which is cut a cam groove *g*, the ends of which extend to the peripheral edge as shown most clearly in Fig. 6. As the sliding abutment and the inlet operating devices for both pairs of cylinders are arranged and operated alike I shall describe but one in detail.

On the adjacent faces of chambers B B′ at diametrically opposite sides are arranged, what I term switch boards, which consist each of a box H which forms a bearing for one end of a rock shaft *h*, the opposite end of which is journaled in a bearing *h′* on the adjacent chamber B′. This rock shaft is held to its normal position by means of a coil spring h^2, which is protected by a box or cover plate h^3. Arms J J′ are fixedly connected to the rock shaft *h*, and with each other by a cross piece *j*; and such arms extend in different angles from the rock shaft down to one side of the disk G, and are guided by a guard rim $g^\times$. The sliding abutment D is held to slide in a way K formed between the guide members *k* held between the flanges $b^\times$ $b^\times$ on the cylinders, such members having apertures $k^\times$ which

register with the annular steam chamber. Each of the abutments is formed with a projecting stem *d* which passes up through the guide members *k k*, and connects with the cross bar *l* of a sliding frame L, which frame has guide arms *l' l'* which fit guide ways l^2 on the outer edges of members *k* as most clearly shown in Fig. 2.

M indicates a lifting rod connected at one end to the cross bar *l*, and at the other end it is pivotally connected to the arm J' projected from the rock shaft before referred to.

The exhaust port N in each of the annular steam chambers, is located in advance of the sliding abutment, as most clearly shown in Fig. 6 and just to the rear of abutment inlet openings O are formed, over which is held to slide a cut off valve P the lower end of which extends over the peripheral end of disk G and has an inturned stud *p* adapted to be engaged by a cam groove in disk G in a manner presently described.

The manner in which my improved engine operates is best explained as follows—Assuming the pistons are traveling in the direction indicated by the arrow in Fig. 6 and the piston in chamber B just over the exhaust port; at this time a projecting lug X on the first disk G will come into engagement with the spring member $j^{\times}$ on arm J, (such member $j^{\times}$ relieving the arm from a too sudden shock) and as such arm is connected to rock shaft *h* such shaft will be rocked and in consequence the arm J' will be swung up to the position shown in dotted lines in Fig. 2, and as it so moves it raises rod M connected to the sliding frame with which the gate is connected, and thereby lifts such gate and opens up a way for the passage of the piston; the several parts being so arranged that immediately after the piston passes under the gate the lug X on disk G will become disengaged from the arm J, to free the rock shaft and allow its spring to rock it in a reverse direction to bring the arms J J' and the gate back to its closed or normal position. It will be understood that at this time the expanded steam within the chamber B exhausts through port N. After the gate operating devices have been released, the forward end of the cam groove in disk G will engage the stud *p* and begin to operate to pull the cut off valve over the inlet port down, and as the piston at this time just passes the said inlet port, it follows that a full head of live steam will discharge into the space between the back of the piston and the sliding gate or abutment. Live steam under full head is admitted into the chamber during the time the first half of the cam groove has passed in engagement with the stud *p*, after which the cut off will be gradually moved up to close off the inlet. Owing to the peculiar relation of the pistons and abutments in the several chambers, it will be readily seen, as steam is cut off from chamber B as described, the cam groove on the disk G between chambers B^2 and B^3 will be about beginning to open up the valve inlet which discharges into chamber B^2 and while the piston in such chamber is being forced forward by live steam impact, the speed of the shaft will be augmented by the expansive steam operating against the piston in the first chamber B. After the inlet to chamber B^2 is cut off, the disk G between the first and second chambers B B' will have made a half revolution with the shaft, and in consequence its cam groove will engage the cut off device on chamber B' and open and close off the steam, and as it passes from such cut off devices, the cam groove in disk G' will operate on the cut off valve devices on the last chamber B^3. Thus it will be seen, that, while a live steam impact is practically at all times against one of the pistons, the speed and power is increased by the impact force of expansive steam against the other pistons, thereby effecting a positive and uninterrupted force against the several pistons, without the usual hammering movements usually incident in this class of engines.

While I have shown four chambers arranged with their inlets in such manner that the shaft is rotated by live steam impact at predetermined intervals, it is manifest, a less or greater number may be employed, if less the cam grooves in the disk are proportionately increased in length and if more, similarly decreased.

The several chambers may be suitably braced as shown in the drawings.

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

1. In a rotary engine, the combination with a fixed annular chamber having a sliding abutment, a drive shaft having a concentric piston operating in the annular chamber, a spring actuated lever, means for holding and drawing the abutment to its normal or closed position, an exhaust arranged in front of the abutment, an inlet at the rear thereof having a sliding gate, a cam operated by the shaft, adapted to first engage the abutment lever operating means and then the inlet gate to open and close the same, all substantially in the manner shown and for the purposes described.

2. A rotary engine comprising a plurality of fixed annular steam chambers, a drive shaft having a series of concentric pistons arranged in pairs projected in diametrically opposite directions, and each pair at right angles to the other, said pistons fitting to travel one in each steam chamber, sliding abutments in each chamber arranged relatively to the shaft in a manner similar to the pistons, a cam mechanism for each pair of pistons, operated by the shaft, connected with the sliding abutments, to operate them successively, exhausts in the chambers in advance of the abutments, inlets at the rear thereof and shifting valves for such inlets, arranged to be operated by the said cam disks all sub-

stantially in the manner and for the purposes shown and described.

3. In a rotary engine the combination with a plurality of fixed annular steam chambers, having each a sliding abutment, having lift devices, the drive shaft, and disks fixedly held on such shaft, formed with concentric piston members fitted to travel in such chambers, of the rock shafts journaled between each pair of steam chambers, having an extending member, a pivotal connecting arm between such member and the sliding abutment lift devices, operating cams mounted on the drive shaft adapted to engage the rock shaft arm at predetermined intervals, and means for feeding steam to and exhausting same from the steam chambers all arranged as shown and for the purposes described.

4. The combination with the drive shaft, a plurality of annular steam chambers mounted thereon, having sliding abutments arranged at diametrically opposite points, lifting devices, comprising frames held to slide in guides on the said chambers, said chambers having each an exhaust in front of and an inlet to the rear of the abutment, and a slide valve operating over the inlet, of disks fixedly mounted on such shaft having pistons fitting the annular chamber, cam disks on such shaft having each a cam groove and a projection stud, the rock shafts spring actuated in one direction, journaled on the steam chambers, angle rods J J′ projected therefrom, and connected with each other, the arm M connecting the rod J′ and the abutment lifting devices, said arms adapted to be engaged by the stud on the said cam disk, and slide valves operating over the steam inlets, having each a projecting arm formed with a stud adapted to be engaged by the groove in the cam disk, all arranged substantially in the manner shown and described.

JAMES C. WALKER.

Witnesses:
EUGENE J. JACOBS,
PERINO BROWN.