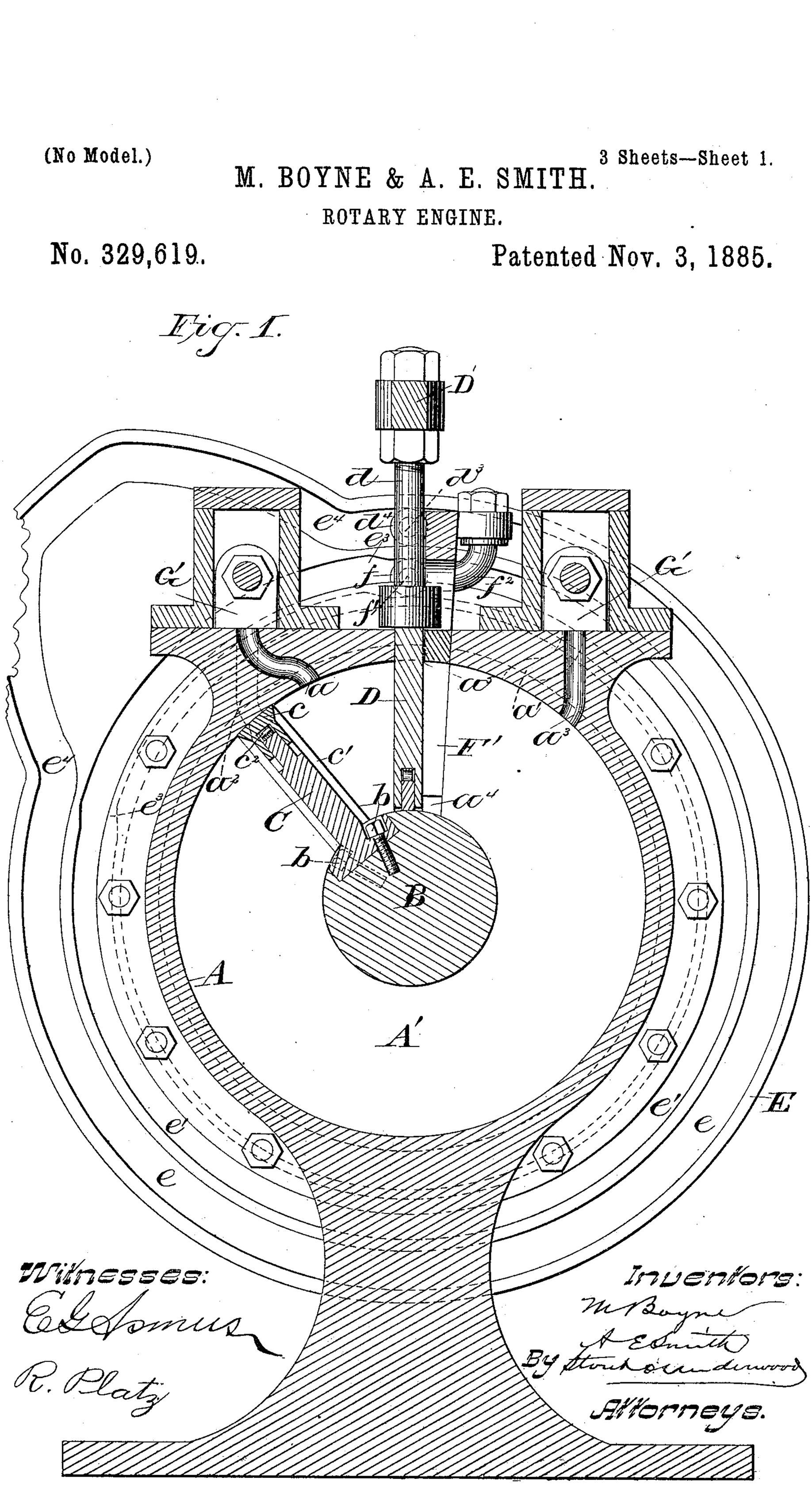
(No Model.) 3 Sheets—Sheet 1.

M. BOYNE & A. E. SMITH.

ROTARY ENGINE.

No. 329,619. Patented Nov. 3, 1885.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

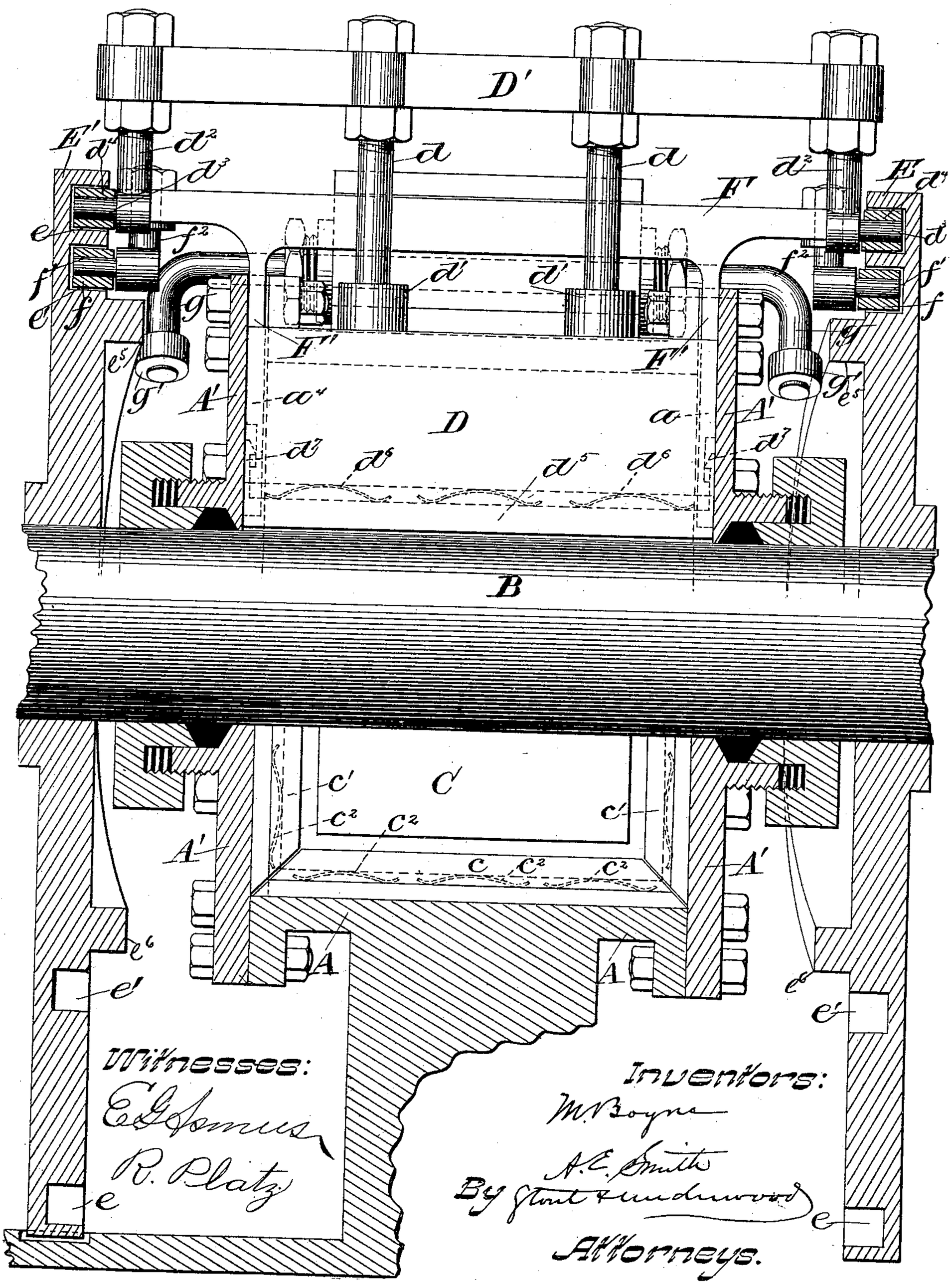

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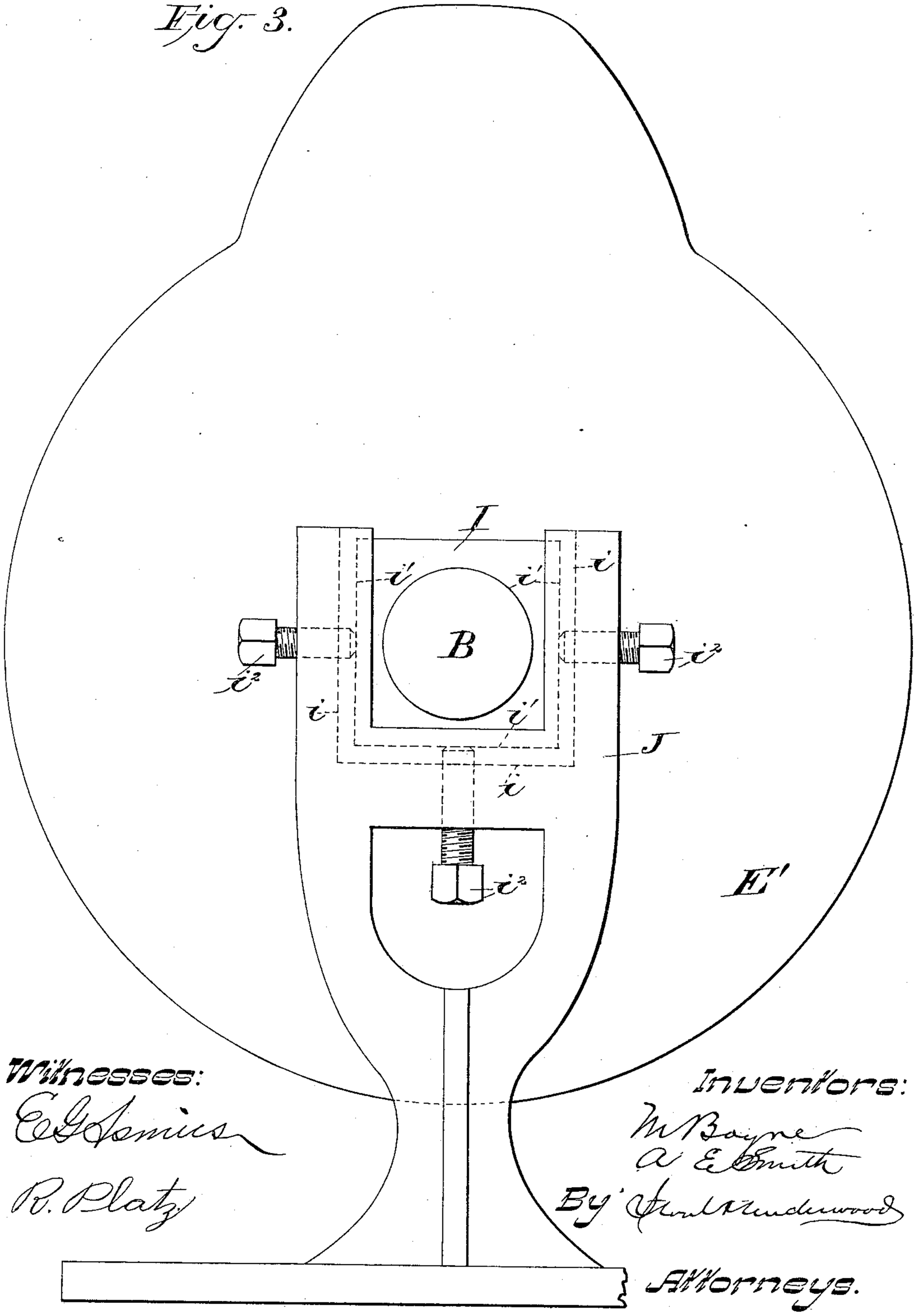
Fig. 3.



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UNITED STATES PATENT OFFICE.

MICHAEL BOYNE AND ALBERT E. SMITH, OF WATERTOWN, WISCONSIN.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 329,619, dated November 3, 1885.

Application filed July 21, 1884. Serial No. 138,390. (No model.)

To all whom it may concern:

Be it known that we, MICHAEL BOYNE and ALBERT E. SMITH, of Watertown, in the county of Jefferson and State of Wisconsin, have invented certain new and useful Improvements in Rotary Engines; and we do hereby declare that the following is a full, clear, and exact description thereof.

Our invention relates to improvements in rotary engines, and will be fully described hereinafter.

In the drawings, Figure 1 is a vertical cross-section of our improved engine. Fig. 2 is a longitudinal vertical section through the center of the same, and Fig. 3 is an end view of the engine, showing the construction of the packing-boxes.

A indicates the engine-cylinder, and A′ A′ are the heads of the same, which are bolted thereon, as usual. B is the shaft, and C is the actuating-vane, which is bolted onto the shaft B in any suitable manner, as shown at *b*. The top and ends of the vane are fitted with packing-strips *c* and *c′ c′*. These strips are set out with springs c^2 c^2, working between their inner sides and the respective parts of the vane, as shown in Fig. 1. The ends of the top strip, *c*, are slotted to receive the ends of the strips *c′ c′*. *a a′* are the steam-receiving ports, and a^2 a^3 are the exhaust-ports. The upper half of each of the cylinder-heads A′ A′ is radially grooved on the inner face, as shown at a^4, Fig. 2, and in these grooves are received the ends of the diaphragm D. This diaphragm is adapted to slide up and down through a suitable opening made at a^5 in the cylinder-top, and is connected, by means of the bolts *d d*, screwing in threaded studs *d′ d′*, formed in the upper side of said diaphragm, to the bar D′, and the ends of this bar project out toward the cam-wheels E E′, keyed onto the shaft B. Suitably bolted onto each of said ends is the vertical arm d^2, and in the lower end of the said arm a stud, d^3, projects horizontally out in the groove *e*, cut in the inner face of the cam-wheels, carrying on its bearing end the anti-friction roller d^4. This groove is made with suitable raising-points, the purpose of which is to carry the roller d^4 high enough to bodily lift the diaphragm D out of the cylinder to allow of the passage of the vane C on its revolution around the cylinder. Another groove, *e′*, is cut in each of the said wheels E E′, slightly inside of the groove *e*, and in this groove runs the anti-friction roller *f*. This roller is suitably mounted on the bearing-stem *f′*, projecting horizontally out on end of the curved arm f^2, bolted onto the outer end of the wedge-frame F. Extending downward on each end of this frame are the packing-wedges F′ F′, which are received in the grooves a^4 a^4 of the cylinder-heads, and slide therein between the diaphragm D and the rear edges of the said grooves, cut on an incline corresponding to that of the wedges. The wedges, which are designed to press the diaphragm against the front edges of the grooves a^4, so as to form a steam-tight joint therewith, are made slightly shorter than the grooves, to allow them sufficient space for action. The grooves *e′ e′*, cut in the inner faces of the wheels E E′ for the rollers of the wedge-frame, have their raising-points formed slightly in advance and rear of the corresponding parts of the grooves *e e*, and, as the wedges F′ F′ have to be lifted only just enough to free the diaphragm D from the pressure they exert thereon, these raising-points are made very slight, as shown at e^3 e^3, the like parts of the grooves *e e* being shown at e^4 e^4.

G′ G′, the steam-valves, which may be of any suitable form, are shown in the drawings as moving in the direction of the cylinder-axis, their stem *g* passing through the steam-chest H and projecting at each end of the same toward the cam-wheels E E′. Their alternate motion is produced by means of cam projections e^5 e^6, formed on the inner faces of the cam-wheels, against which run the anti-friction rollers *g′*, mounted on the ends of the valve-stems *g*. It is obvious that either one of the valves G and G′ may be used, according to the direction which it is desired to impart to the actuating-vane and the driving-shaft, as in whatever direction the engine is rotated the action of the diaphragm D and of its steam-packing wedges is entirely the same. The packing-strip d^5 is fitted on the under side of the said diaphragm in the same manner as the top and end strips of the actuating-vane,

the range of its springs d^6 d^6 being limited in any suitable manner, as shown at d^7 d^7. The driving-shaft B is journaled in the bearing-boxes I I, mounted in the upper ends of the stands J of the engine-frame. Each of these stands has an open slot in its upper end, and both the vertical and horizontal inner faces of this slot are centrally grooved to a certain depth, as shown by dotted lines at *i i i*, to receive the corresponding flanged edges of the boxes, (indicated by the dotted lines *i' i' i'*.) The set-screws i^2 i^2 i^2, the inner ends of which abut against the edges of the boxes, serve to hold the said boxes in proper adjustment, according to the wear of the inner periphery of the cylinder.

The operation of our rotary engine may be readily understood from the above description and the accompanying drawings. In the position shown in Fig. 2 of the latter the actuating-vane C is standing opposite the exhaust-port a^2, and the anti-friction rollers d^4 and *f* have just entered the regular portion of their respective cam-grooves *e* and *e'*, the rollers *f* being the last to reach said portion, so as to let down the wedges F' F' in place against the ends of the diaphragm only after this latter has been brought down on its seat through the rollers d^4 d^4. As steam is introduced into the cylinder through the receiving-port *a*, just opened, the actuating-vane C is carried around with the shaft B three-fourths of a revolution, opposite the exhaust-port a^3. At this moment the cam-wheels E E' will be presenting the raising-points e^3 e^3 of their groove *e'* to the rollers *f f* of the packing-wedges. These latter are thereby slightly raised to free the diaphragm D from the pressure, and immediately after the rollers d^4 d^4 will engage in the raising parts e^4 e^4 of the grooves *e e* to lift the diaphragm bodily out of the cylinder, wherein the said diaphragm returns as soon as the vane C has passed beyond the grooves a^4 a^4.

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

1. In a rotary engine, in combination with a movable diaphragm adapted to slide up and down through a suitable opening of the cylinder in the grooved inner faces of the cylinder-heads, and provided with anti-friction rollers working in lifting-grooves of cam-wheels attached to the driving-shaft, a frame carrying wedges that are adapted to be moved slightly in advance and in rear of the said diaphragm in the grooves of the cylinder-heads, substantially as and for the purpose set forth.

2. In a rotary engine, in combination with a movable diaphragm adapted, by means substantially as described, to be moved in and out of the steam-cylinder, a frame having wedges adapted to move slightly in advance and rear of the said movable diaphragm, and having anti-friction rollers in each of its ends, and with wheels fastened onto the driving-shaft and having suitable grooves to receive the anti-friction rollers of the wedge-frame, substantially as and for the purpose set forth.

3. In a rotary engine, the combination of the cylinder A, having grooved heads A' A', shaft B, provided with the rotating vane C, the diaphragm D, having arms d^2, anti-friction rollers d^4 d^4, and packing-strip d^5, and cam-wheels E E', having grooves *e e*, substantially as shown and described, and for the purpose set forth.

4. In a rotary engine, the combination of the cylinder A, having grooved heads A' A' and opening a^5, the diaphragm D, shaft B, and rotating vane C, provided with packing-strips *c* and *c' c'*, substantially as shown and described, and for the purpose set forth.

In testimony that we claim the foregoing we have hereunto set our hands, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

MICHAEL BOYNE.
ALBERT E. SMITH.

Witnesses:
S. S. STOUT,
H. G. UNDERWOOD.