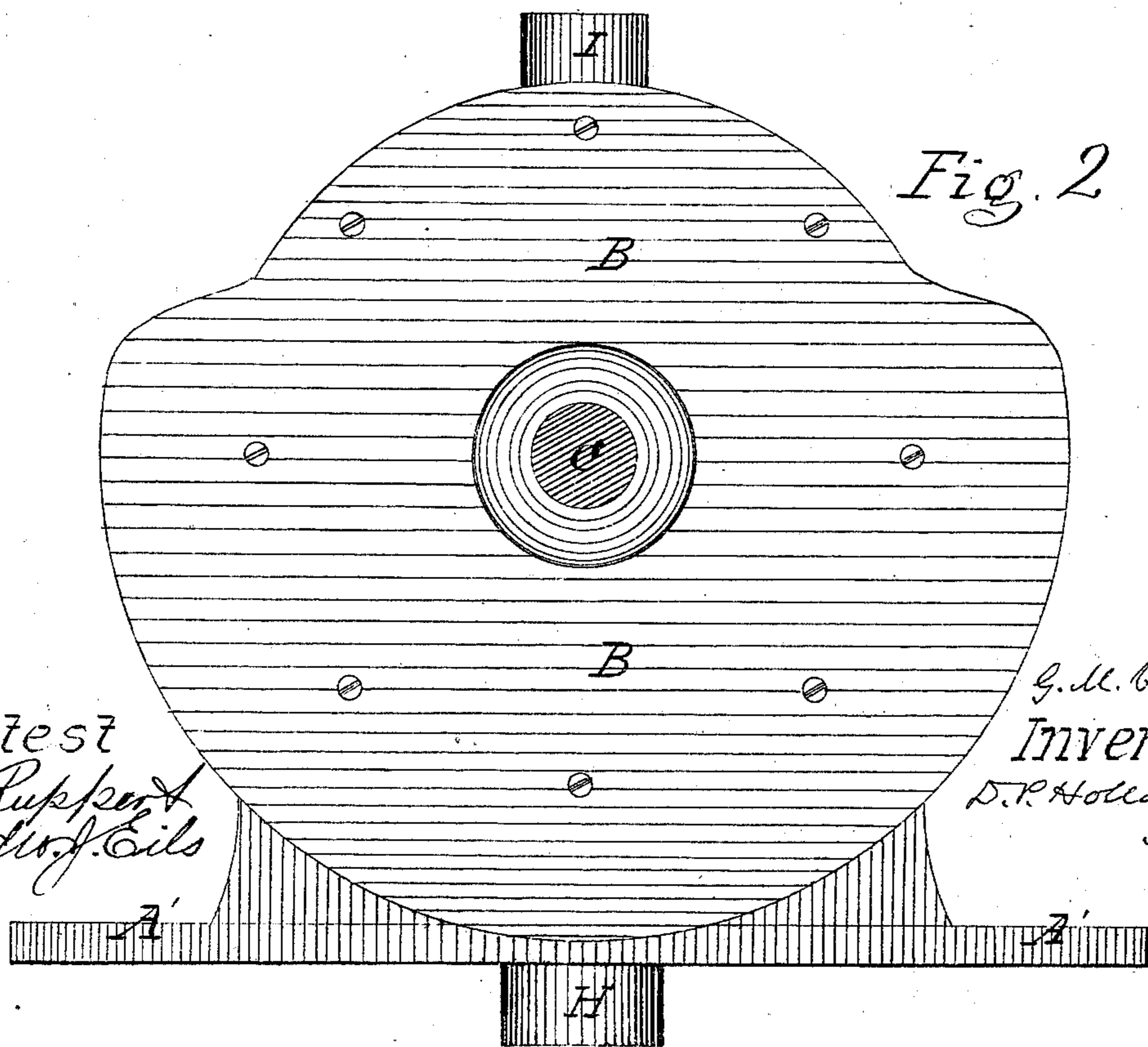
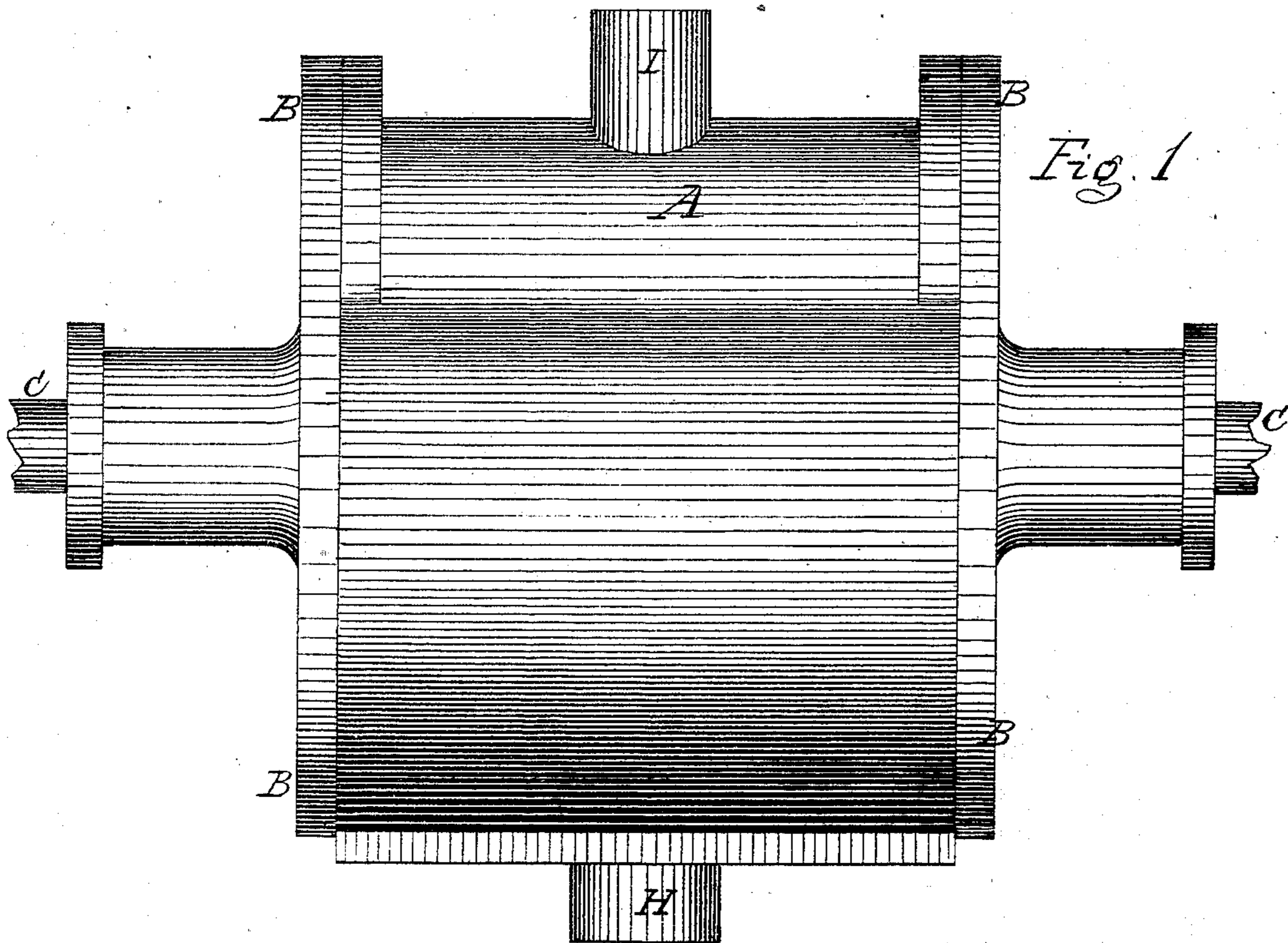


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Improvement in Rotary Engines.

No. 120,470.

Patented Oct. 31, 1871.



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Fig. 3.

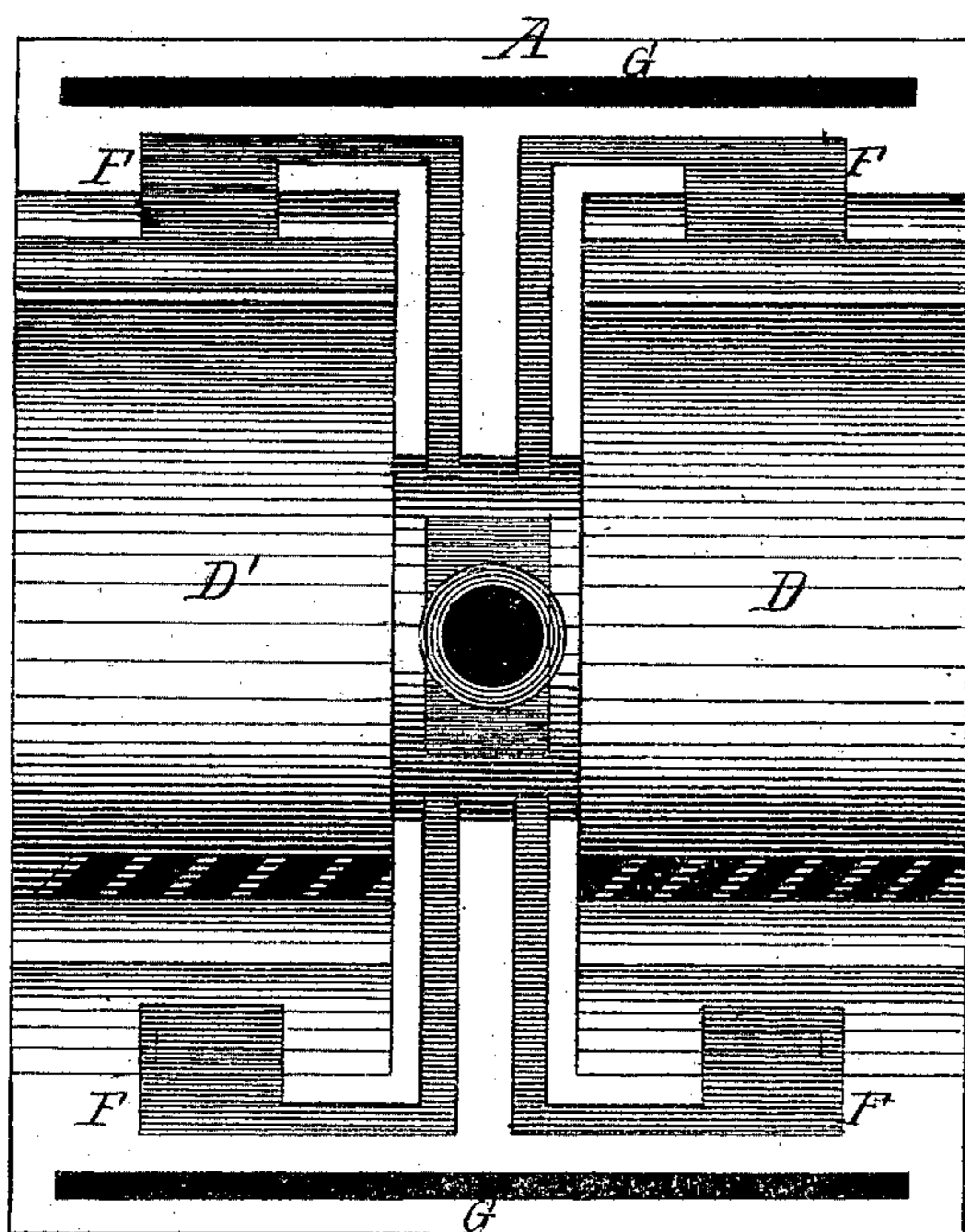
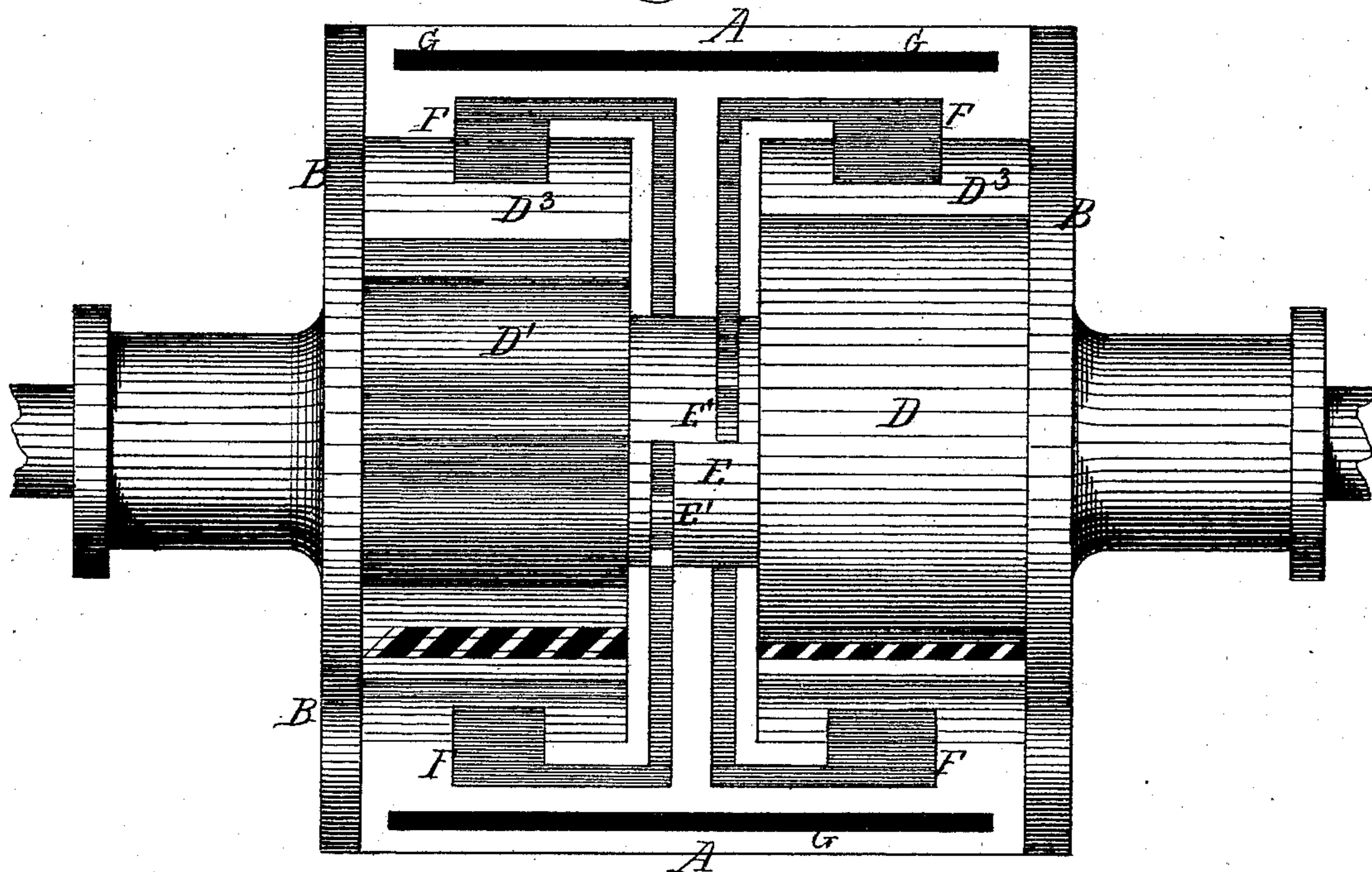


Fig. 4

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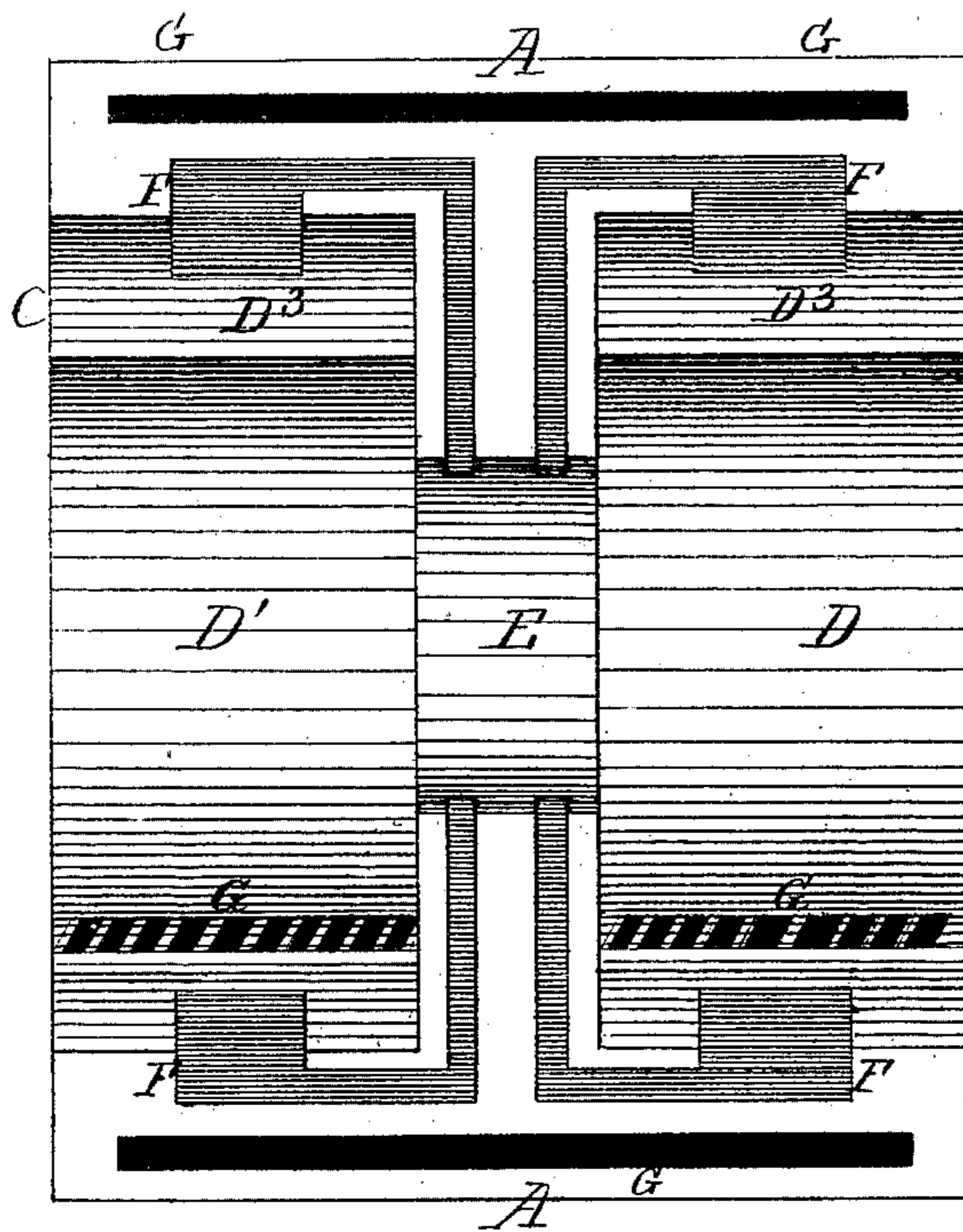


Fig. 5

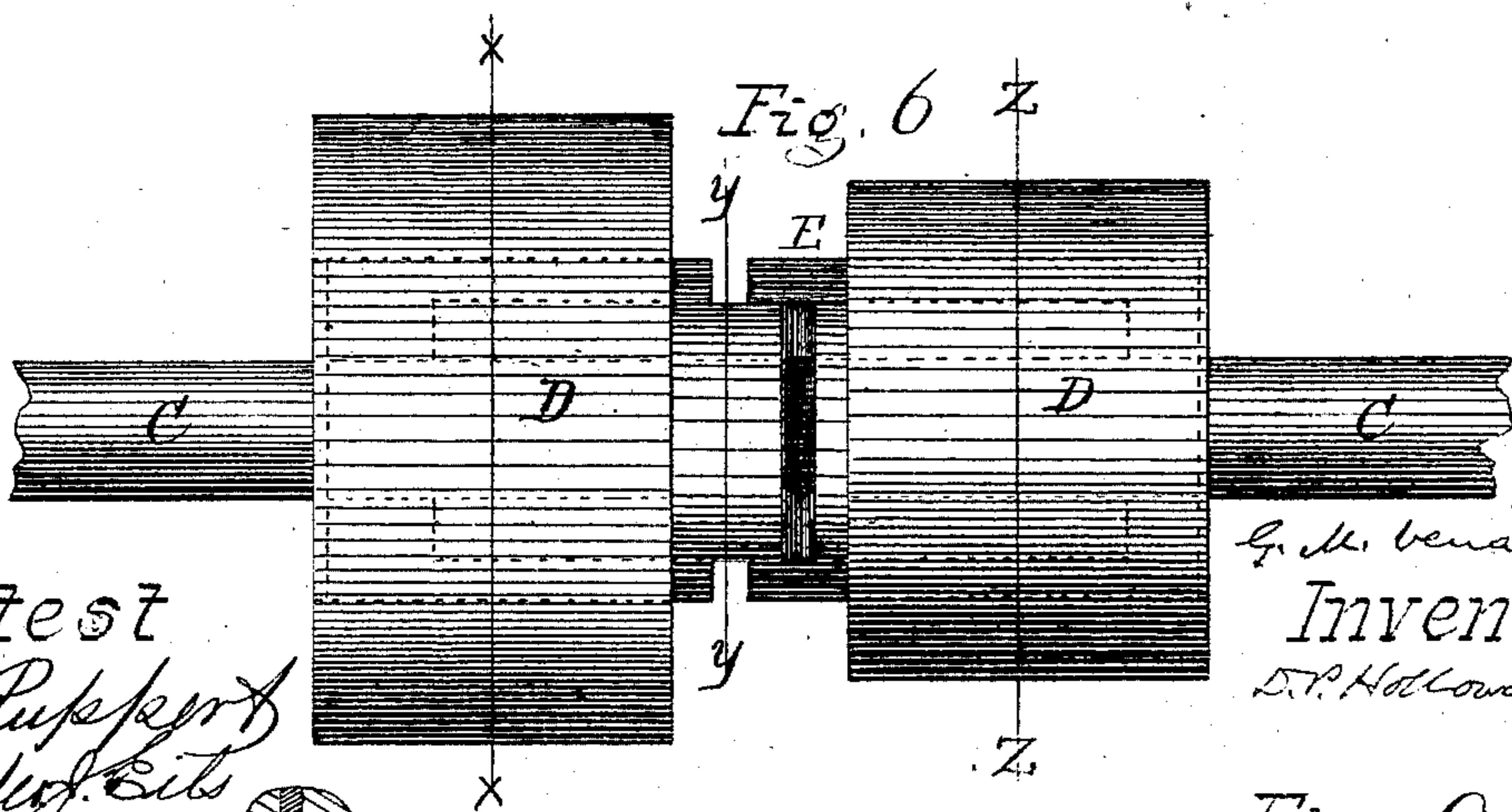


Fig. 6

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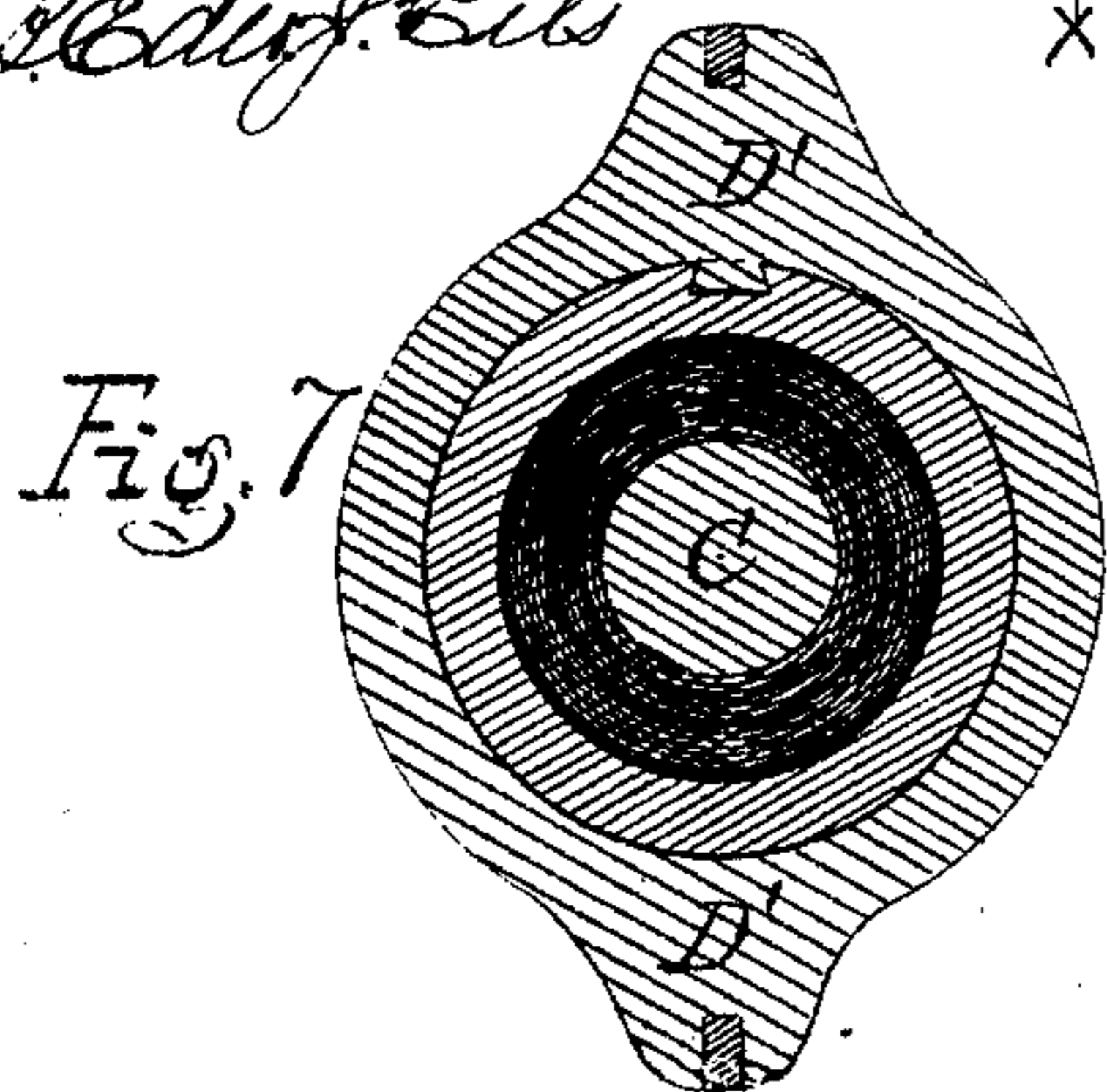


Fig. 7

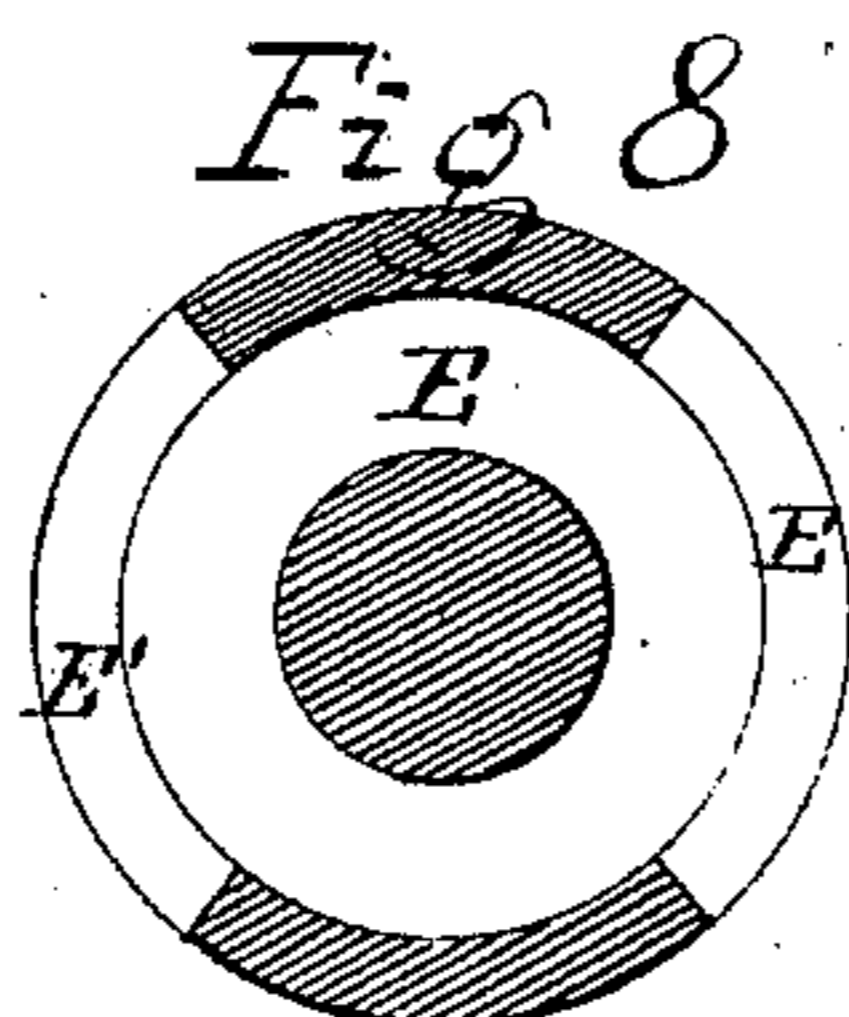


Fig. 8

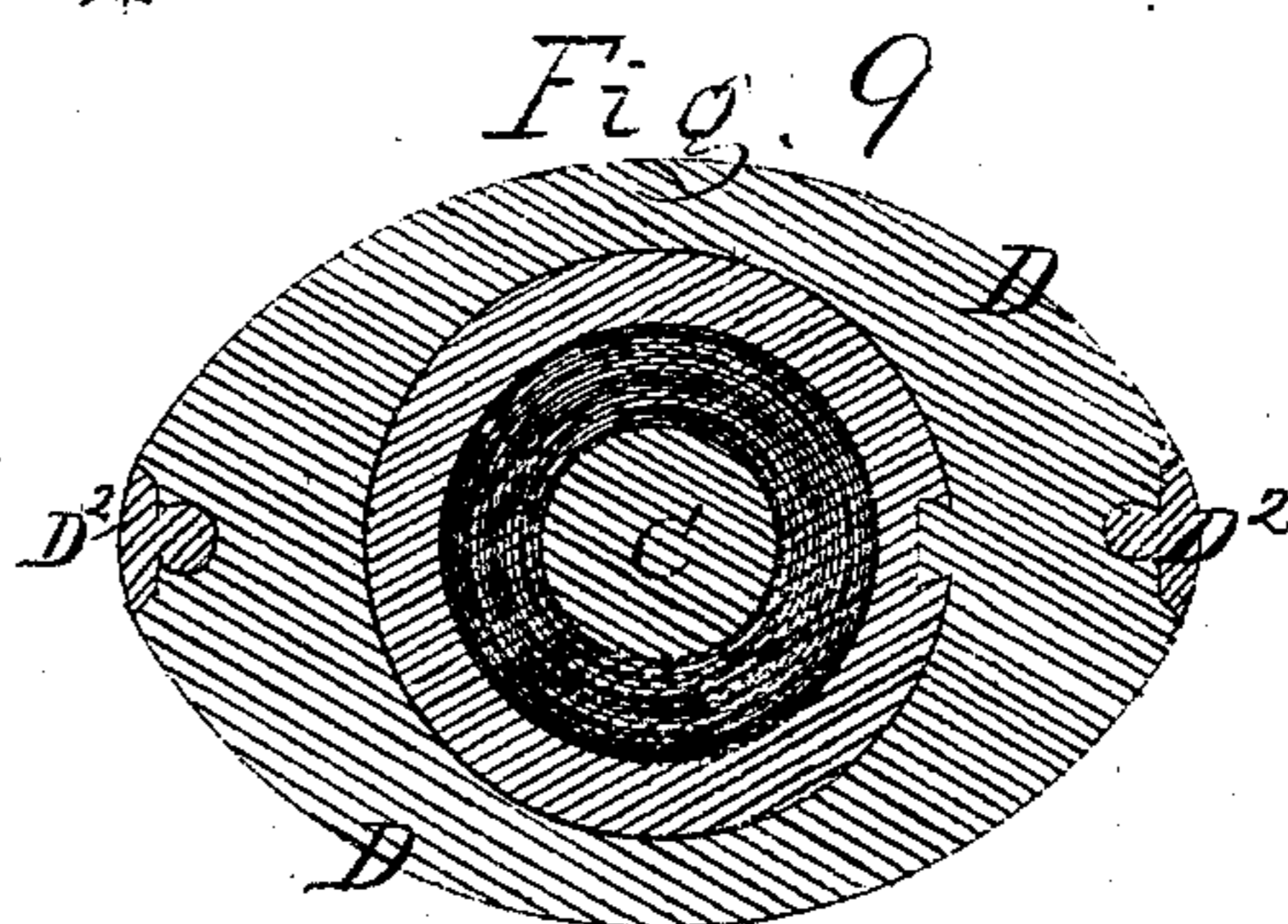


Fig. 9

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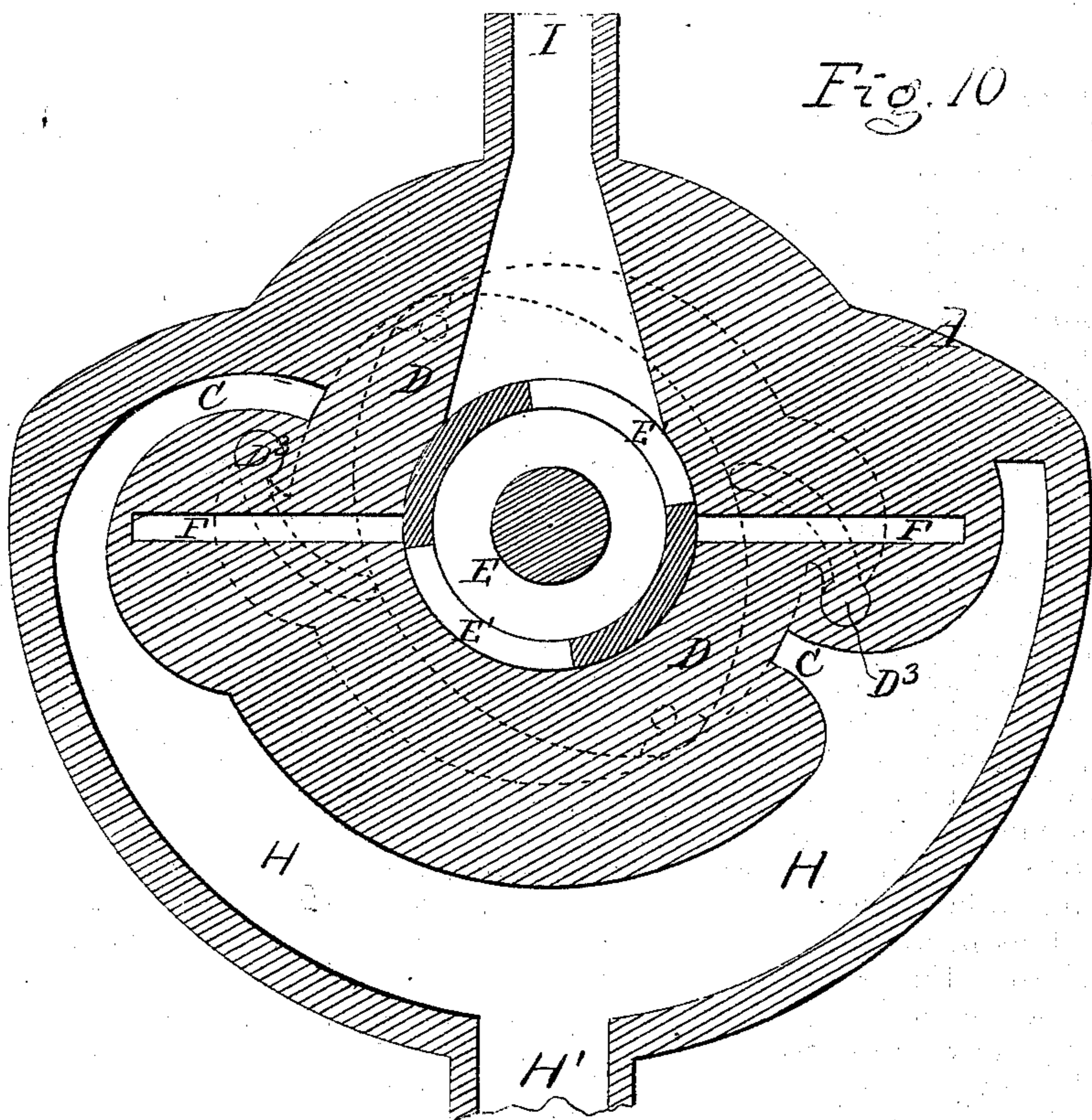


Fig. 10

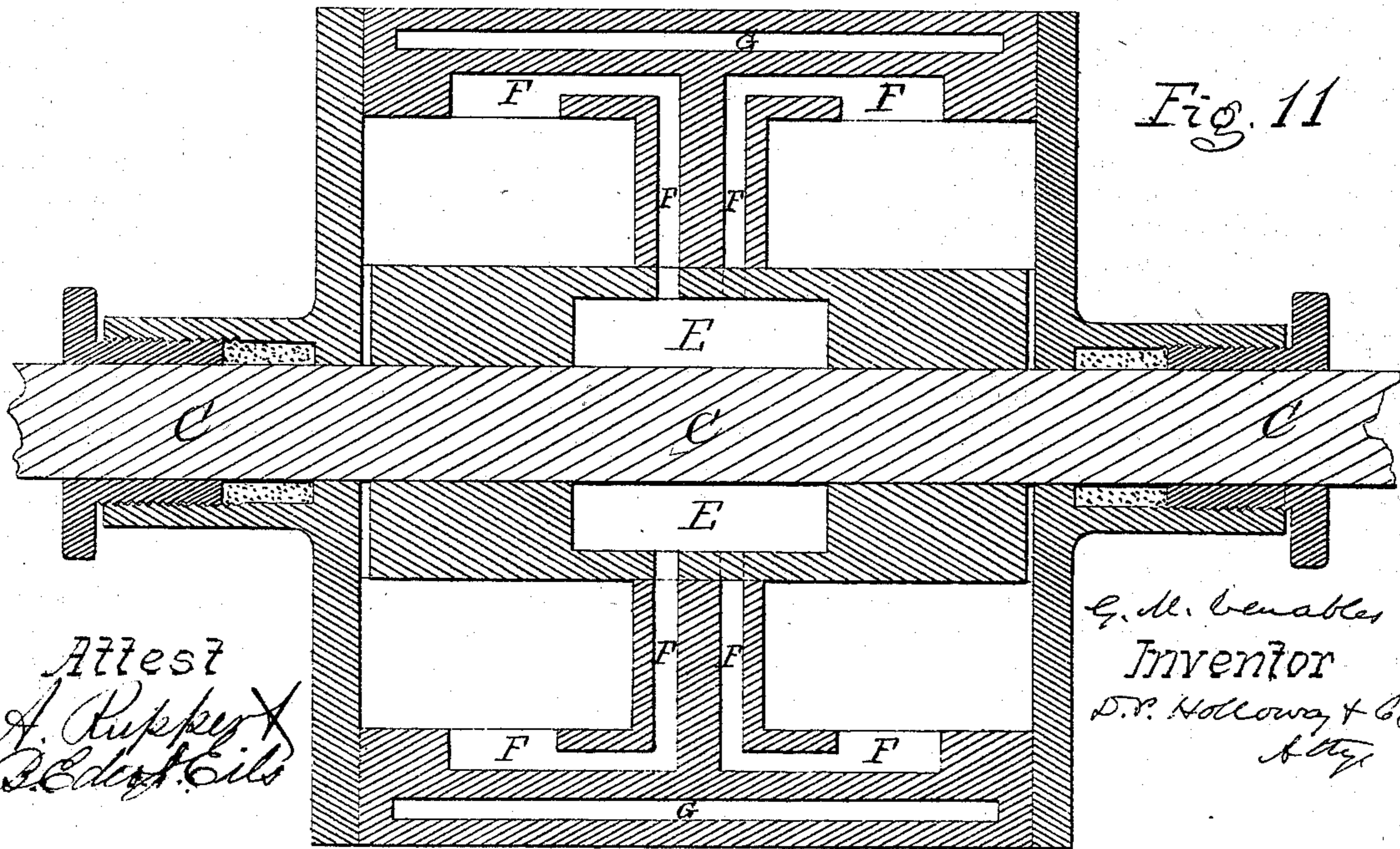


Fig. 11

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# UNITED STATES PATENT OFFICE.

GILBERT M. VENABLE, OF MEMPHIS, TENNESSEE.

## IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. 120,470, dated October 31, 1871.

*To all whom it may concern:*

Be it known that I, GILBERT M. VENABLE, of the city of Memphis, in the county of Shelby and State of Tennessee, have invented a new and useful Improvement in Rotary Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing making part of this specification, in which—

Figure I is a side elevation of my improved engine. Fig. II is an end view. Fig. III, Sheet 2, is a plan view, the upper half of the case or cylinder being removed to show the revolving piston in position, the rotating steam-chest, and the induction and eduction-ports. Fig. IV, Sheet 2, is a plan view of the lower surface of the upper portion of the case or cylinder, also showing the steam-ports and the nozzle to which the steam-pipe is attached, and the curved valves. Fig. V, Sheet 3, is a plan view of the case, its upper portion being removed to allow the position of the revolving pistons to be shown in connection with the curved valves or abutments, and with the rotary steam-chest. Fig. VI, Sheet 3, is a side elevation of the revolving pistons, their steam-passages being shown in dotted lines, the revolving steam-chest with its induction-passages, and the shaft upon which they are secured. Fig. VII, Sheet 3, is a transverse section on line *xx* of Fig. VI, showing one form of rotating piston. Fig. VIII, Sheet 3, is a transverse section on line *yy* of Fig. VI, showing the induction-ports in the revolving steam-chest. Fig. IX is a transverse section on line *zz* of Fig. 6, showing a modified form of rotating cylinder. Fig. X, Sheet 4, is a transverse section of the engine, showing the induction steam-passages, the rotating steam-chest and piston, the position of the curved valves with reference to the case and to the piston, and the arrangement of the eduction-apertures; and Fig. XI, same sheet, is a plan view, showing the induction-ports, the steam-chest, shaft, and packing-boxes.

Corresponding letters refer to the corresponding parts in the several figures.

This invention relates to rotary engines, and has for its object the production of an engine of this type which shall be evenly balanced, both as regards the pressure of the steam upon its pistons and shaft in a line with the axis of such

shaft and in a line transverse thereto, so that there shall not be any tendency to curve under friction by pressing the pistons against the heads of the case or cylinder, or unequally against the bearings which support the axle, or against the inner surface of the cylinder; and to this end the invention consists of a rotating steam-chest formed within the rotating piston or pistons, or in the parts which connect such pistons when more than one is used, and in the construction, combination, and arrangement of certain of the other parts, as will be more fully described hereinafter.

In constructing engines of this character I use a case or cylinder of the form shown in Figs. I and II, or of any other form which is adapted to receive and hold in position the moving parts of the engine, and to have formed in it the necessary induction and eduction-ports; and, as the case shown in the drawing is adapted to receive two pistons, I shall describe it as such, premising, however, that an engine may be constructed with one cylinder without in any sense changing the nature of the invention. That portion of this case in which the pistons rotate is bored smoothly and of such diameter as it is desired to have the pistons. Between the two chambers in which the cylinders rotate there is to be formed a partition, through which there is bored a hole of sufficient diameter to receive the rotating steam-chest. Within this partition the induction-apertures, or a portion of them, are formed. In the lower portion of the case an exhaust or eduction-chamber is formed, as will be more fully explained hereinafter. Upon the ends of the case A heads B B are placed, which have in them apertures for the passage of the shaft and for the reception of suitable packing and packing-boxes, as shown in Fig. XI, Sheet 4. These heads are to be bolted to the case in the usual manner, in order that they, in connection with the case, may form a steam-tight chamber or cylinder for the piston to rotate in. Passing through the chamber there is a shaft, C, which has its bearings in the heads B B, and which is to carry upon one or both of its ends a wheel or pulley for transmitting the power of the engine to the machinery to be moved. Upon the shaft C and within the cylinder or cylinders of the engine there is firmly keyed a cylindrical piece of metal, the central portion of which has a cavity formed

in it, as shown in Fig. XI, Sheet 4, which cavity, with the cylindrical piece of metal, forms the rotating steam-chest E. Upon the ends of this cylinder or chest the pistons D D<sup>1</sup> are firmly keyed, they being of the form shown in Fig. VII, Sheet 3, or of the form shown in Fig. IX on same sheet, and having in their outer or bearing-surfaces either of the forms of packing-pieces shown in the figures last alluded to, preference being given to the form shown in Fig. IX, as that form is best adapted to an engine which is made capable of being reversed, so that the pistons may run in either direction, it being capable of having steam admitted under its flanges for changing its position when such reversal takes place. The dotted lines in Fig. VI, Sheet 3, show the cavity which constitutes the space within the chest; and they also show that the cylindrical piece does not extend entirely through the pistons, but leaves a small cavity in the piston at the outer ends, so that they shall have a fair bearing upon the cylinder-heads, and so that, if any steam should pass through between the pistons and the cylinder or chest, it may be retained in the cavity and thus form a water-packing. In that portion of the chest which is between the pistons and within the partition in the case there is formed a series of openings, which are in line with the openings in the partition, they being so arranged as to open the induction-port at the moment when the highest part of the piston has passed the circular valve, and remain open during one-fourth, more or less, of a revolution of the piston, when, in consequence of the movement of the chest, the opening or port will have passed under the solid portion of the partition, or beyond the opening therein, and the steam will be cut off and will act expansively upon the piston throughout the next succeeding one-fourth or other fractional part of its revolution; and, owing to the fact that there are two induction-ports and two valves to each piston, and to the further fact that the steam is admitted alternately upon each side of the piston, so that it presses thereon in opposite directions and thus balances the pistons and causes them to run evenly upon the cylinder, and the shaft to turn equally upon all parts of its boxes. The openings in the steam-chest are all arranged, as above described, so as to admit the steam to the pistons, and to cut it off at the proper times; and as the rotating chest E is at all times filled with steam when the engine is in operation, it follows that the end pressure is always the same in both directions, and that the pistons are relieved from any friction that would be caused by forcing them against the heads of the cylinder. The induction-passages F F extend from their connection with the rotating chest E through the partition in the case to the outer portion or shell of the same, where they are turned at an acute angle, or are curved, as shown in Fig. V, Sheet 3, and extend inward, so as to deliver the steam

upon the outsides of the valves or abutments D<sup>3</sup> D<sup>3</sup> and press them firmly upon the outer surface of the pistons. The abutments are constructed substantially of the form shown in Fig. X, Sheet 4, and are placed in cavities formed in the case for their reception. The curved form given to these abutments forms one feature of my invention, and is of importance in engines of this character, as without it they cannot be made to work successfully, owing to the fact that when made of any other form the point of the piston will strike them at a point near where they are pivoted to the case and will cause them to move so rapidly in opening as to cause a heavy thumping in the engine, and eventually to break the valves. To prevent this the inner surface of the abutments should be of such a circle as to cause its outer end to at all times rest upon the periphery of the piston, which will cause it to open gradually and without any jar. The exhaust-passages G G are arranged as shown in Figs. III, IV, V, X, and XI, the points at which they communicate with the cylinder being provided with bars arranged at about the angles shown, so that in passing over them the piston will have a bearing-surface upon said bars. From these points these passages lead through the case to the steam-chamber H, as shown in Fig. X, Sheet 4, one of them communicating with the upper portion of said case and one with the lower portion, as shown in the figure last referred to. From the chamber H the steam escapes through the nozzle H', from which it may be conducted to any desired point.

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

1. A rotating steam-chest formed within or partially within a rotating piston of an engine, said chest having formed in it steam induction-passages arranged to act as cut-offs for the steam, substantially as and for the purpose set forth.
2. The within-described method of balancing the pistons of a rotary steam-engine by admitting steam to the interior of its pistons, substantially in the manner described.
3. The arrangement of the induction-passages F F with reference to the rotating steam-chest and to the abutments D<sup>3</sup>, substantially as and for the purpose set forth.
4. The arrangement of the exhaust-passages G G, substantially as and for the purpose set forth.
5. The cavities in the outer ends of the pistons, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GILBERT M. VENABLE.

Witnesses:

JOS. T. K. PLANT,  
C. F. CLAUSEN.

(150)