No. 630,648.

Patented Aug. 8, 1899.

R. E. BREWER.

ROTARY ENGINE.

(Application filed Apr. 19, 1899.)

(No Model.)

4 Sheets—Sheet 1.

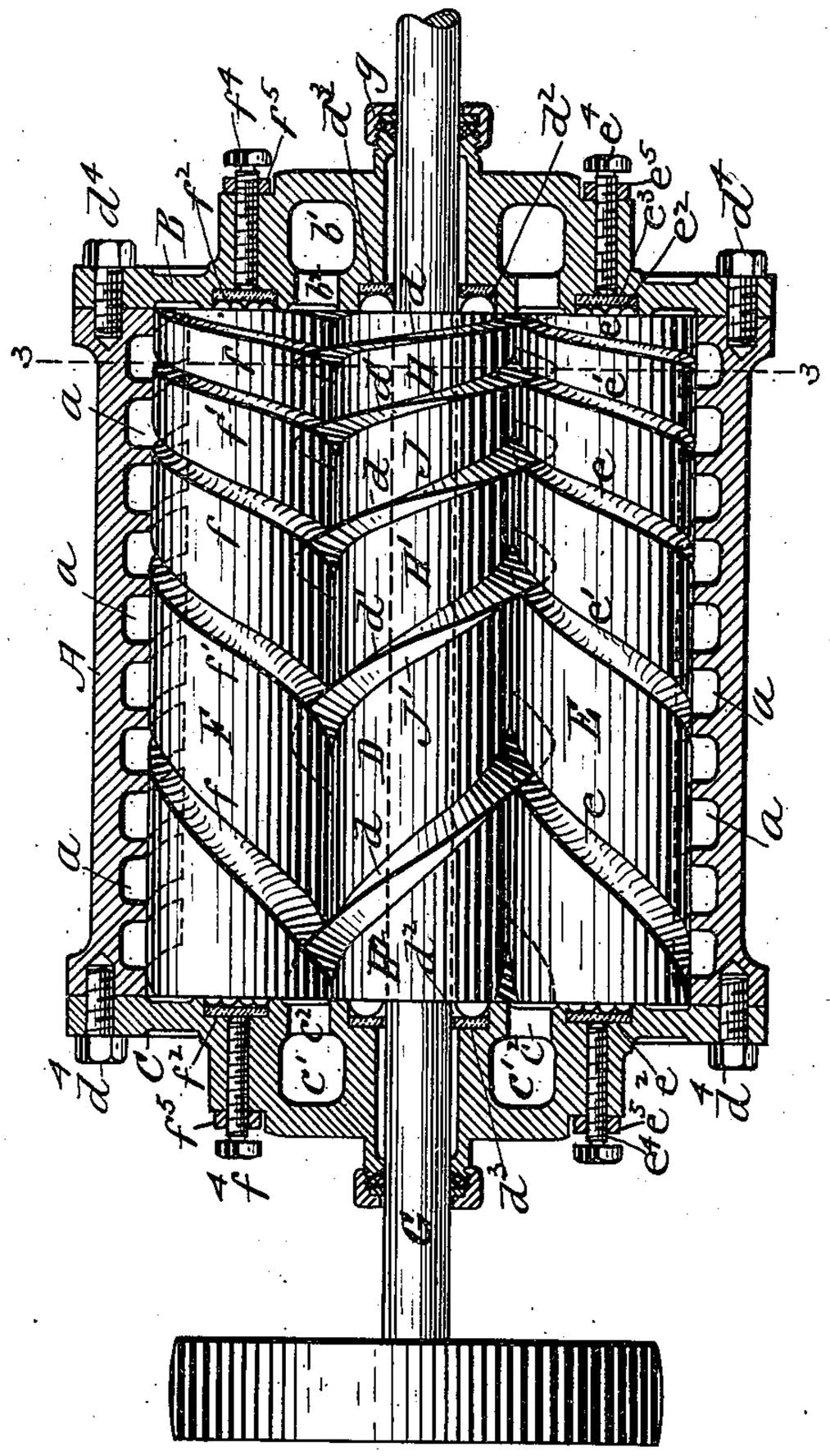

Fig. 1.

WITNESSES

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4 Sheets—Sheet 2.

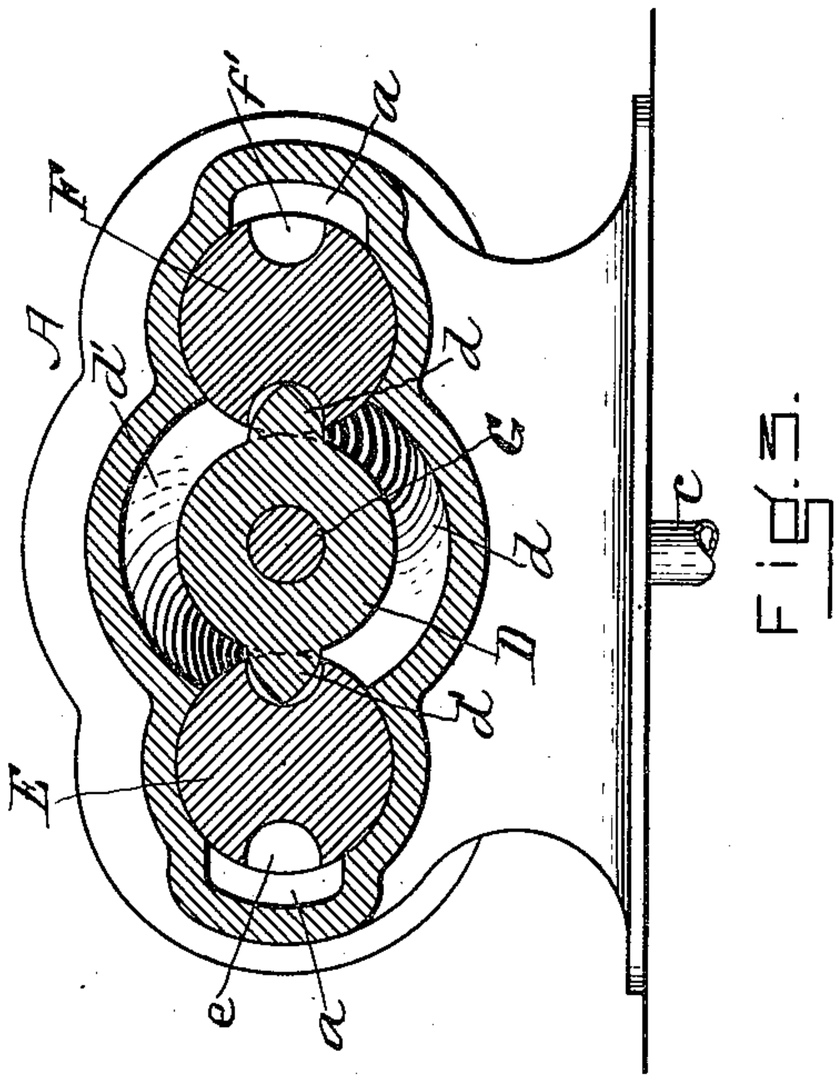

Fig. 5.

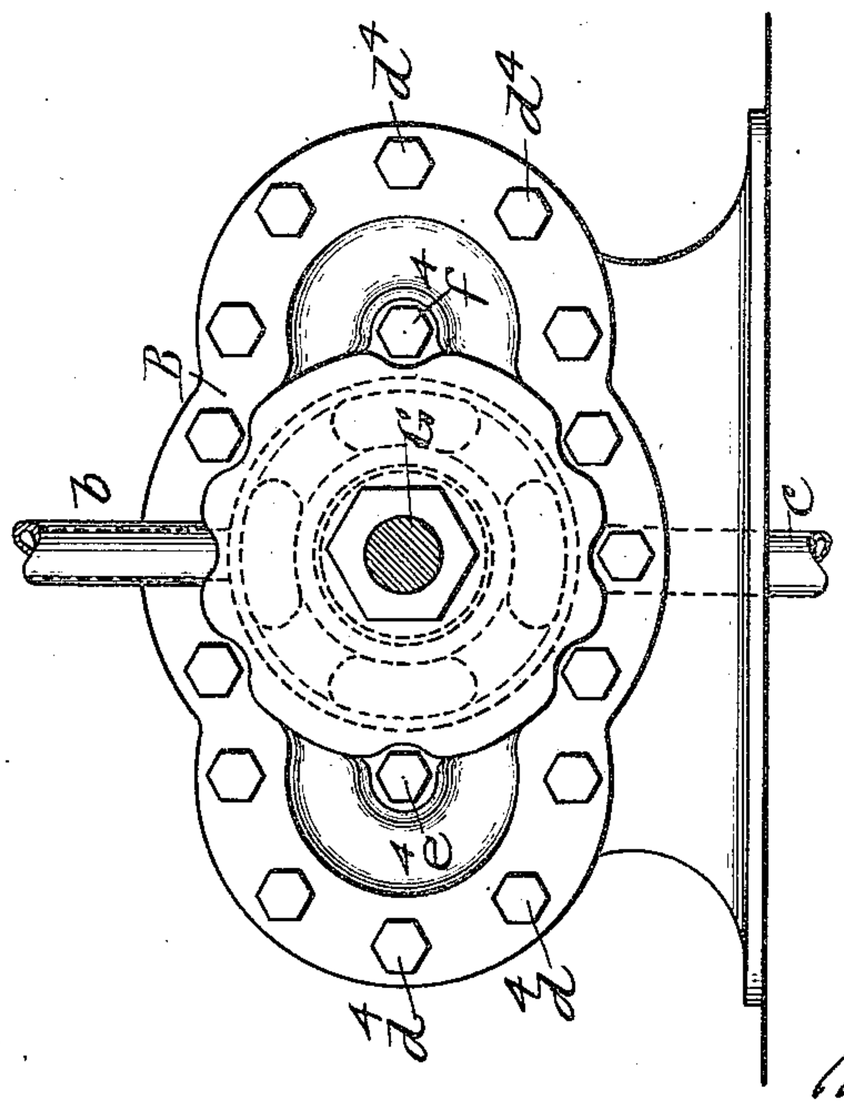

Fig. 2.

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4 Sheets—Sheet 3.

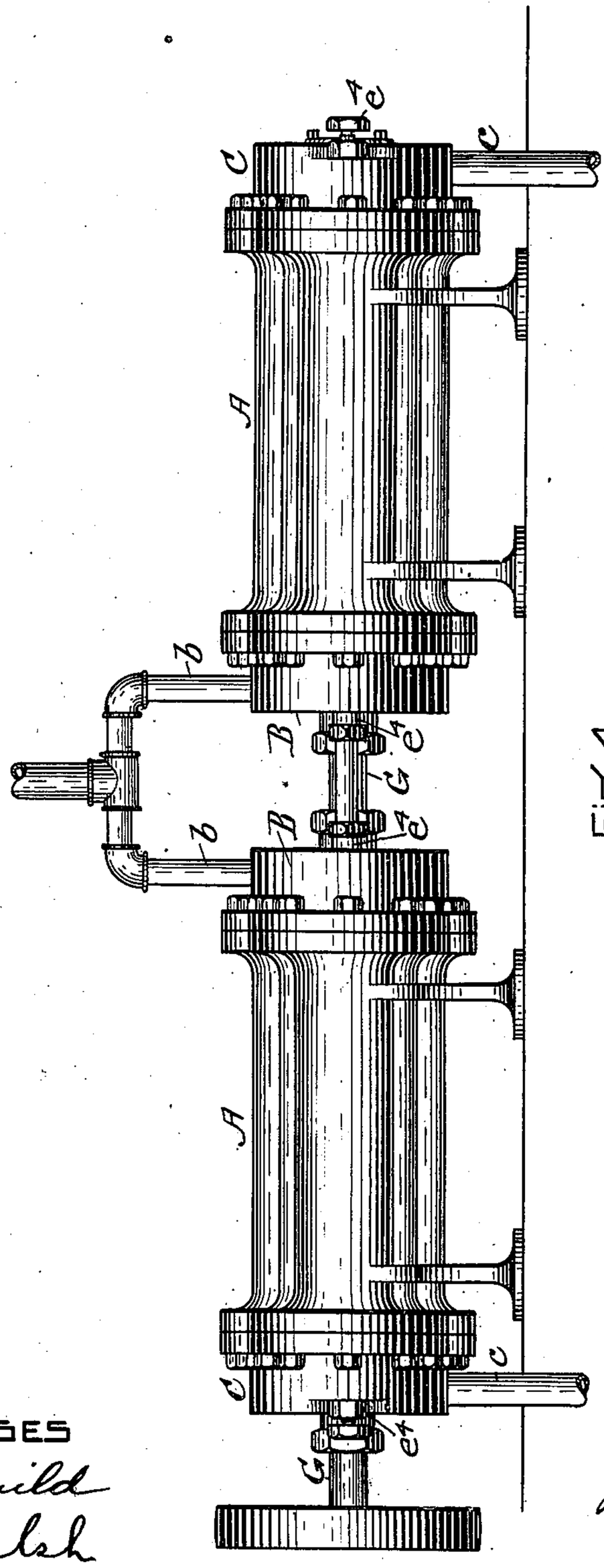

Fig. 4.

WITNESSES

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R. E. BREWER.

ROTARY ENGINE.

(Application filed Apr. 19, 1899.)

(No Model.)

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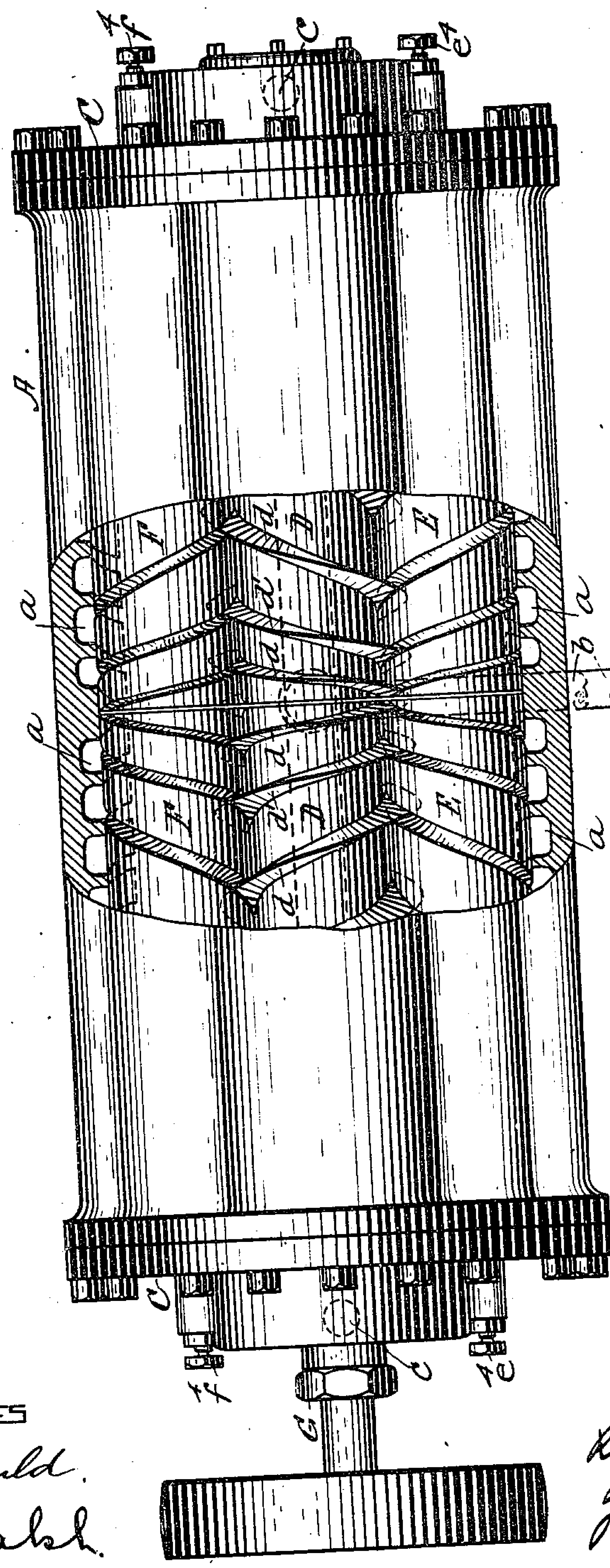

FIG. 5.

WITNESSES

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UNITED STATES PATENT OFFICE.

ROBERT E. BREWER, OF BOSTON, MASSACHUSETTS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 630,648, dated August 8, 1899.

Application filed April 19, 1899. Serial No. 713,534. (No model.)

To all whom it may concern:

Be it known that I, ROBERT E. BREWER, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Rotary Engines, of which the following is a specification.

The purpose of my invention is to utilize the expansible quality of steam to greater extent than has heretofore been possible.

To this end my invention in its preferred form consists in a roll provided with two or more threads having an increasing pitch from the inlet end of the roll to the outlet, the whole being inclosed in a casing, in which are also contained two rolls, one on each side of said threaded roll and grooved to receive the threads on said first roll, the whole forming two spiral chambers divided by said grooved rolls into sections, so that when steam is introduced into said chambers its passage through the casing is interrupted and instead of passing in a spiral course around said threaded roll it forces its way through the engine in a line substantially parallel with the axis of said roll, causing said roll to turn because of the constantly-increasing difference of area of thread against which the steam acts. The threaded roll I have called for convenience the "piston-roll" and the grooved rolls the "valve-rolls."

My invention will be understood by reference to the drawings, in which—

Figure 1 is a horizontal section of an engine embodying my invention. Fig. 2 is an end elevation; Fig. 3, a section on line 3 3 of Fig. 1; Fig. 4, a side elevation of two engines coupled together in a manner to be described, Fig. 5 showing another mode of coupling, partly in plan and partly in section.

A is the casing, which is provided with two removable heads B and C, attached thereto by screws d^4, as shown, the whole inclosing the piston-roll D and the valve-rolls E F. The piston-roll D is provided with a double thread $d\ d'$ of increasing pitch, which is sufficiently high to entirely close the passage between the exterior of the piston-roll D and the interior of the casing A and prevent the free passage of steam from one end of the casing to the other, forming walls for this purpose.

The valve-rolls E are made with grooves $e\ e'$, corresponding to the threads $d\ d'$, and the valve-roll F is provided with grooves $f\ f'$, also corresponding to the threads $d\ d'$, so that as the roll D turns the threads $d\ d'$ will fit within the grooves $e\ e'\ f\ f'$ and cause the rolls E F to rotate with the roll D.

The head B is provided with a steam-inlet b, by which steam is admitted to the steam-chamber b', from which it passes into the interior of the casing through ports b^2. The head C is provided with an exhaust-outlet c, connected by the chamber c' and ports c^2 with the interior of the casing. Each head is also provided with recesses $d^2\ e^2\ f^2$. In each of the recesses $e^2\ f^2$, which are located opposite the axes of the valve-rolls E F, is a disk $e^3\ f^3$, and within the recess are ball-bearings to reduce the friction of the turning rolls. Set-screws $e^4\ f^4$ and jam-nuts $e^5\ f^5$ are also provided to adjust the bearings.

The piston-roll D is provided with a shaft G, by which power is conveyed from the engine. This shaft may be a reduced section of the roll projecting from each end thereof or it may be a separate shaft passing through said roll, as shown in the drawings. The recesses d^2 are located about this shaft, and each contains an annulus d^3 and ball-bearings to reduce the friction of the piston-roll D. These bearings are adjusted by the screws d^4, which attach the heads B C to the casing A. Stuffing-boxes g of any suitable kind are provided about the shaft.

It will be seen that by reason of the increasing pitch of the spiral $d\ d'$ a series of compartments or inclosures H H', &c., and J J' will be formed on the upper and lower sides of the piston-roll D, which will increase in size as the roll rotates, thus allowing the steam to gradually expand, (see Figs. 1 and 3,) and the roll D is rotated because the pressure of the steam in endeavoring to expand acts upon the threads of increasing pitch which exposes a constantly-increasing area to the steam and forces the roll around in a direction contrary to that of the increasing spiral.

The purpose of the valve-rolls E F is to confine the steam between the threads of the piston-roll. It is evident that if these valves are omitted the steam, while by its first impact it might give a turn to the screw, would tend to take a spiral course around the piston-roll, between its threads, and thus fail to give

any lasting rotary motion to the piston-roll. Each valve-roll being provided with what might be called a form of "involute groove" and being in rolling contact with the piston-roll, what may be termed "upper" and "lower" recesses are formed, so that substantially all of the steam which enters one recess remains in that recess throughout its passage through the casing, and by acting on the thread in front of it, which has an increasing pitch over the one behind it, exerts a power to turn the roll, dependent upon the difference of relative area between the exposed surfaces of the threads in front and behind a given body of steam. As shown, this difference is due to the difference between the angle of the two threads with the axis of the roll; but it is evident that this difference of area might be secured by changing the height of the thread. I prefer to have two valve-rolls, because the space about this piston-roll is thus divided into two diametrically opposite equal recesses, and the piston-roll is balanced by steam-pressure on both sides of it. A certain small proportion of the steam will pass through the grooves in the valve-rolls. Some of this will collect in the pockets *a* in the inside of the casing and serve to balance any pressure exerted by the steam in contact with the piston-roll to force the valve-rolls outward.

In Figs. 4 and 5 I have shown two methods of coupling two of my piston-rolls together. In Fig. 4 the same shaft G passes through both piston-rolls, the rolls being turned end for end, so that the inlets b^2 will be in the adjacent ends of the casing, the interior construction of the two engines being alike, except that the threads are right-handed in one engine and left-handed in the other. In Fig. 5 the cylinders are also coupled together, in this case by carrying the shaft G through both rolls D and keying them thereto and in mounting the two rolls E on the same shaft and the two rolls F on the same shaft. The steam-inlets b^2 in this case lead directly into the middle of the casing, so as to supply steam to the chambers H J. In this case each end of the engine is provided with exhaust-heads C, like those above described.

In operation the steam inlet and exhaust are opened, and the steam entering the casing passes into the two spiral chambers and forces its way to and out of the exhaust, being prevented from taking a spiral course by reason of the valve-rolls. Owing to the spiral nature of the walls which retard the forward movement of the steam and the straight walls which confine it laterally, it acts upon the thread with what might be described roughly as a "wedge-like" action, forcing it to one side, as it were, and thus giving the necessary rotary motion to the piston-roll. This is, in fact, due to the difference in area between the parts of the threads exposed to the steam, the area of the thread or wall in front of the steam being greater than the area of the thread behind it, so that the steam pressing in all directions alike exerts more force on the greater movable area and causes the roll to rotate. As the steam passes along the roll the area opposed to it increases, so as to render very effective the expanding force of the steam and utilize it economically.

What I claim as my invention is—

1. A steam-engine having a suitable casing containing a piston-roll provided with a spiral double thread of increasing pitch and two grooved valve-rolls all arranged together as described, and with a suitable steam inlet and exhaust, whereby there are formed a series of expanding compartments each presenting an increased area to the expansive force of the steam, and the steam is caused to pass through said engine in contact with the entire length of each of said spiral threads upon the piston-roll, and in a line substantially parallel with the axis of said roll, as set forth.

2. A steam-engine having a suitable casing, an inlet and exhaust, said casing containing a piston-roll adapted to be rotated and having two spiral threads running from one end to the other of the roll, in combination with two valve-rolls, each grooved to receive the threads upon said piston-roll, whereby the steam is let into and retained within the space between said threads and is prevented from taking a spiral course, said threads affording an increasing area opposed to the action of the steam, as it passes from the entrance to the outlet of said engine, as set forth.

3. A steam-engine consisting of a casing having a suitable inlet and exhaust and containing a roll adapted to be rotated and provided with two threads of increasing pitch and means consisting of two valve-rolls provided with grooves to receive said threads, whereby the space between said threads is divided into expanding sections of increasing size extending from one end of said roll to the other, as and for the purposes set forth.

4. In a steam-engine, a casing and piston-roll mounted and adapted to be rotated therein and provided with two threads of an increasing pitch from one end to the other of said roll, each thread having two or more turns about said roll and two valve-rolls of equal length with said piston-roll and each provided with spiral grooves conforming to the shape of the threads upon said piston-roll, said valve-rolls being mounted one on each side of said piston-roll and in rolling contact therewith, in combination with a steam inlet and exhaust, as and for the purposes set forth.

5. In a steam-engine, a valve-casing containing three rolls mounted in the same plane and adapted to rotate with a rolling contact, the middle roll being provided with two or more threads having an increasing pitch from one end thereof to the other and the outer rolls being provided with grooves to receive the threads on said middle roll, said casing also being provided in its interior with a series

of pockets along two of its sides adjacent to the outer sides of said outer rolls, as set forth.

6. A steam-engine consisting of three rolls each adapted to be rotated, the middle roll being provided with two or more threads of increasing pitch from one end thereof to the other, and the two outer rolls being provided with grooves to receive said threads, said rolls being arranged in rolling contact with each other whereby there is formed a series of expanding compartments one below and one above said piston-roll, each adapted to balance the other, said casing also being provided with two sets of steam-pockets, one set being substantially opposite the other and each set being upon the farther side of said outer rolls from the middle of said casing, as and for the purposes set forth.

7. The steam-engine above described, consisting of two piston-rolls each suitably mounted to rotate upon the same axial line, and two pairs of valve-rolls, each pair also being mounted to rotate upon the same axial line, said piston-rolls being provided with a thread of increasing pitch running from the middle outward and in opposite directions, and said valve-rolls being provided with grooves adapted to receive the threads on the piston-roll adjacent to them, in combination with means whereby said rolls are suitably mounted and the steam is fed to and retained within the chambers formed between said threads and allowed to exhaust therefrom, as and for the purposes set forth.

In testimony whereof I have hereunto set my name this 14th day of April, 1899.

ROBERT E. BREWER.

Witnesses:

GEORGE O. G. COALE,

E. A. GUILD.