

(No Model.)

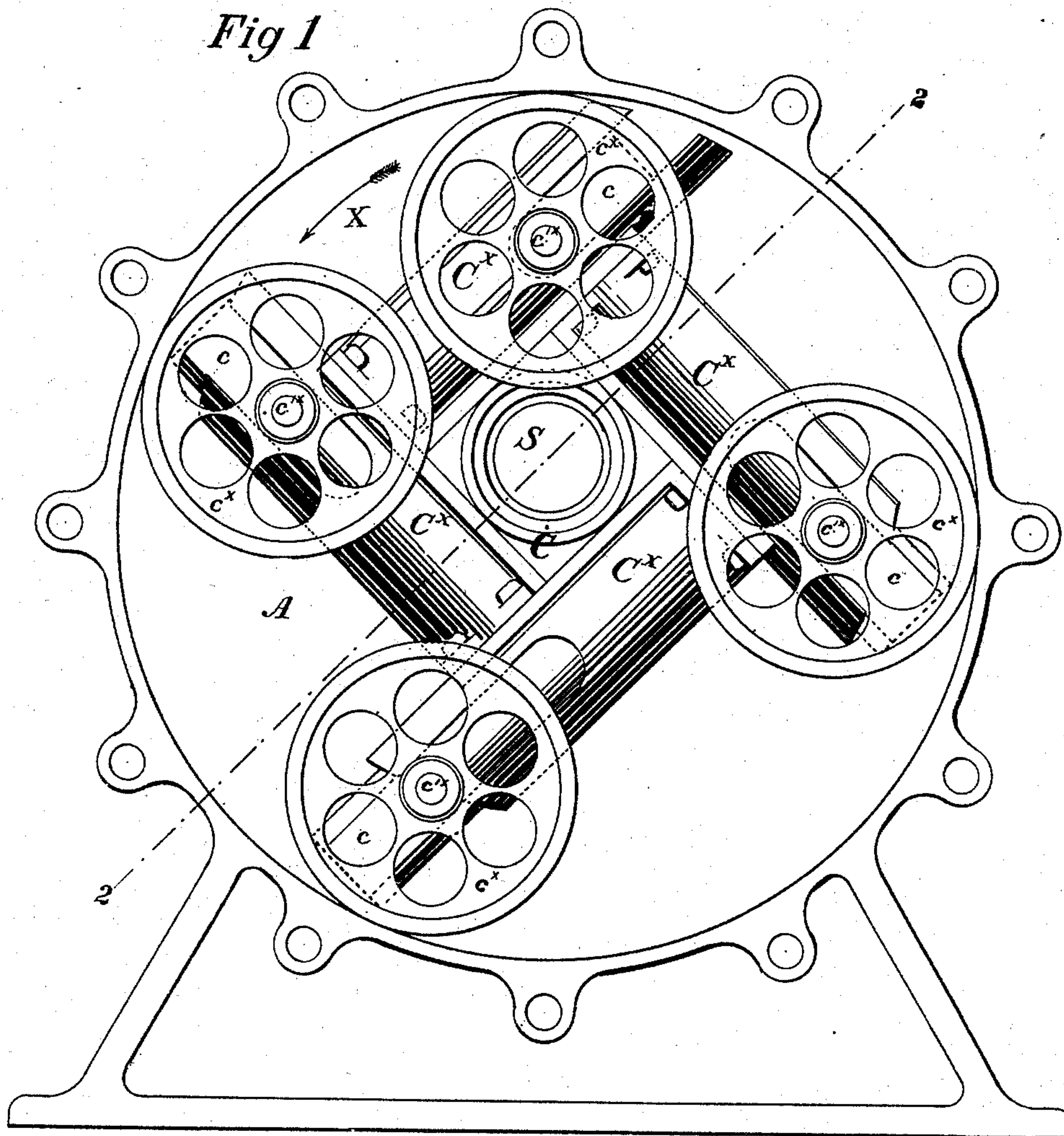
3 Sheets—Sheet 1.

F. B. ALLEN.
STEAM ENGINE.

No. 496,966.

Patented May 9, 1893.

Fig 1



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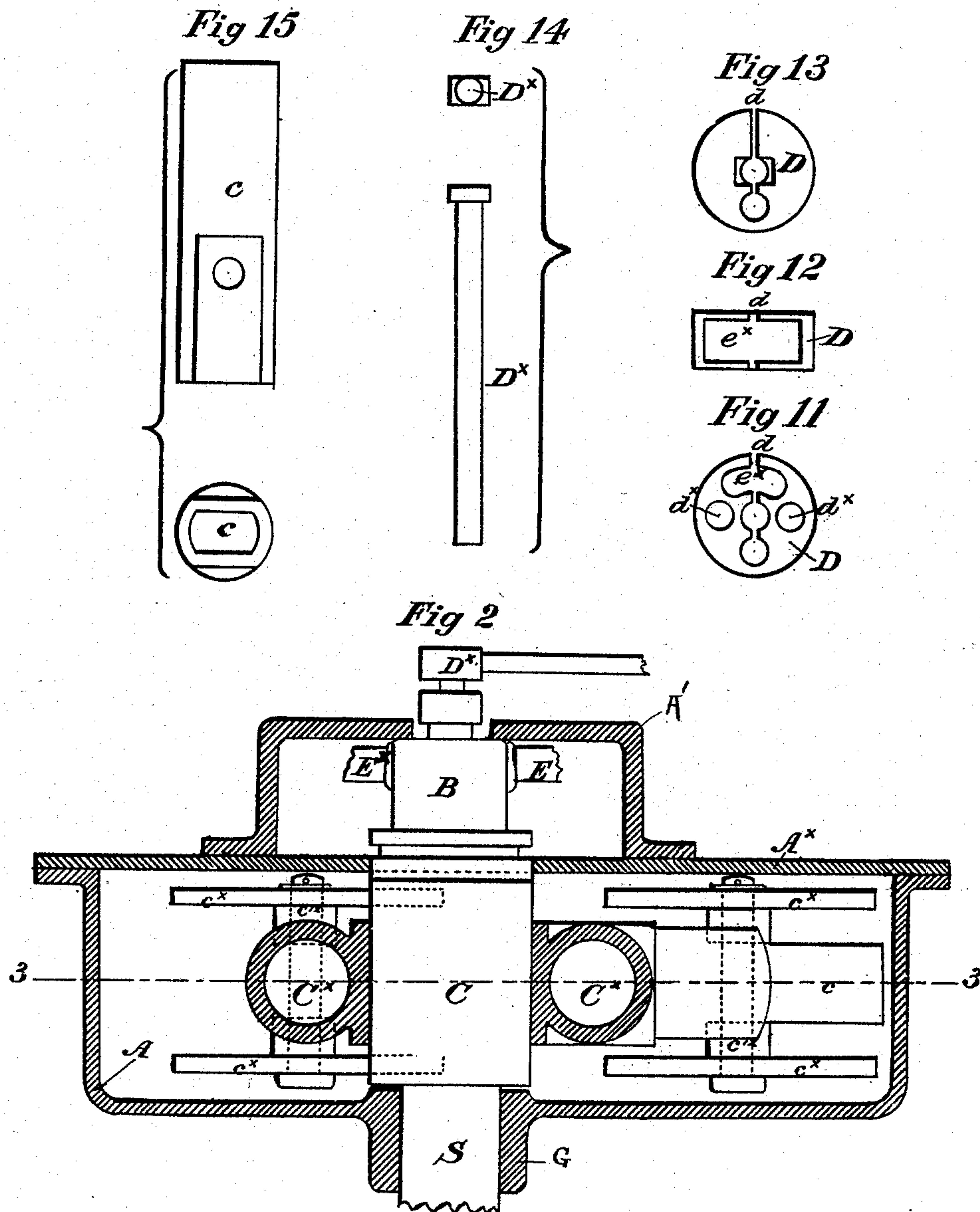
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(No Model.)

3 Sheets—Sheet 3.

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Fig 3

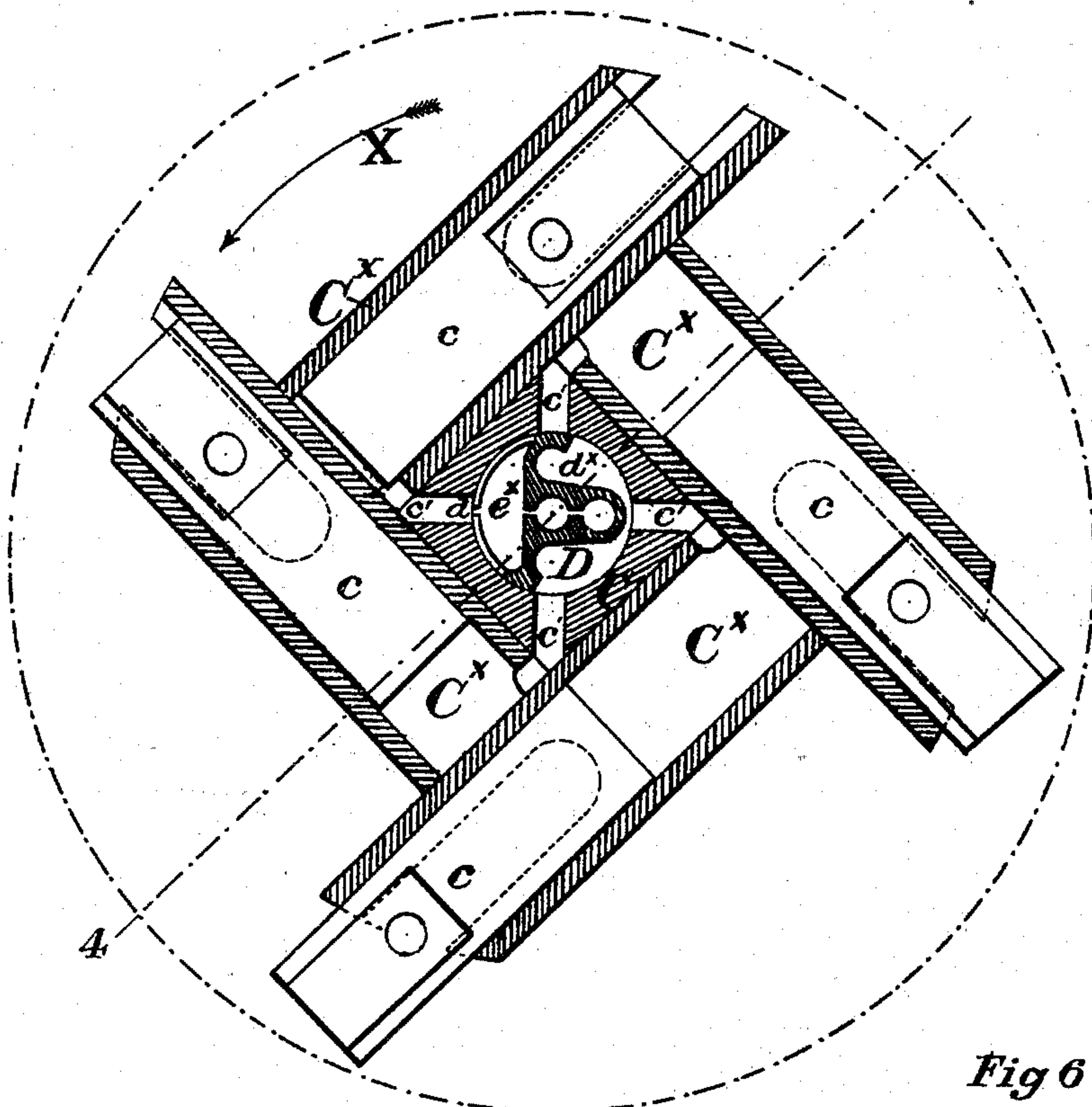


Fig 5

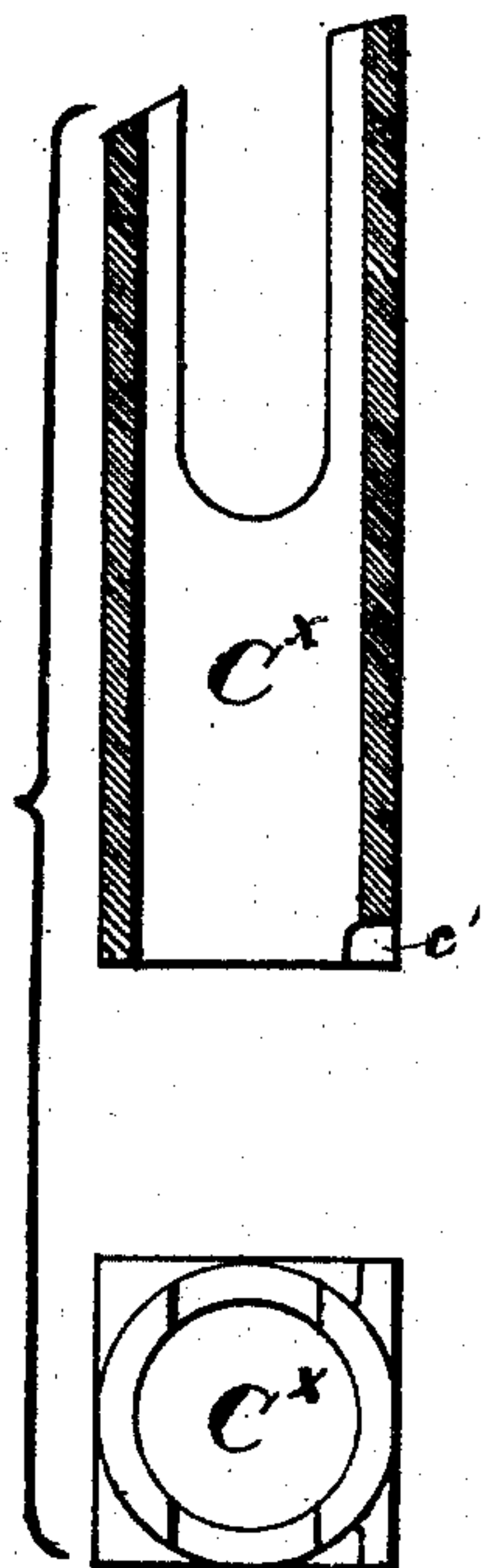


Fig 4

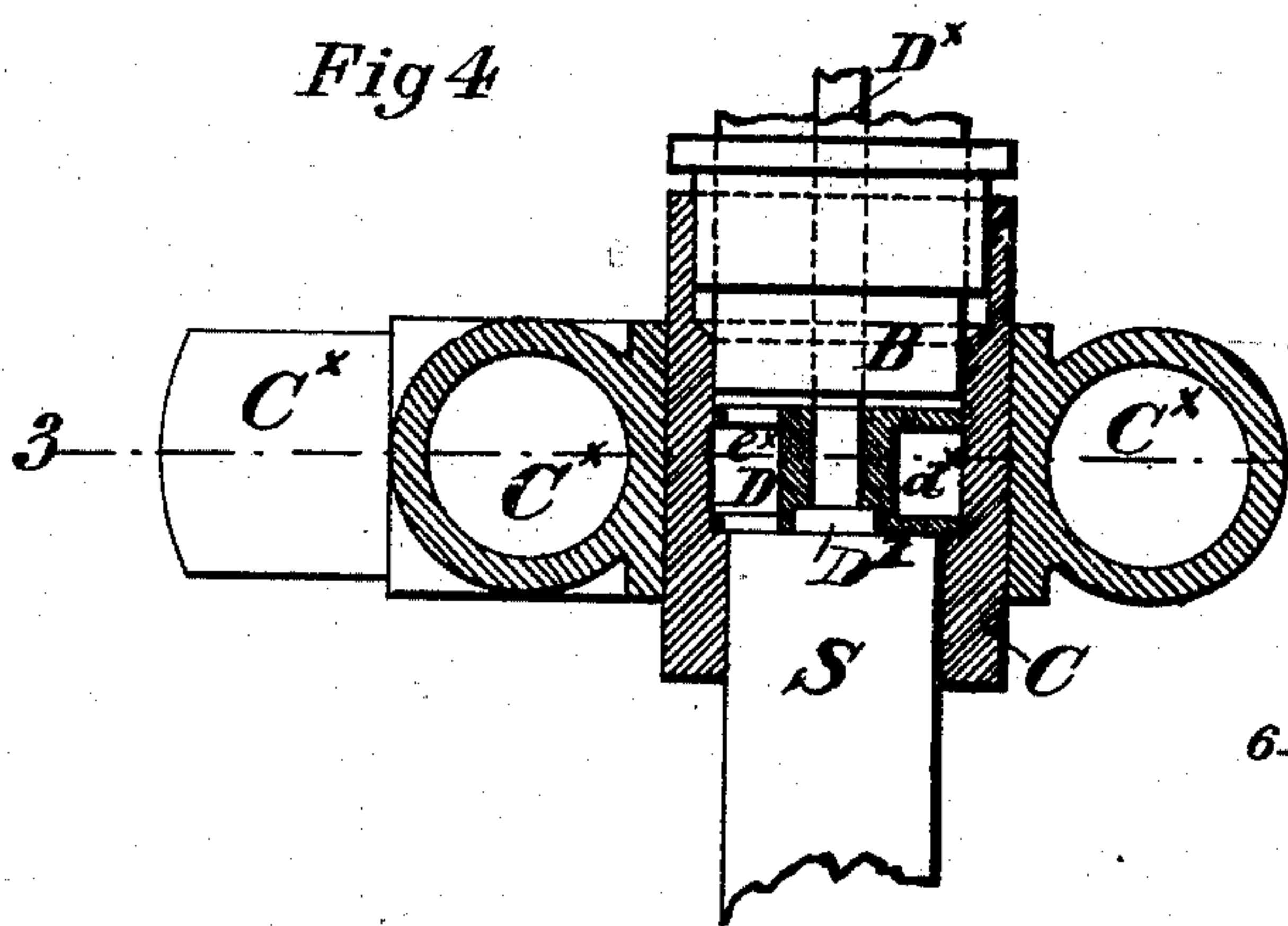


Fig 6

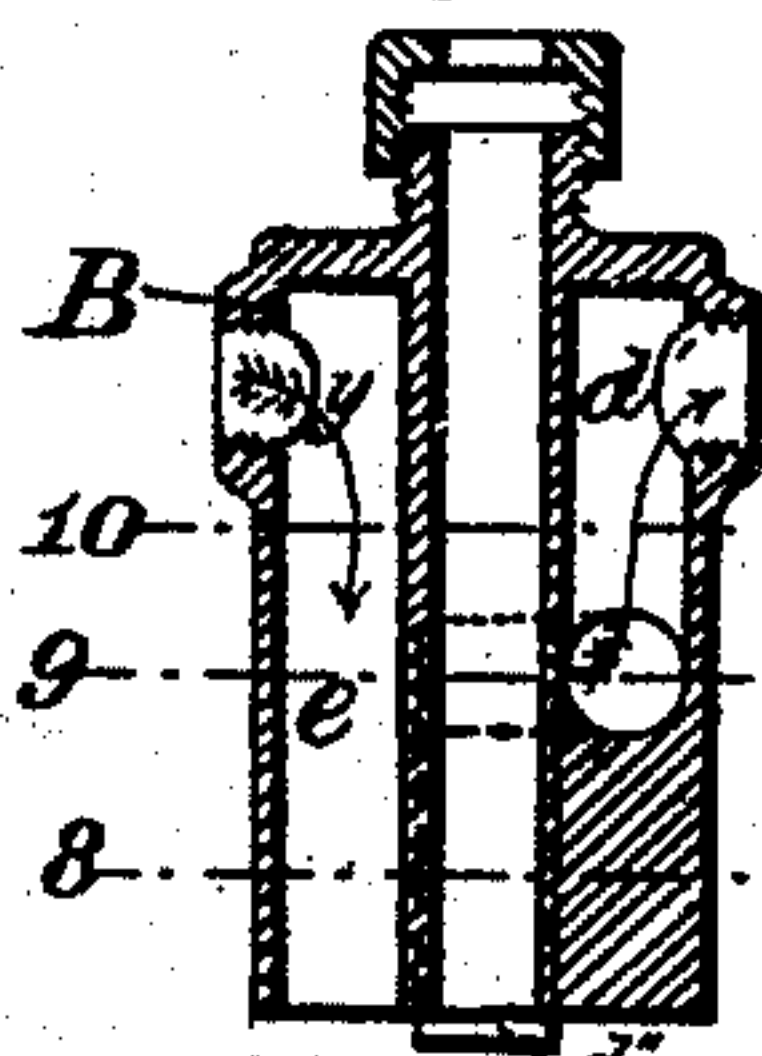


Fig 7

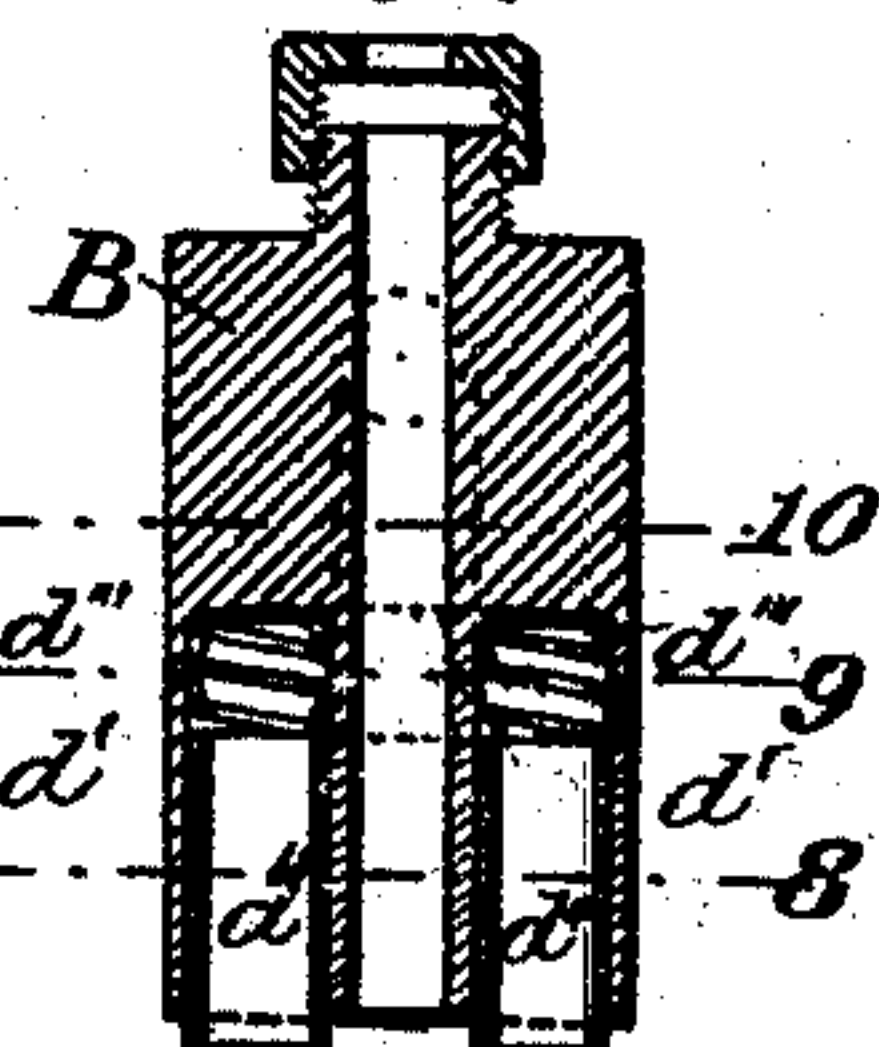


Fig 8

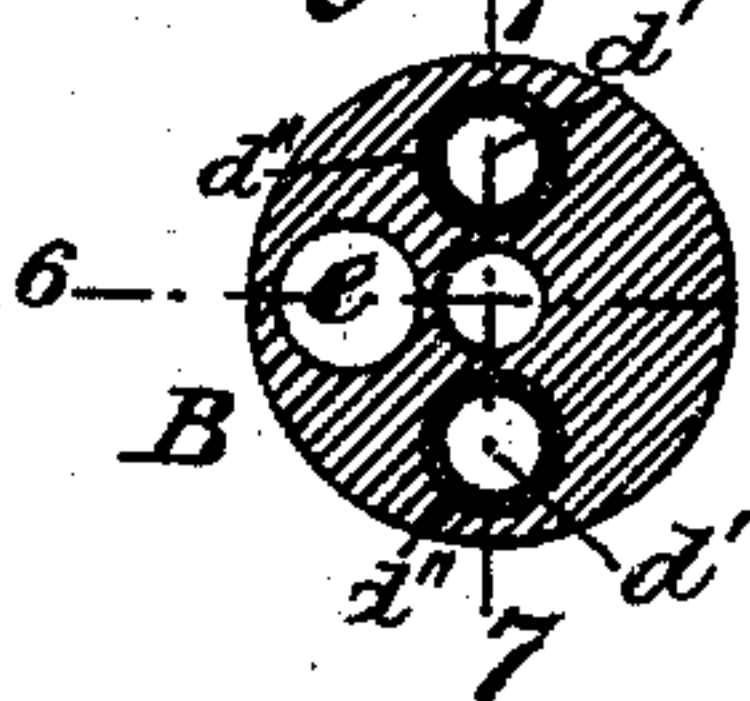


Fig 9

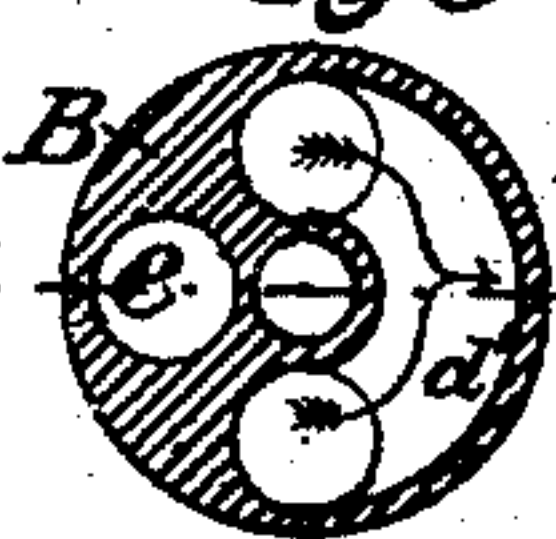


Fig 10



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UNITED STATES PATENT OFFICE.

FRANK. B. ALLEN, OF SALT LAKE CITY, UTAH TERRITORY.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 496,966, dated May 9, 1893.

Application filed October 12, 1891. Serial No. 408,546. (No model.)

To all whom it may concern:

Be it known that I, FRANK. B. ALLEN, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and Territory of Utah, have invented certain Improvements in Rotary Steam-Engines, of which the following is a specification.

My invention relates to improvements in that class of rotary steam engines wherein the steam is admitted to a series of steam cylinders through a central live steam port, said cylinders being arranged in the form of a ring about said steam port with their pistons bearing against an eccentric annular casing, whereby steam admitted to said cylinders in succession serves to force said pistons against said casing and thus cause the ring of pistons to rotate, and the object of my invention is to improve the general construction of such engines, whereby the faults of previous constructions, excessive friction and consequent wear and leakage, are in a great measure obviated.

My invention will be fully described hereinafter and its novel features carefully defined in the claims.

In order that my invention may be the better understood, I have illustrated in the accompanying drawings, a rotary engine of this general character constructed according to my invention, in which—

Figure 1 is a face or front view of the engine, the cover or face plate of the casing being omitted in order to illustrate the parts behind it. Fig. 2 is a cross section of the engine taken at right angles to Fig. 1 and in the plane indicated by line 2—2 in said figure. Fig. 3 is a vertical mid-section of the engine taken at right angles to Fig. 2 and in the plane indicated by line 3—3 in said figure. Fig. 4 is a partial cross section taken substantially in the plane indicated by line 4—4 in Fig. 3, the outer casing being omitted. Fig. 5 is a longitudinal section and end view of the steam cylinder, detached. Figs. 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15 are detached detail views which will be hereinafter referred to.

In the drawings A represents the annular box-like casing of the engine, which casing is provided with a cover section A^x adapted to

be bolted or otherwise secured to the casing A.

B is the steam chest, which is cylindrical in shape and is fixed just above the center of the casing A, as seen in Fig. 1, so that their respective circumferences are eccentric to one another.

C is the rotating ring member or section carrying the several steam cylinders C^x, of which four are shown in the drawings, although the engine may be provided with any suitable number.

c are the pistons within the cylinder C^x, each of said cylinders being cut away at the upper and lower sides as shown in Fig. 5, in order to form guides to guide the piston c in its longitudinal movements.

On each of the pistons c is mounted a pair of wheels or rollers c^x, which rotate upon shafts c'^x, secured to the ends of pistons c. The peripheries of these rollers bear or roll upon the eccentric inner surface of the annular casing A of the engine, and as the piston is forced out by the pressure of the steam admitted to the cylinder behind it, said wheels will roll down around said eccentric surface, turning the rotating member or ring section C in the direction of the arrow α , seen in Fig. 1, as will be readily understood.

To the face or cap plate A^x of the engine casing is secured by means of bolts or the like, a bent or U shaped casting or tie bar A', against which the steam chest abuts at its exposed end, serving to support said steam chest and to counteract the pressure of the steam on the inner end thereof. The supply pipe E, from the steam generator or boiler, passes into the steam chest B, which it taps at a right angle, where it communicates with a passage e, extending lengthwise of said steam chest. The valve D is seated under the inner end of said steam chest and has a bore or passage e^x, co-inciding with the passage e, which passage is of the cross section seen in Figs. 3 and 11, consisting of three connected bores whereby the valve is adapted to admit steam to the cylinders when turned to diametrically opposite positions.

d is the live steam port in the valve D at the upper end of passage e^x, and c' is the port for admitting steam to the cylinder C^x, behind

the piston c , which port is formed partly in the rotating ring section C , and extends through the rear end of the wall of the cylinder C^x , as illustrated in Fig. 3. The cylinder C^x receives
 5 and exhausts steam through the one port c' , as will be hereinafter explained, said port being carried around, as the ring section C rotates, into co-incidence with the exhaust port d^x , in the valve D , which port communicates
 10 through a passage d' , with the exhaust outlet in the steam chest B . This passage d' in the steam chest is branched at its lower end into two bent passages, into the lower straight portions of which branches are fitted slender tubes
 15 d'' , which abut at their upper ends against spiral springs d''' set in the upper ends of the respective branches of passage d' whereby said tubes are kept pressed out with an elastic, yielding pressure below the level of the
 20 lower surface of the steam chest B . The valve D is thus held away from the lower surface of the steam chest B , whereby a steam space is maintained between said valve and steam chest, and a tight joint is maintained between
 25 the exhaust passages in the steam chest and valve by means of said springs, thus avoiding any loss of power due to the escape of live steam into the exhaust passage d' . The passage d' communicates at its upper end with
 30 an exhaust pipe E^x which serves to convey the exhaust steam from the steam chest to the outer air.

I will now describe the operation of the engine, referring more particularly to the first
 35 four figures of the drawings for illustration.

The steam being admitted to the steam chest B from the generator or boiler, and the valve D being open as seen in the drawings, passes through said steam chest and valve in
 40 the direction of the arrows y in Fig. 6, and out through the steam port d therein. Entering the cylinder C^x through the port c' , the steam forces the piston c outward, the wheels or rollers c^x on said piston pressing forcibly
 45 against the eccentric inner surface of the casing. By reason of the eccentricity of this face of the casing, the wheels will roll down around said surface, in the direction of the arrow x in Fig. 1, said rolling movement continuing
 50 until the widest portion of the space between the casing and steam chest shall have been reached. Before this point has been reached, however, the steam will have been cut off from said cylinder by the passage of the port c' ,
 55 around out of co-incidence with and beyond the live steam port d in the valve, thus allowing time for the expansion of the steam within the cylinder, whereby a much greater proportion of its force may be utilized than where
 60 the steam is allowed to entirely fill the cylinder before being cut off. By the time the widest portion of the space between the casing and the ring section will have been reached, the port c' in the cylinder will have
 65 passed around into co-incidence with the exhaust port in the valve, when the exhaust will begin, said exhaust continuing for a half ro-

tation of the ring section C , or until the narrowest portion of the space between the casing and ring section, (that at the top in Fig. 70 1) shall have been reached. By the time the aforesaid cylinder has commenced to exhaust the port c' of the next cylinder C^x in the ring section C will have been brought around into co-incidence with the live steam port d in the valve and steam will enter said cylinder
 75 through said port, forcing the piston out and repeating the operation as before described. Thus it will be seen that one or more of the cylinders in the ring section is always open
 80 to the live steam.

I will now describe the construction and operation of the valve and steam chest, referring more particularly to Figs. 6, 7, 8 to 14, which are details of the steam chest, valve
 85 and valve rod, detached.

The steam chest B is cylindrical in form, being as before stated set eccentrically to the peripheries of casing A , and said steam chest projects out beyond the side of said casing
 90 through face plate A^x , and abuts at its outer end against the bent casting A' , which serves as a stay to prevent said steam chest from being blown or forced out under the pressure of the steam.

S is the shaft of the engine which is set securely in the ring section on that side opposite the steam chest, and said shaft finds a bearing at G in the casing of the engine. The
 100 end of the ring section on the side opposite to shaft S , is rounded off the main portion thereof being square as seen in Figs. 1 and 3, and said rounded portion finds a bearing in the said face plate A^x , wherein it may turn. Between the end of the shaft S and the steam
 105 chest B , sets the valve D , normally pressed down against said shaft and away from the steam chest by the spring tubes $d'' d''$, as will be clearly understood.

D^x is the valve stem which passes through
 110 a longitudinal opening formed for it through the center of the steam chest and valve, and is provided at its inner end with a square head, D' which fits into a corresponding square recess in the valve D formed to receive it. On
 115 its outer end, beyond the steam chest B , this valve rod is provided with an operating or reversing lever, whereby it may be turned by reversing the lever, said square head D' serving to lock the valve to its rod, as will be
 120 clearly understood.

In reversing the engine it is only necessary to give a half turn to this reversing lever, when the live steam port in the valve D will be turned to the position occupied by the exhaust outlet as seen in the drawings. The result of this will be readily observed, the engine will take steam when it should exhaust, and consequently will stop.

I do not wish to limit myself to the precise
 130 construction and arrangement of the parts as herein shown, as these may be varied to some degree without departing materially from the principles of my invention. For example it

is not essential that the casing A should entirely inclose the rotating member C, or that such casing shall be a true circle eccentric to the center of rotation of said rotating member. Indeed, so long as the distance between the periphery or inside surface of said casing from the center of rotation gradually increases, the form and extent of said surface is not essential.

10 Having thus described my invention, I claim—

1. In a rotary engine, the combination with a ring section carrying the steam cylinders and pistons, of a stationary steam chest about 15 which the ring section rotates, and a valve arranged also in the ring section back of the steam chest and independent of the same; substantially as shown and described.

2. In a rotary steam engine the combination 20 with a movable ring section carrying steam cylinders and pistons arranged in the cylinders, of a stationary steam chest, a valve independent of the steam chest and back of the same, and the valve stem having a polygonal 25 head adapted to fit into a correspondingly shaped recess in the face of the valve; substantially as shown and described.

3. In a rotary engine the combination with

a case, of a ring section journaled eccentrically within the case, said ring section having 30 ports, the steam cylinder arranged on the ring section and also provided with ports, the pistons arranged thereon provided with rollers at their outer ends, the stationary valve having inlet and exhaust ports, the stationary 35 steam chest having inlet and exhaust passages, and the spring pressed tubes arranged in the rear end of the steam chest and adapted to bear against the face of the valve; substantially as and for the purposes set forth. 40

4. In a rotary engine, the combination with the steam chest and the ring section mounted rotatively thereon, of the valve D, for governing the admission of steam to the cylinders on said ring section, said valve provided with 45 two connected steam passages, equidistant from the valve center, whereby a certain degree of elasticity is imparted to said valve, as and for the purposes set forth.

In witness whereof I have hereunto signed 50 my name in the presence of two subscribing witnesses.

FRANK. B. ALLEN.

Witnesses:

JOHN D. CAPLINGER,
LEWIS SCHOPPE.