

No. 626,005.

Patented May 30, 1899.

F. J. FETTE.
ENGINE.

(Application filed Apr. 14, 1898.)

(No Model.)

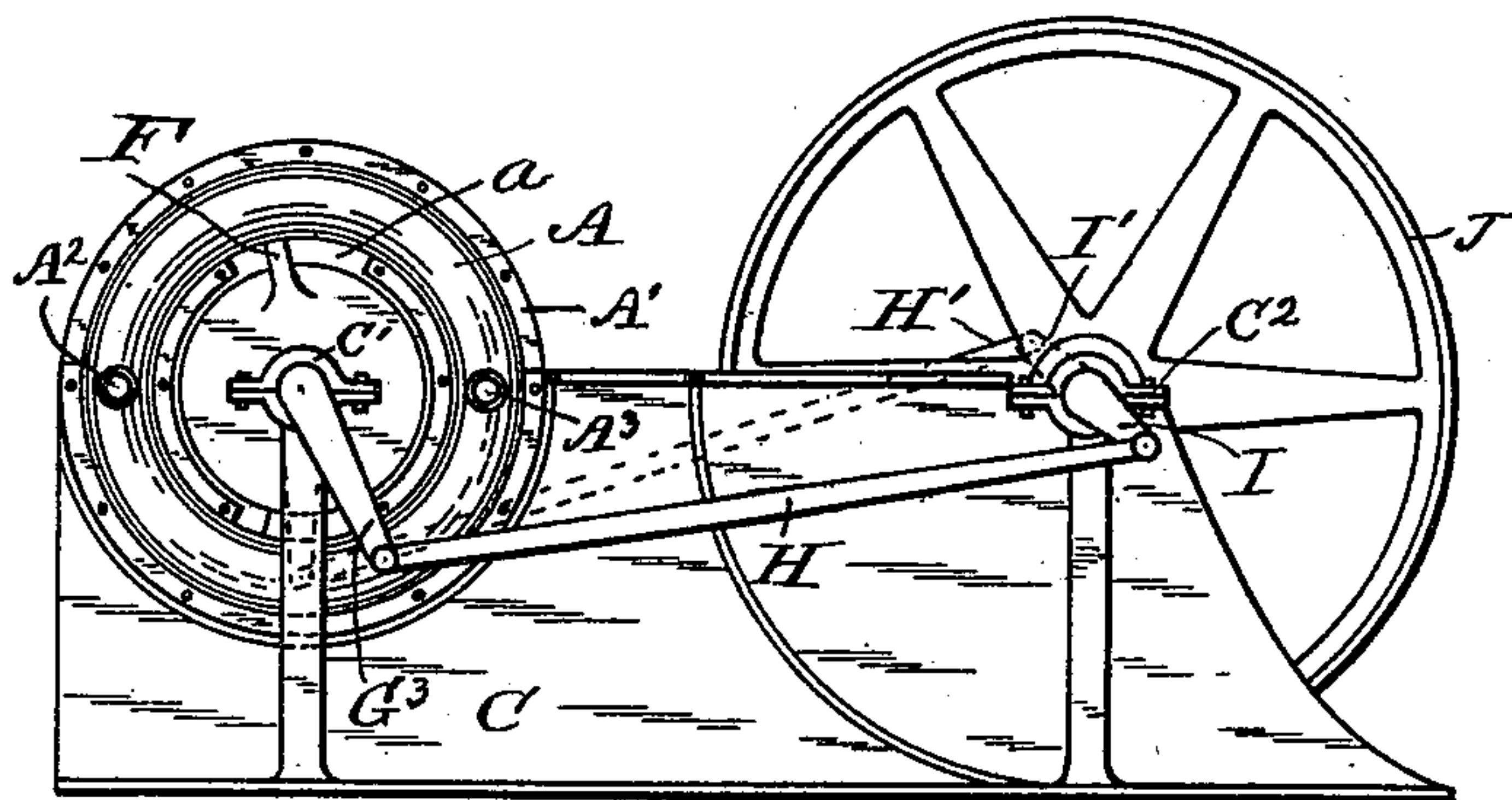


Fig. 1.

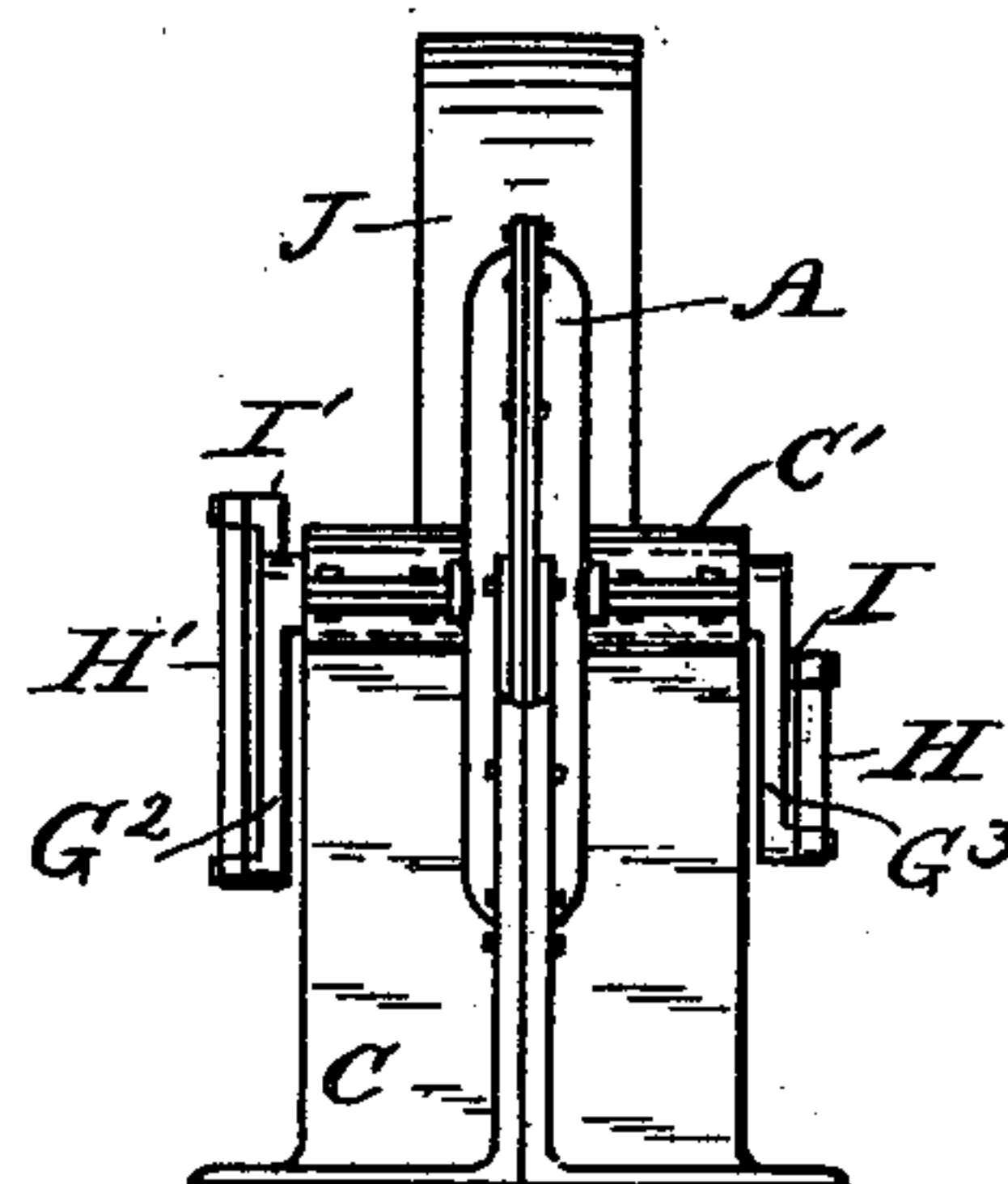


Fig. 2.

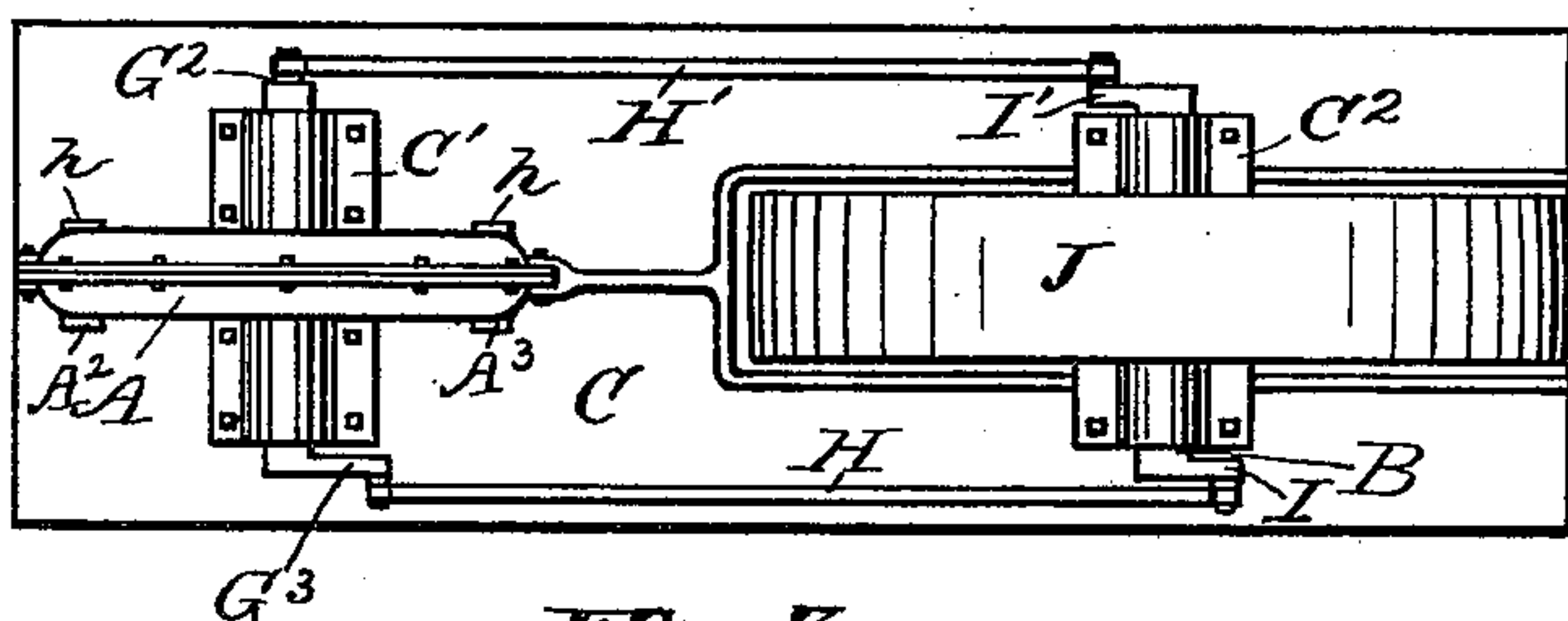


Fig. 3.

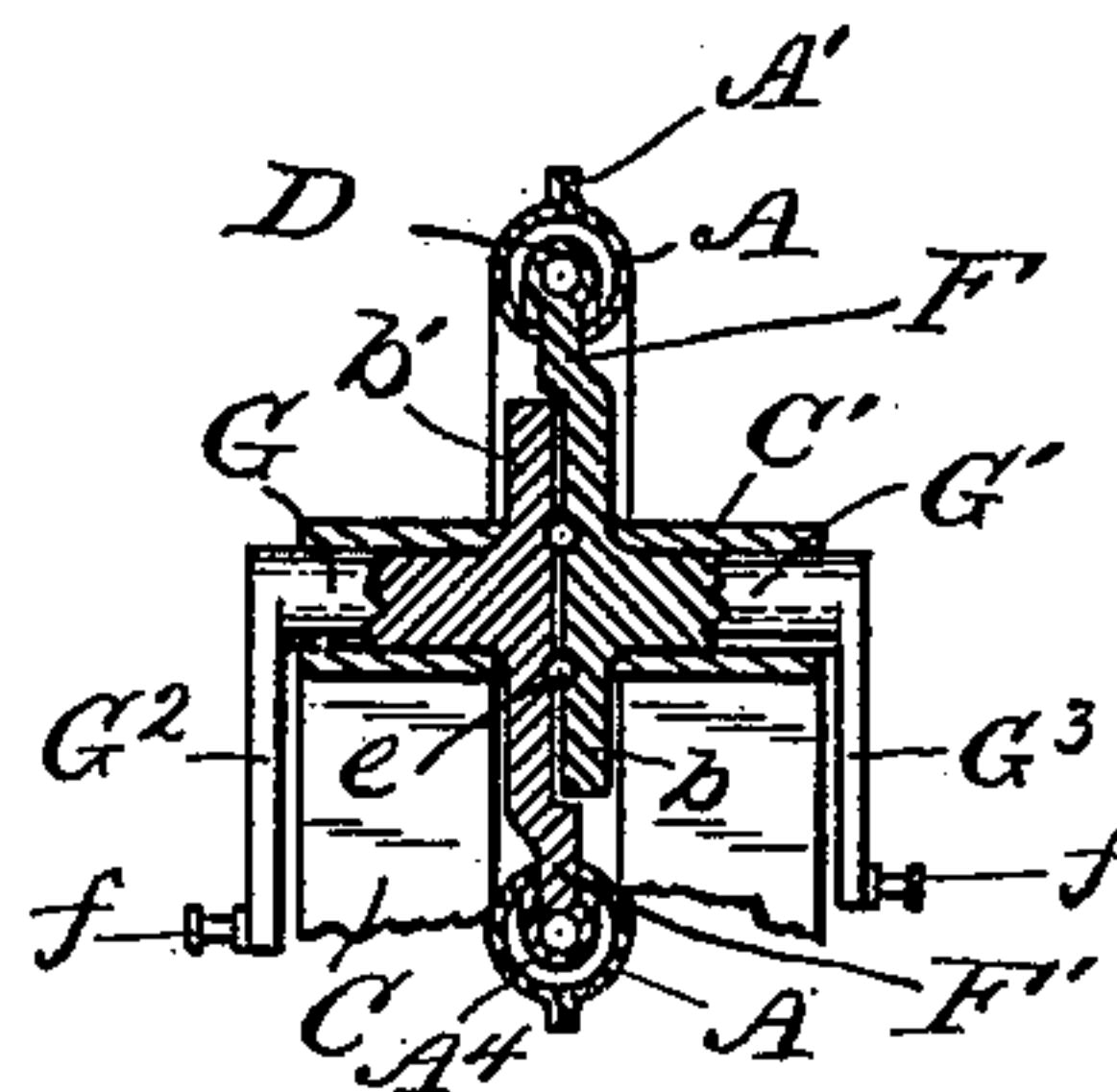


Fig. 4.

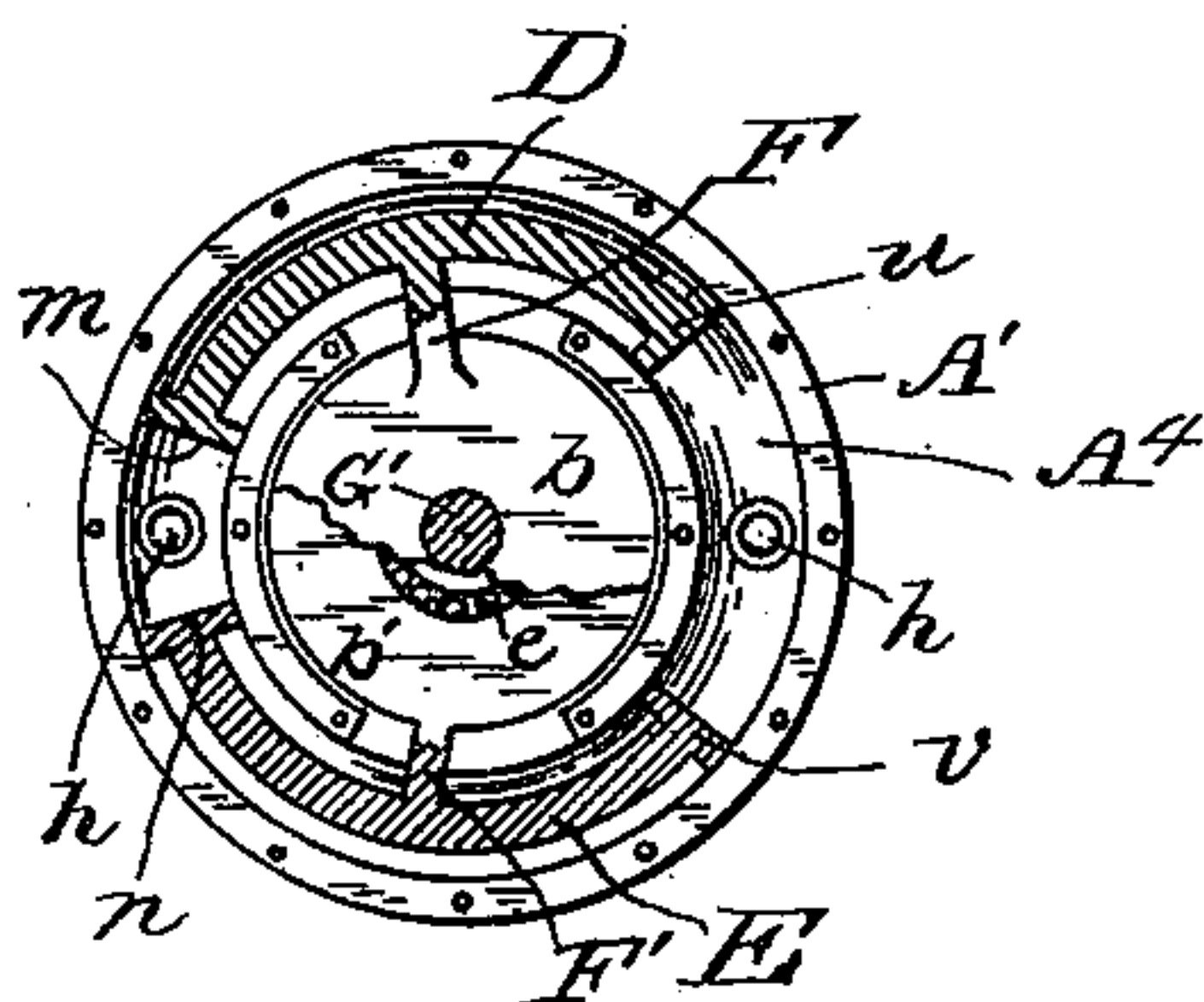


Fig. 5.

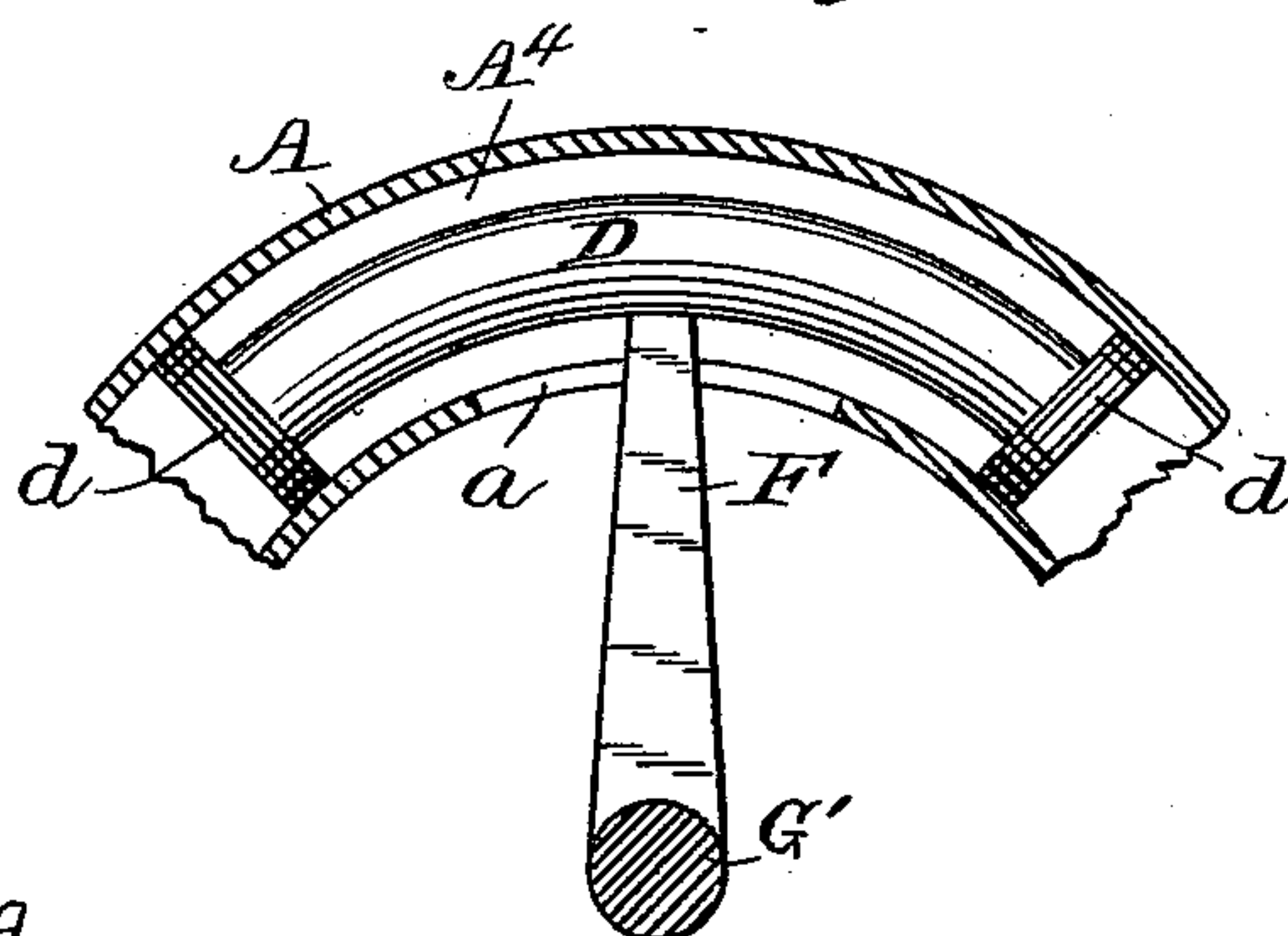


Fig. 6.

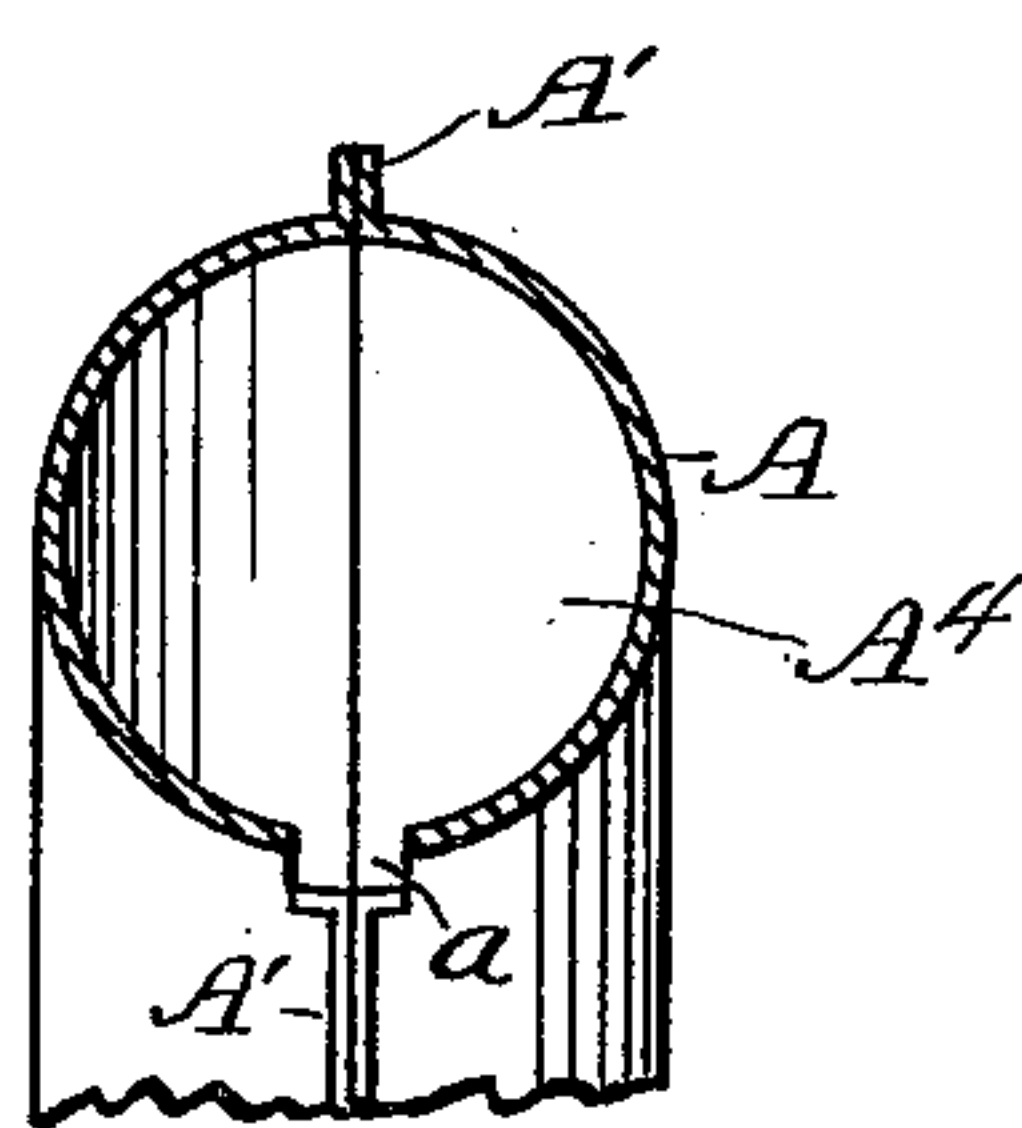


Fig. 7.

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ENGINE.

SPECIFICATION forming part of Letters Patent No. 626,005, dated May 30, 1899.

Application filed April 14, 1898. Serial No. 677,561. (No model.)

To all whom it may concern:

Be it known that I, FRANK J. FETTE, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to that class of engines in which a piston working in a cylinder is acted upon by steam, gas, or fluid pressure to produce motion and power for operating machinery or for other purposes; and it has reference particularly to the power-cylinders, the pistons, and to the means for transmitting power to the rotatory cranks of the main driving-shaft of such engines. It consists in useful improvements in the construction of the cylinder, the pistons, and in the means by which the power is transmitted from the pistons to the driving-shaft and in the parts and combination and arrangement of parts hereinafter more fully described, and pointed out in the claims.

My object is to provide an engine of improved construction which shall utilize the steam or other force to the greatest advantage, and therefore the most economically in producing power, by employing the steam or gas expansively to its maximum practicable limit, thus effecting a great saving in operating expense. This object is attained in my invention, in which the steam entering the cylinder acts upon two pistons and transmits the power to two cranks upon the same shaft, converting reciprocating into rotative motion.

My invention is, furthermore, cheaply constructed and is durable and economical in maintenance.

Referring to the drawings, in which like letters of reference designate the same parts in the several views, Figure 1 represents a side elevation of an engine constructed in accordance with my invention; Fig. 2, an end elevation looking toward the cylinder; Fig. 3,

a top plan view; Fig. 4, a vertical transverse sectional view through the center of the cylinder; Fig. 5, a vertical longitudinal sectional view through the cylinder; Fig. 6, a side view of a piston and its rocking arm and a fragmentary portion of the cylinder in half-section, and Fig. 7 a transverse sectional view of a fragment of the cylinder.

In carrying out my invention I employ such material as may be best suited for the several parts, and I apply any type of valves and valve mechanism as may be desired for controlling the admission of steam or other similar force to the cylinder and releasing it therefrom, as the valves and their operating mechanism which are adapted for steam or gas engines are applicable to my invention with slight modifications in arrangement to conform to the supply and exhaust ports of my cylinder.

The cylinder A is made in the form of an annular tube, the bore A^4 being preferably circular and is continuous throughout the ring, so that a piston working therein travels in a semicircular direction about an axis situated at the center of the ring-shaped cylinder. Thus the pistons have an oscillatory motion considered in connection with their connected arms and axis. The cylinder may be made in any suitable number of sections for convenience in boring and otherwise finishing it, as in two parts, as shown, and provided with flanges A' , by which they are connected by suitable bolts. At opposite points are port-openings A^2 , A^3 , and $h h$, the first two of which may be used both for ingress and egress of steam or gas or for ingress alone, while the two latter may be used for egress, according to the type of valve or valves used. Midway between the ports A^2 A^3 at each side is an opening a in the cylinder, through which the arm F or F' works. A suitable main frame, as C, is preferably cast, adapted either for a horizontal or for a vertical engine, and having suitable bearings, as C' and C². The cylinder is suitably secured rigidly to the main frame, so that the axis about which the pistons D E oscillate is parallel to the axis of the main driving-shaft B of the engine. Suitable covered openings are preferably pro-

vided at or near each port $A^2 A^3$ to gain access to the piston-heads when adjusting the packing.

Two truncated pistons D and E are applied 5 to a cylinder, the two being alike and occupying in their travel the whole bore of the cylinder except a small clearance-space at each port-opening corresponding to the space between a piston and a cylinder-head of the 10 ordinary type of straight-bore cylinder. The length of each piston is determined by the length of the crank on the main driving-shaft and the corresponding length of the bore of the cylinder. Each piston has a curved 15 body portion, preferably hollow, to each end of which is a packed head d , fitting the bore of the cylinder, while the body portion is somewhat smaller. The distance between the two heads is such that each head shall travel 20 from the adjacent admission-port a distance equal to twice the length of the crank on the driving-shaft.

The rocking arms F and F' are alike and are securely attached to a rocking shaft G or 25 G', extending therefrom to the longitudinal center of the pistons, to which they are securely attached, or they may be formed integrally with the pistons, or they may each be attached to a disk web b or b' , the latter being secured to the rocking shafts. Ball-bearings e may be interposed between the disks and suitable adjusting mechanism may be 30 applied to the outer ends of the rocking shafts to compensate for end wear.

35 A rocking arm G^2 of suitable length is firmly secured to the shaft G and a like arm G^3 to the shaft G', each having at the free end a suitable wrist-pin f . These arms, if desired, may be situated at the inner ends of the 40 shafts, the main shaft-cranks being adapted thereto. The shafts G G' are mounted in suitable bearings, as C'. In locating the positions of the arms $G^2 G^3$ radially on their axial shafts and with relation to the pistons the 45 pistons are set in mid-stroke and both arms set so as to project from the axis in the same direction in a line drawn through the center of the axis and the center of the pins f , said line being at a right angle to a line drawn 50 through the center of the pins f and the center of the main driving-shaft B, the cranks I, I' being at the same time set at a right angle to the last-mentioned line, but projecting from their axis in opposite directions. 55 In these positions the length of the connecting-rods H II' is obtained. The cranks and connecting-rods are of the usual form of construction. A suitable balance-wheel J is secured to the main shaft B and may be used 60 as a driving-wheel. It will thus be apparent that the piston D, the arm F, the arm G^3 , and crank I move in unison, while corresponding members at the opposite side of the engine move in unison, the arms G^2 and G^3 having 65 a swinging or reciprocating motion in opposite directions, while the cranks I and I' ro-

tate about their axis. When the crank I is at the dead-center nearest the cylinder and the crank I' at the opposite dead-center, the pistons are at their limit of stroke, the ends 70 u and v in Fig. 5 being adjacent at the port.

In operation let it be assumed that, as shown in Fig. 5, the ends m and n of the pistons are receding in opposite directions, steam having been admitted between them through the ad- 75 jacent port. Thus the same force ordinarily applied to one piston and crank is here applied to two pistons and cranks. At, say, half-stroke the expansion has been double that of the single-piston engine, and consequently of 80 less force against each piston; but this is equalized by reason of the lesser force acting upon two instead of one lever or main crank. To the mechanic, therefore, the advantages 85 will be obvious.

In the foregoing description while I use the term "cylinder" as applied to the member in which the pistons operate, because of the bore therein being continuous and designed to receive but a single charge at the begin- 90 ning of each stroke of the two pistons, it may be considered as a pair of curved cylinders, each having its ends connected to the other, but with a communication between the two, so that the single charge enters both cylinders 95 with equal force at each junction of the two cylinders. Thus the vital function of my invention lies in applying a given force to a plurality of cranks on the same shaft through the medium of a plurality of pistons acted 100 upon by the actuating force, as steam, whereby the power of the given quantity of steam is multiplied. In lieu of the two curved cylinders I may therefore employ two straight-bore parallel cylinders connected by a port 105 at each end and suitable connecting mechanism adapted to operate the cranks described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is— 110

1. In an engine, the combination of the annular cylinder circular in cross-section and having a continuous bore therethrough provided with the two diametrically opposite apertures or armways at the inner periphery 115 and having the two diametrically opposite port-openings arranged at right angles to said armways, the two truncated pistons in said cylinder each having two packed heads, the disks mounted upon rock-shafts and centrally 120 within the circle formed by said cylinder, the arms connecting each a disk with a piston, the ball-bearings between said disks, and the rocking arms on said shafts connecting the pitmen, substantially as shown and described. 125

2. In an engine, the combination of the continuous annular cylinder constructed in sections and having the oppositely-disposed armways communicating therewith and the port-openings situate at right angles to said arm- 130 ways, the truncated pistons, valves and controlling mechanism for said port-openings,

the shafts at opposite sides of said cylinder,
the disks at the inner end of said shafts, the
arms connecting said disks with said pistons,
antifrictional ball or roller bearings between
5 said disks, and the arms at the outer ends of
said shafts connecting the pitmen, substan-
tially as shown and described.

In testimony whereof I affix my signature
in presence of two witnesses.

FRANK J. FETTE.

Witnesses:

WM. H. PAYNE,
AUGUST UHLMANN.