

No. 670,863.

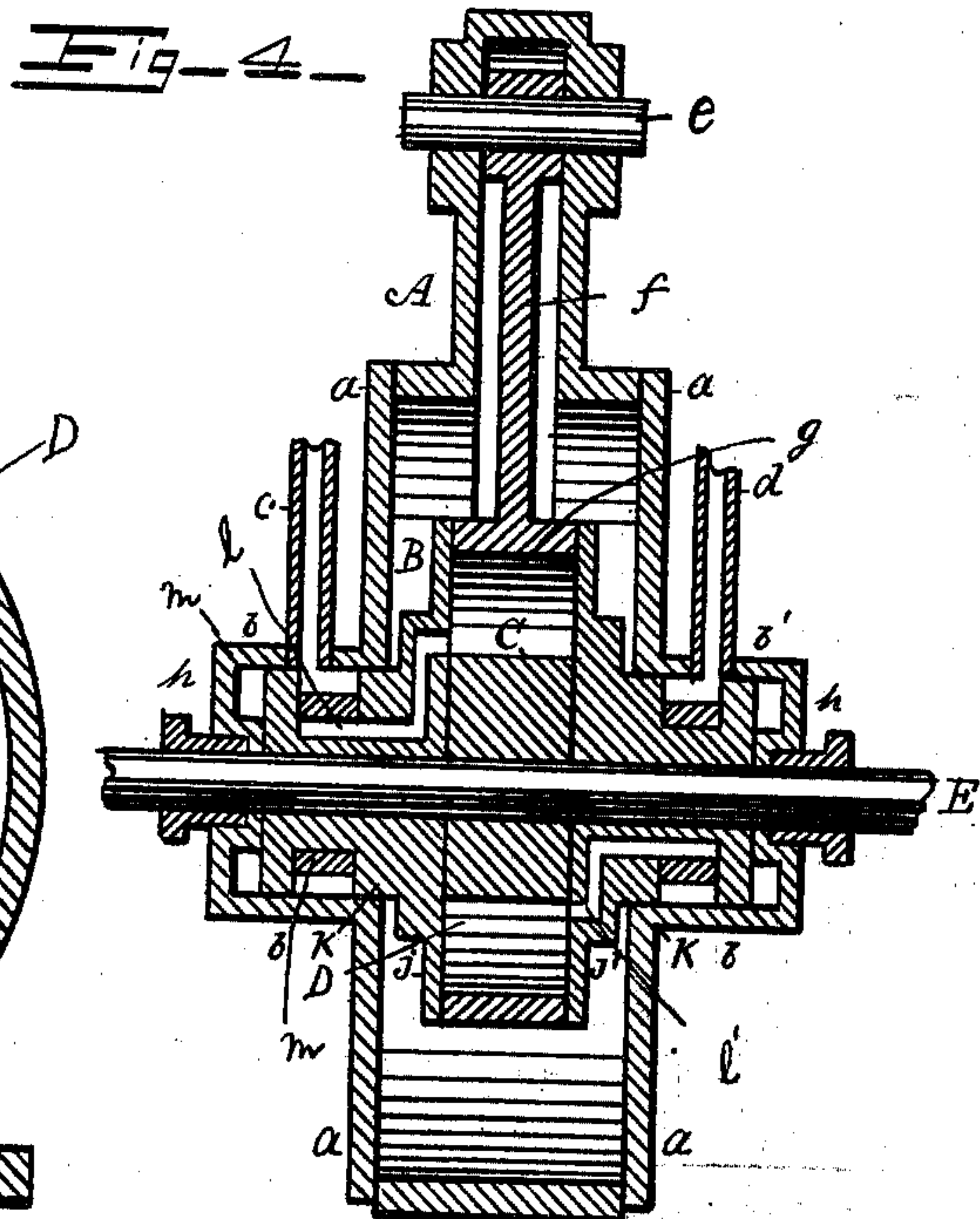
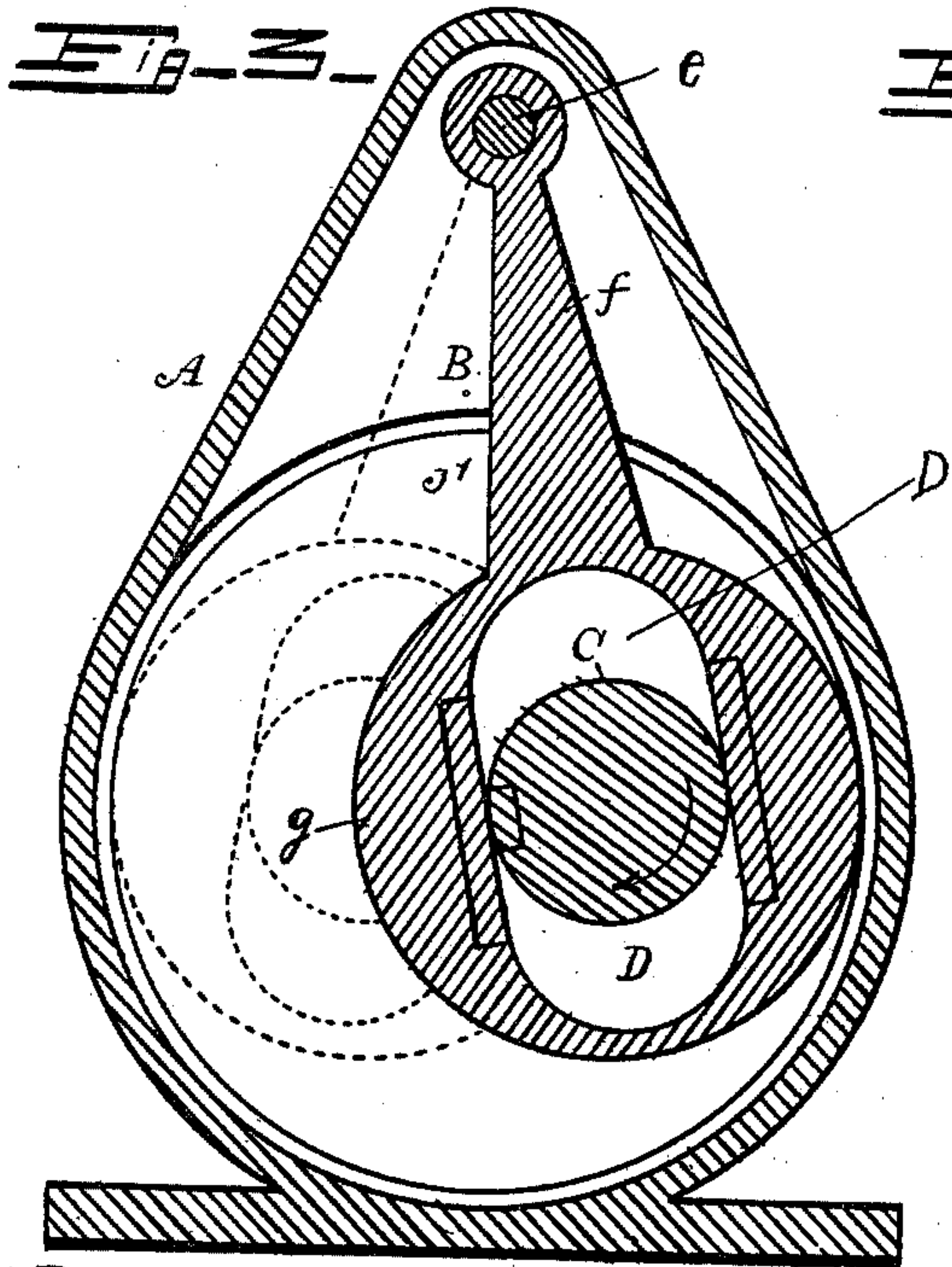
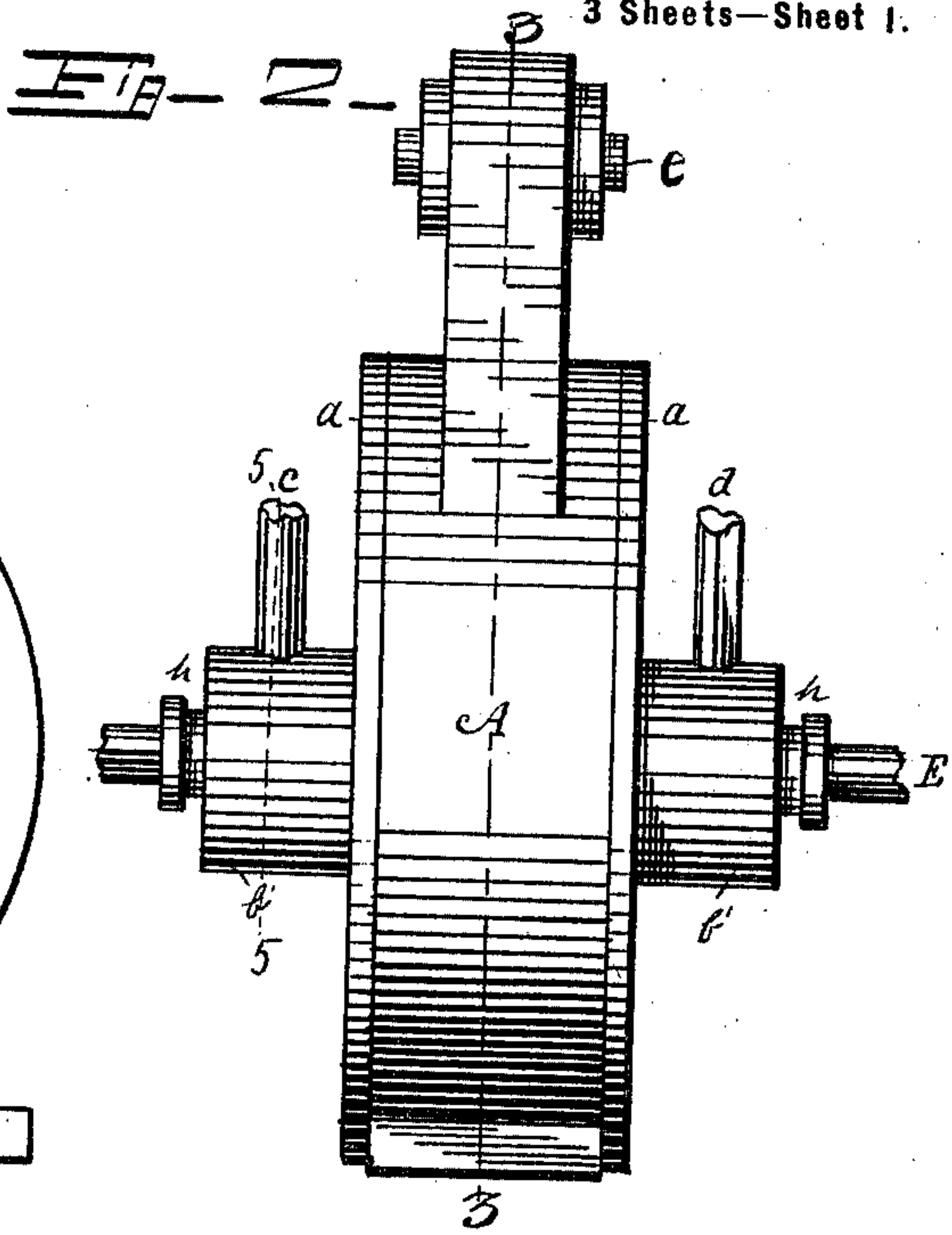
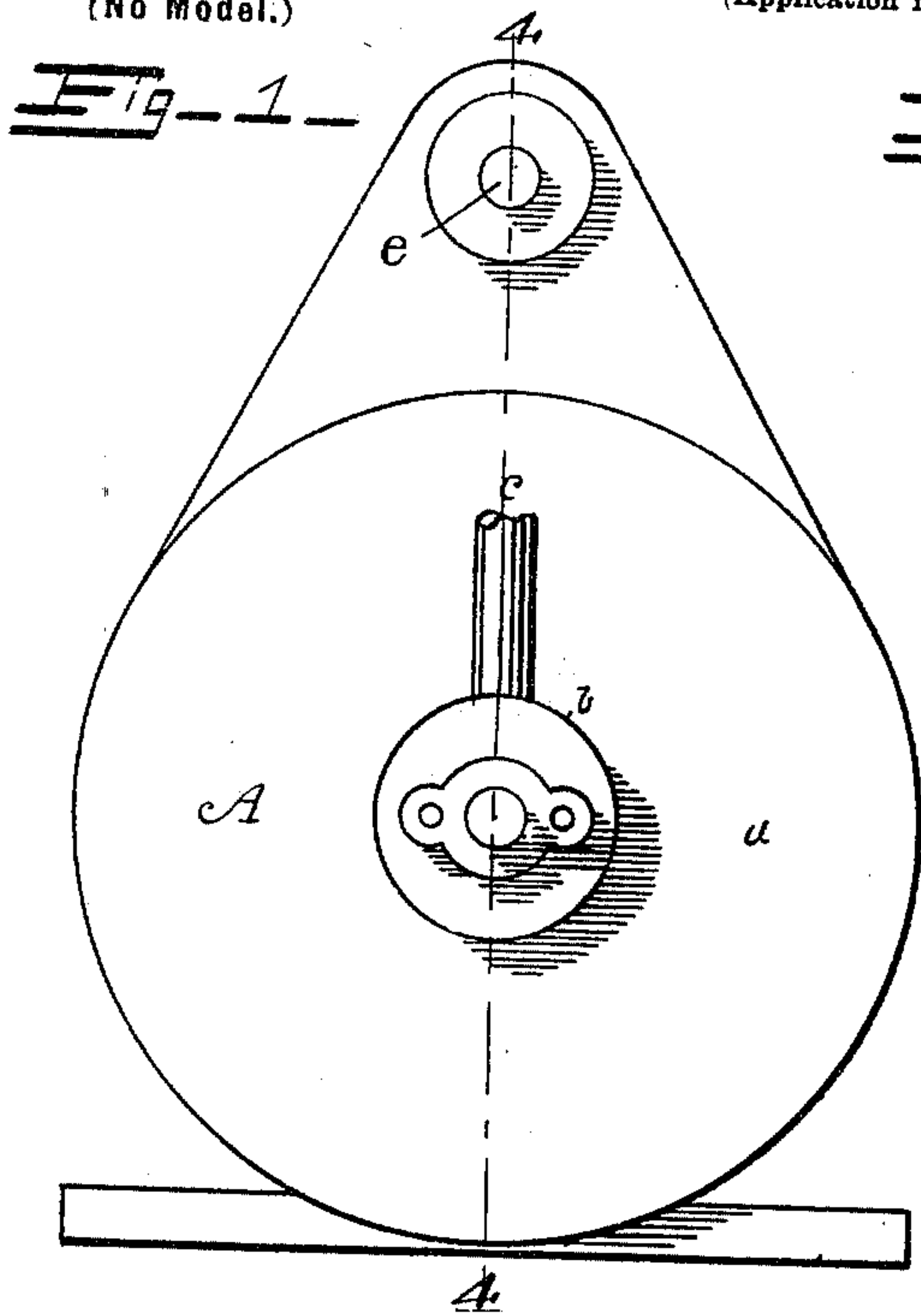
J. W. POWERS.
STEAM ENGINE.

Patented Mar. 26, 1901.

(No Model.)

(Application filed Oct. 4, 1899.)

3 Sheets—Sheet 1.



WITNESSES

Henry McFarlane
Grace E. Smith

INVENTOR

J. W. Powers

No. 670,863.

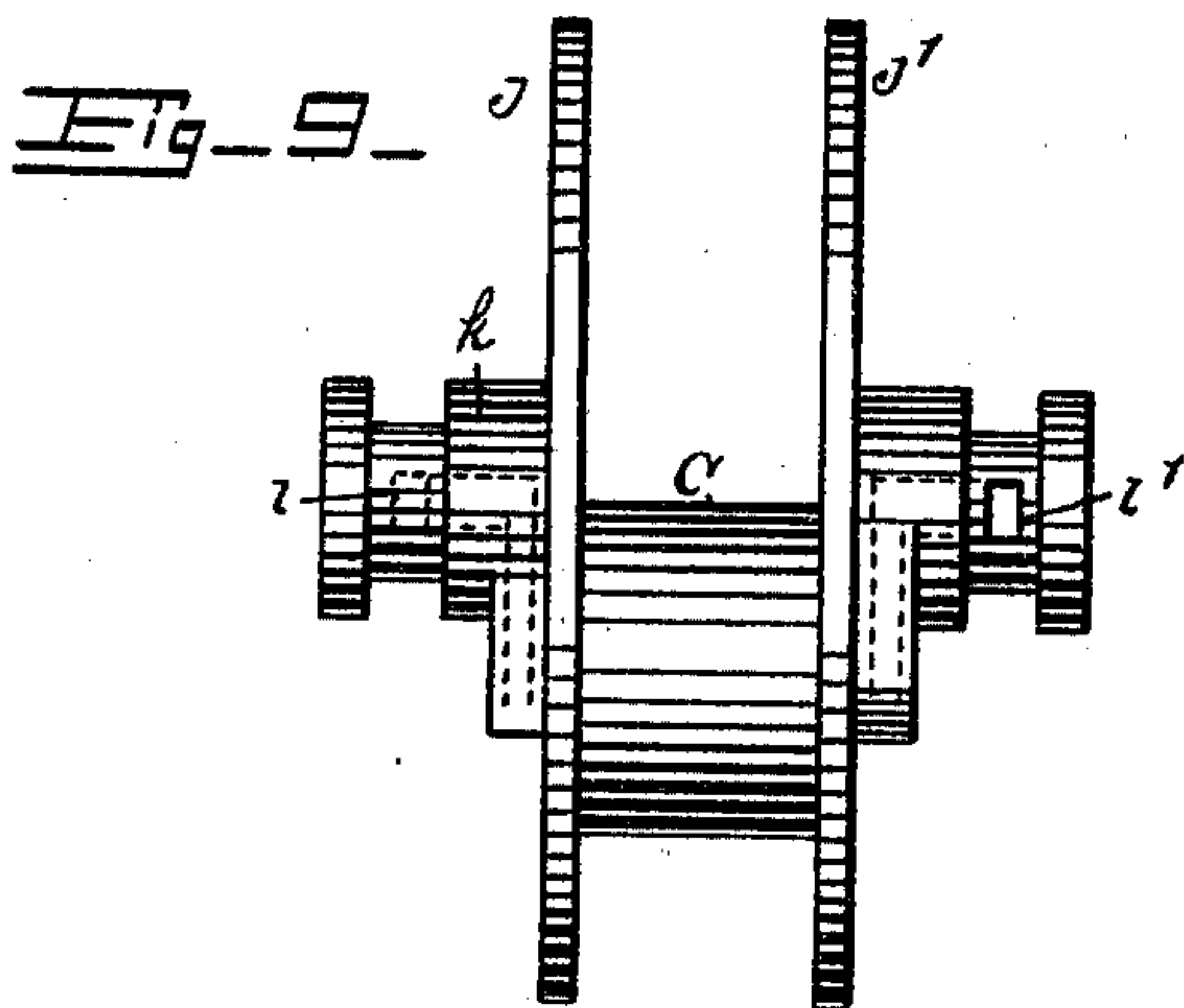
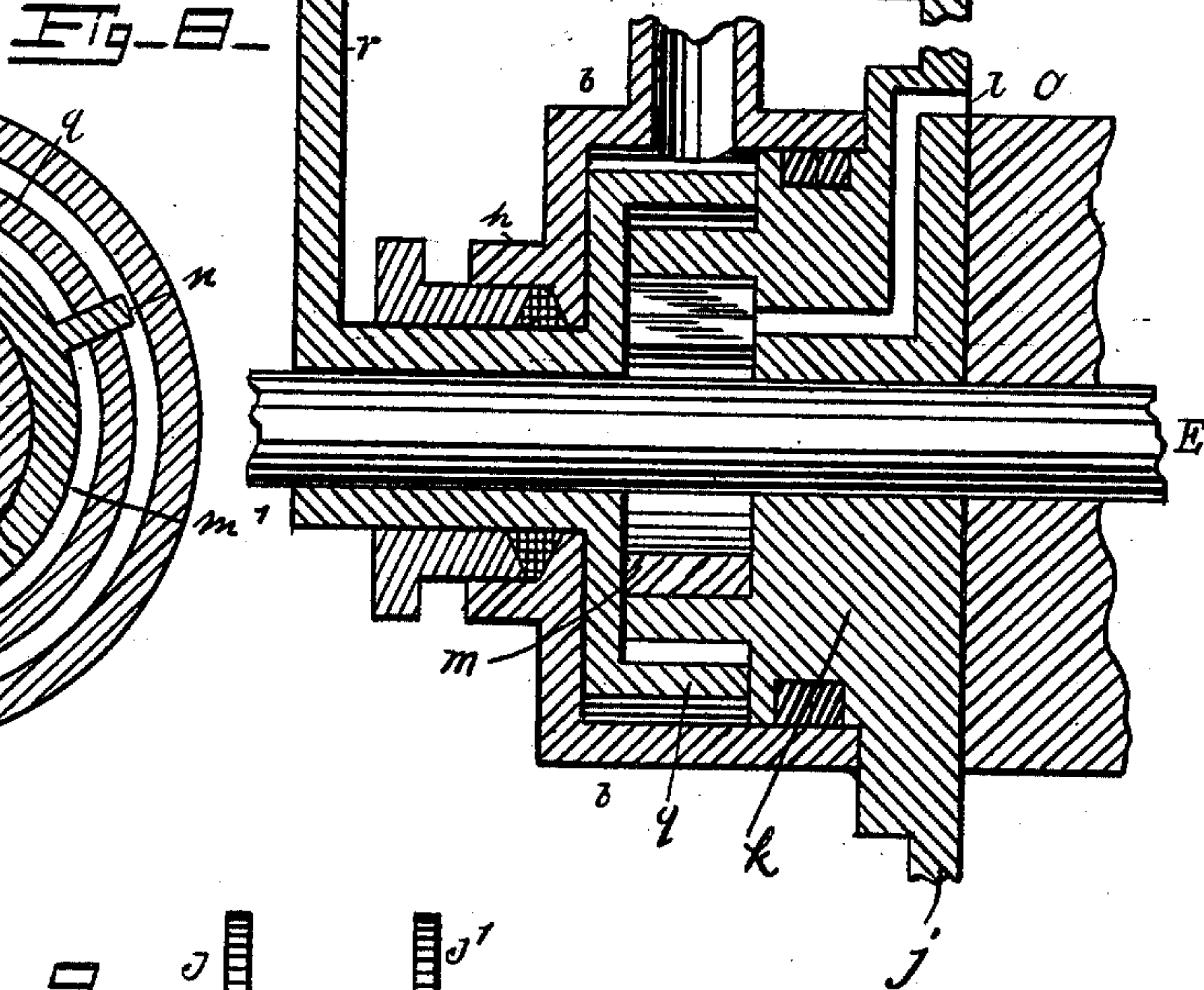
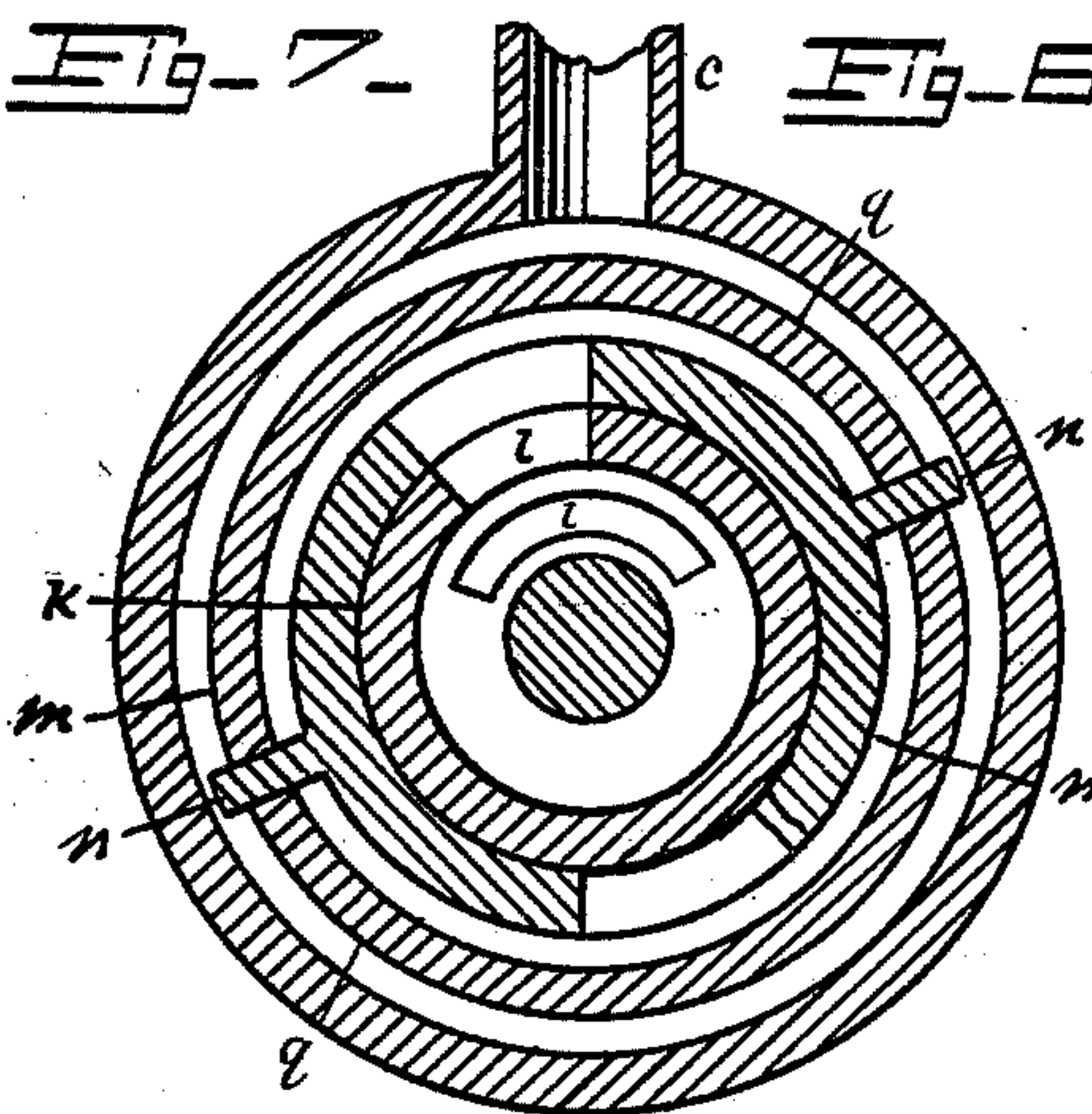
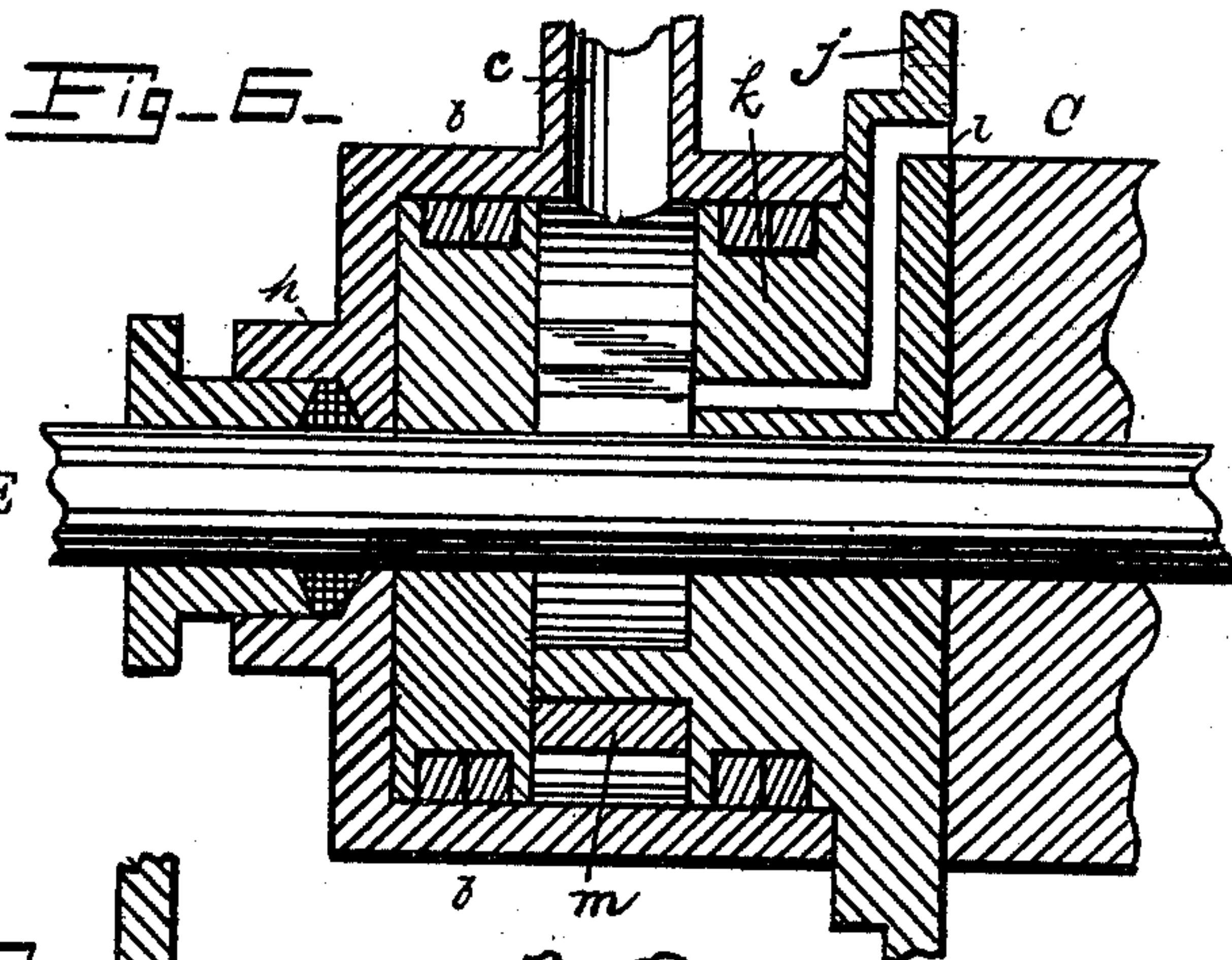
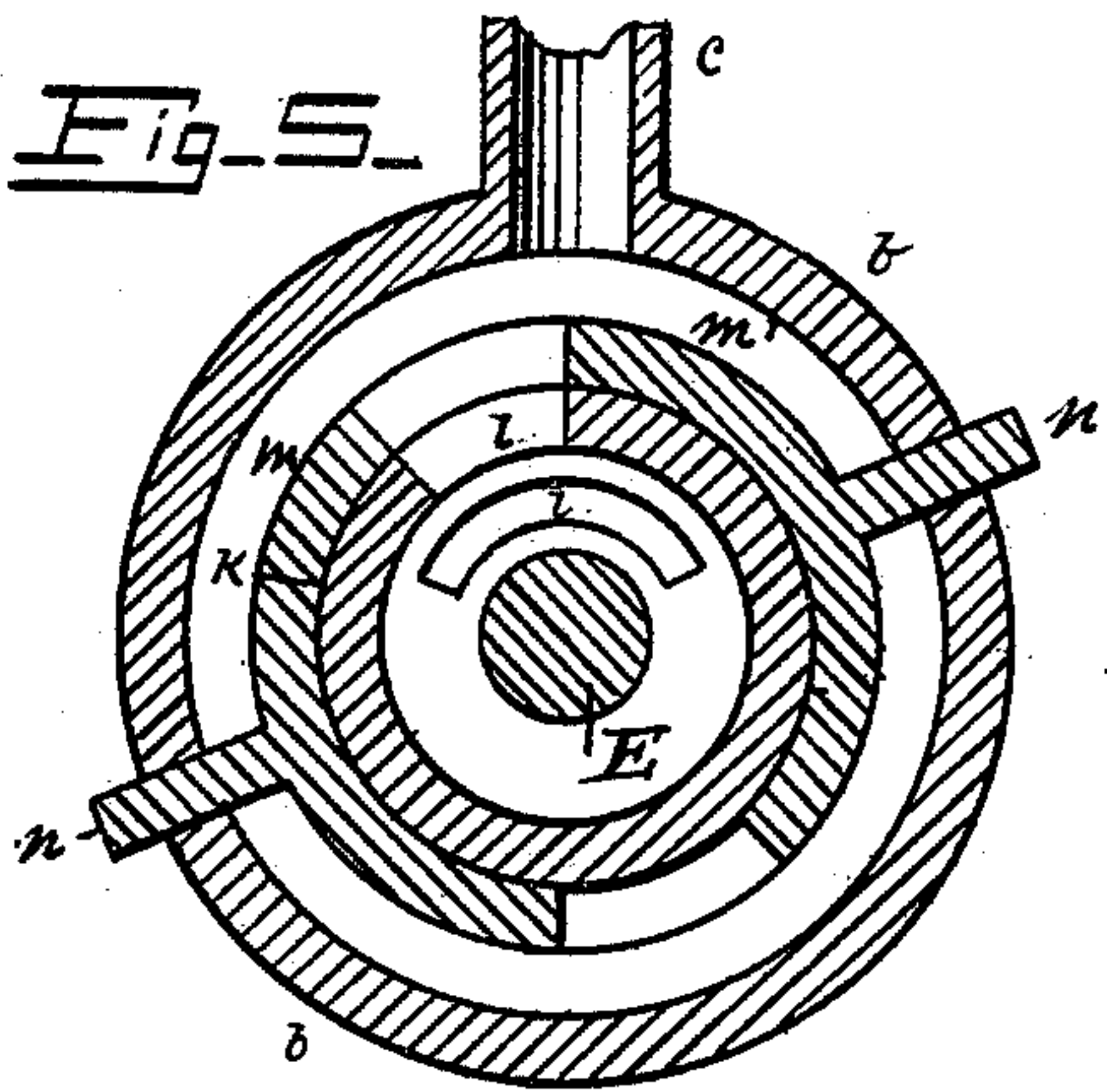
Patented Mar. 26, 1901.

J. W. POWERS.
STEAM ENGINE.

(Application filed Oct. 4, 1899.)

(No Model.)

3 Sheets—Sheet 2.



WITNESSES

Henry McFarman
Grace E. Smith

INVENTOR

J W. Powers

No. 670,863.

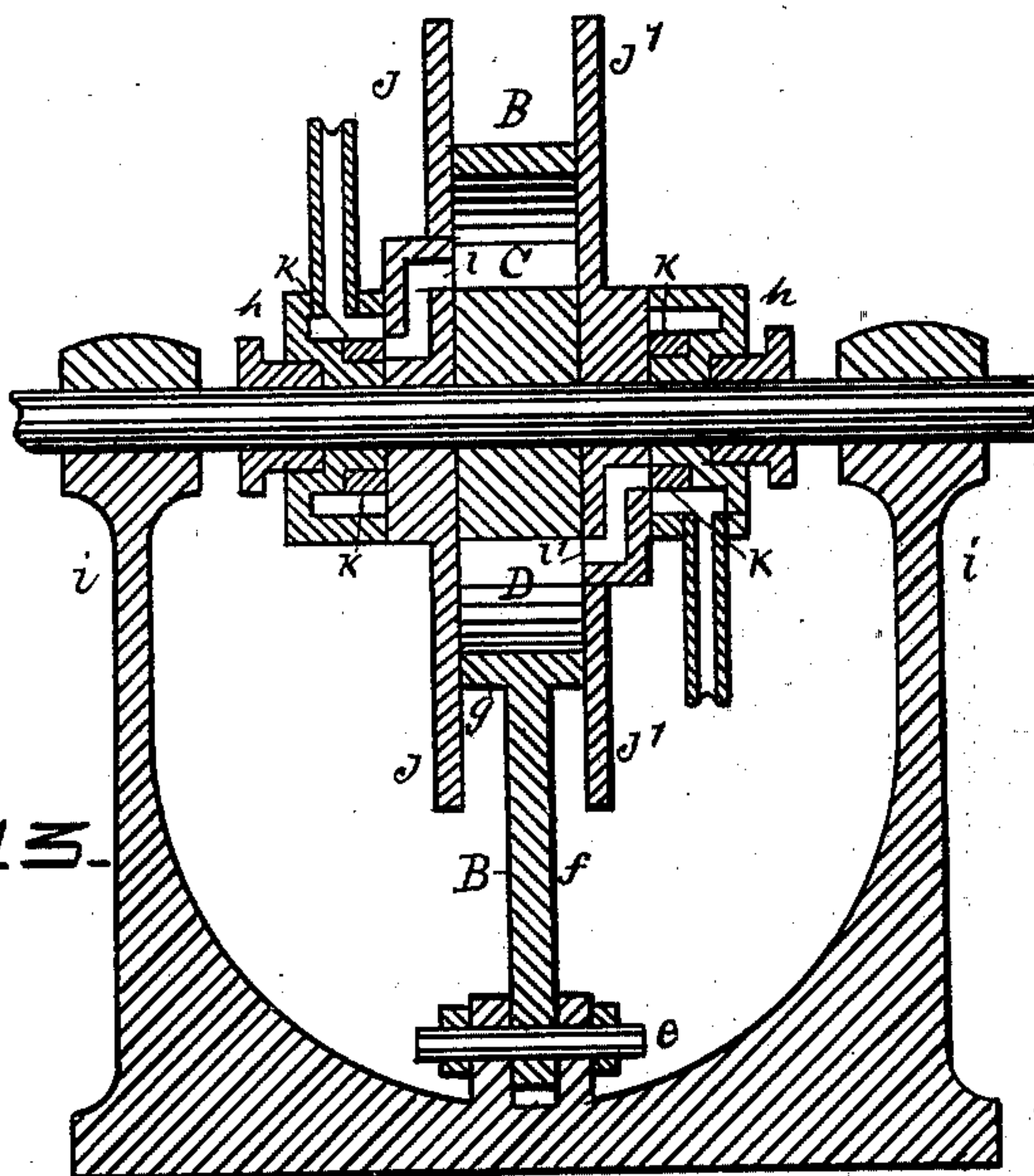
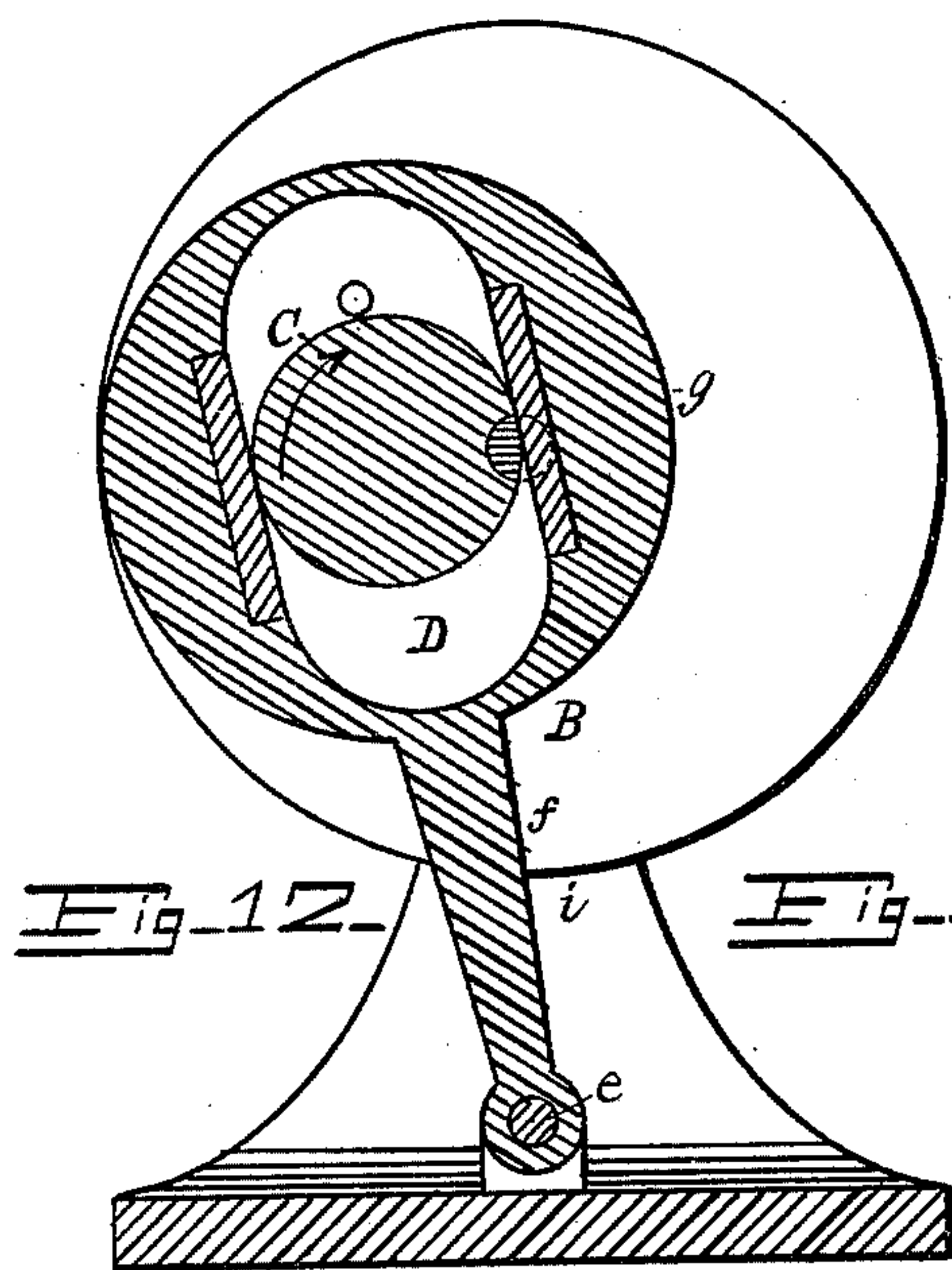
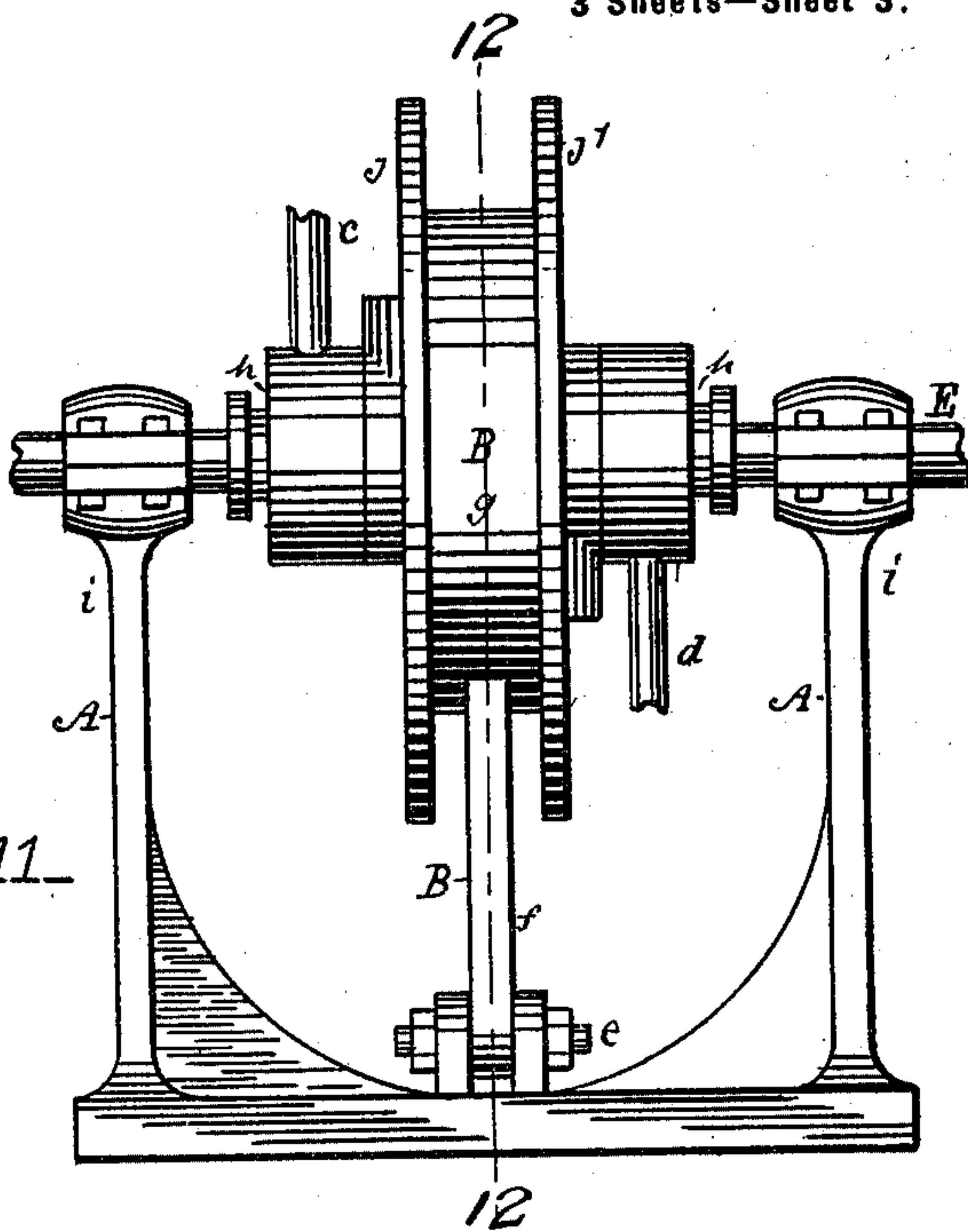
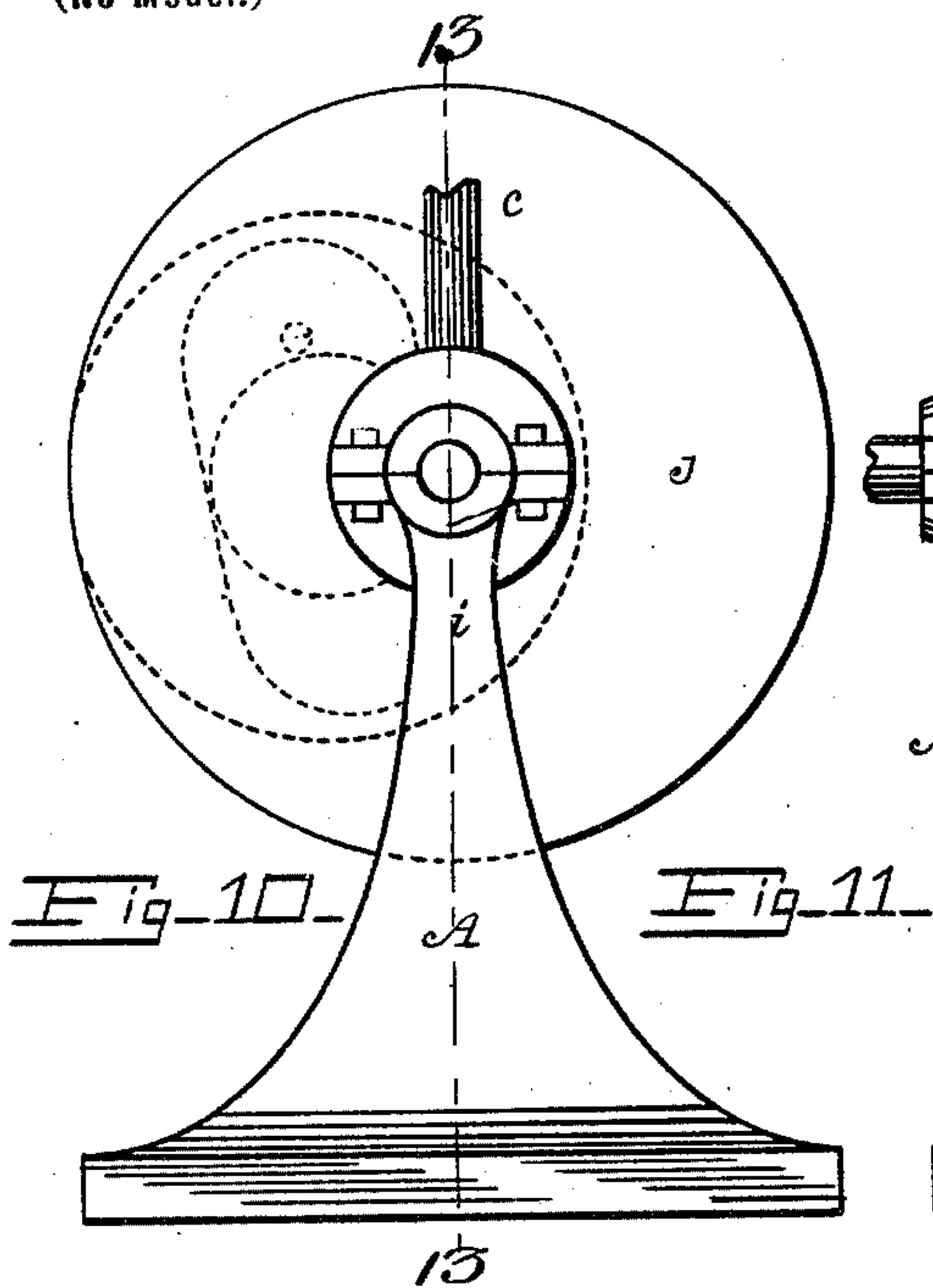
Patented Mar. 26, 1901.

J. W. POWERS.
STEAM ENGINE.

(Application filed Oct. 4, 1899.)

3 Sheets—Sheet 3.

(No Model.)



WITNESSES

Henry McFarnham
Grace E. Smith

INVENTOR

J. W. Powers

UNITED STATES PATENT OFFICE.

JAY W. POWERS, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR TO THE POWER DEVELOPING COMPANY, OF MINNESOTA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 670,863, dated March 26, 1901.

Application filed October 4, 1899. Serial No. 732,579. (No model.)

To all whom it may concern:

Be it known that I, JAY W. POWERS, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented new and useful Improvements in Steam-Engines, of which the following is a full, clear, and exact description, such as will enable those skilled in the art to which my invention belongs to properly construct the same.

My invention relates to steam-engines; and it consists of certain improvements on that form of steam-engine disclosed in Letters Patent of the United States, No. 624,536, granted to me on the 9th day of May, 1899.

The purposes in my present invention are, first, to provide means other than that previously disclosed for conveying live steam to and exhaust-steam from my piston, and, second, to provide means whereby I can cut off the live steam at any predetermined point and use the same expansively.

To these ends my invention consists of a case or frame, a pendulum supported thereby and oscillatory therein, an elliptical chamber within the body portion of the said pendulum, a cylindrical piston rotatable within the said elliptical chamber, and a shaft supported by the said case or frame and affixed to the said piston, substantially as shown in the accompanying drawings and more fully described in the following specification.

In the drawings, Figure 1 is a side elevation of my invention; Fig. 2, an end view thereof; Fig. 3, a section of Fig. 2, taken on the line 3 3; Fig. 4, a section of Fig. 1, taken on the line 4 4; Fig. 5, a section of a portion of Fig. 2, taken on the line 5 5; Fig. 6, a section of a portion of Fig. 1, taken on the line 4 4; Fig. 7, the same as Fig. 5, but showing cross-section of valve-adjusting mechanism; Fig. 8, the same as Fig. 6, but showing longitudinal section of adjusting mechanism; Fig. 9, a longitudinal elevation of the piston, flanges, and shaft detached; Fig. 10, a side elevation of a modified construction; Fig. 11, an end view of the same; Fig. 12, a section of Fig. 11, taken on the line 12 12; and Fig. 13, a section of Fig. 10, taken on the line 13 13. Similar letters refer to similar parts throughout the several views.

A is the case or frame; B, the pendulum; C, the piston; D, the elliptical chamber, and E the shaft.

The case or frame A may be closed, as shown in Figs. 1, 2, 3, and 4, or it may be open, as shown in Figs. 10, 11, 12, and 13. In either case it is designed to support the pendulum B and the shaft E. Its heads *a a* (when the case is closed) are provided with steam-chests *b* and *b'*. Into the former is affixed a supply-pipe *c*, which serves to convey live steam thereto, and into the latter is affixed an exhaust-pipe *d*, which serves to convey the exhaust-steam therefrom.

The pendulum B is supported by and oscillates within the case or frame A, being suspended from or supported by the pivot *e*. It consists of a shaft portion *f* and a body portion *g*. Within this body portion *g* is the elliptical opening or chamber D, within which the piston C rotates. The proportion of this elliptical chamber D is an important feature of my invention and is as follows: Its major (vertical) diameter is double that of its minor (horizontal) diameter, while its depth is equal to that of the body portion *g* of the pendulum B.

The piston C consists of a short cylindrical body having parallel ends. Its proportions are as follows: Its diameter is equal to the minor diameter of the elliptical chamber D and its length is equal to the depth of the same.

The shaft E is let into the periphery of the piston C to one-half its diameter and the half extending beyond the peripheral line cut away, thus making the piston wholly eccentric, or, in other words, making its eccentricity equal to its diameter, as shown in Fig. 9. This shaft may revolve in boxes *h*, affixed to the heads *a a*, as shown in Figs. 1, 2, 3, 4, 6, and 8, in pillow-blocks *i*, as shown in Figs. 10, 11, 12, and 13, or in both boxes and pillow-blocks.

Mounted upon the shaft E and affixed to the parallel sides of the piston C are the flanges *j* and *j'*, which form the side walls of the elliptical chamber D. One of these flanges, *j*, is provided with an outwardly-extending hub *k*, which serves as a revoluble valve-seat, as will hereinafter be set forth. An in-

gress-port l extends radially inward from the periphery of the hub k , thence laterally therein, thence radially outward within the flanges j , and thence laterally, terminating in the elliptical chamber D, just beyond the periphery of the piston C, and serves to convey live steam to the elliptical chamber. An exhaust-port l' extends laterally from the periphery of the piston C into the flange j' , thence radially inward therein, and thence laterally, terminating in the steam-chest b' , and serves to convey the exhaust-steam from the elliptical chamber.

Concave valves m and m' are chambered within or are incased by the steam-chest b , their concave faces fitting to the periphery of the hub or revolving valve-seat k , and serve to alternately open and close the ingress-port l . They are held in place by means of guide-pins n .

The operation of my engine is as follows: Live steam being admitted through the supply-pipe c enters the steam-chest b , the ingress-port l , (now open,) and the upper end of the elliptical chamber D, expands therein, and drives the rotary piston C around in the direction indicated by the arrow, to the bottom of the elliptical chamber D. Now this rotary movement of the piston C also rotates the flanges j and j' , affixed thereto, and with them the shaft E to which they in turn are affixed, and in so doing carry the ingress-port l in the hub or valve-seat k under the concave valve m , thus shutting off the live steam before the piston C has completed its stroke, or reached the lower end of the elliptical chamber D. While the rotary piston C is thus being impelled by live steam in the upper end of the elliptical chamber D, the exhaust-steam in its lower end escapes through the exhaust-port l' , extending through the flange j' , and the exhaust-pipe d . Now this semirotation of the piston C, flanges j , and shaft E brings the ingress-port l between the valves m and m' , thereby opening it, when more of the live steam will enter the lower end of the elliptical chamber D and drive the piston C still farther around in the direction of the arrow to the top of the elliptical chamber D. Now this continued rotation of the piston C carries the ingress-port l in the hub or valve-seat k under the concave valve m' , thus again shutting off the live steam before the piston C has completed its stroke or reached the upper end of the elliptical chamber D. While the rotary piston C is thus being impelled by the live steam in the lower end of the elliptical chamber D the exhaust-steam in its upper end escapes, as before, through the exhaust-port l' and the exhaust-pipe d . It will be seen that the rotation of the piston C is continuous in one direction, that in its rotations it oscillates the pendulum B, thereby holding the opposite parallel walls of the elliptical chamber D therein in constant contact therewith, and that it alternately enters, fills, and recedes from opposite ends of the

said elliptical chamber D, thereby forming at each revolution of the shaft E two crescent-shaped pockets, wherein the steam expands, exerting its force from the elliptical wall and against the rotary piston.

I provide improvements for changing the positions of the valves m and m' , so that the points in the revolution of the piston and its appurtenant parts at which the steam is cut off from the chamber D, may be varied. These improvements are shown in Figs. 7 and 8 and consist of a cage or ring q , within which the guide-pins n of the valves are seated, and a lever or arm r , by which the cage or ring may be adjusted.

In the modification shown in Figs. 10, 11, 12, and 13 I substitute an open frame for the closed case A, supporting my shaft upon pillow-blocks i and supporting my pendulum from below in an inverted position. In this construction the steam-chests to which the supply-pipe leads and from which the exhaust-pipe extends are held rigid by being affixed to the pillow-blocks. Its operation is the same as that of the construction above described.

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

1. In a steam-engine of the type herein shown, the combination of the case or frame; an elliptically-chambered pendulum supported thereby and oscillating therein; a shaft supported by said case or frame, and passing through said elliptical chamber; a cylindrical piston, eccentrically mounted upon the said shaft, and rotatable within the said elliptical chamber; flanged heads mounted upon the said shaft and affixed to the said piston, and means for admitting live steam to, and exhaust-steam from, the said elliptical chamber, substantially as shown and described.

2. In a steam-engine of the type herein shown, the combination of a case or frame; an elliptical chamber oscillating therein; a shaft supported by said case or frame, and passing through the said elliptical chamber; an eccentric piston mounted upon the said shaft; flanges affixed to the said piston and covering the parallel sides of the said elliptical chamber, and means for conveying live steam to, and exhaust-steam from, the said elliptical chamber, substantially as shown and described.

3. In a steam-engine of the type herein shown, the combination of the case or frame, provided with steam-chests; the elliptical chamber oscillating therein; an eccentrically-mounted piston rotating within the said elliptical chamber; a revoluble valve-seat having supply-ports; valves chambered within said steam-chests; a valve-cage also chambered within the said steam-chests outside the said valve-seat, said valve-cage having an adjusting-lever affixed thereto; valves affixed in said cage, said valves being adapted to cover the supply-ports in said valve-seat; a supply-pipe

leading to, and an exhaust-pipe extending from, the said steam-chests, substantially as shown and described.

4. In a steam-engine, the combination of an
5 outer case having parallel heads, said heads
being provided respectively with supply and
exhaust steam pockets, an elliptically-cham-
bered case supported by and oscillating with-
in the said outer case, a shaft journaled in
10 said heads and extending through the said os-
cillating case, a cylindrical piston eccentric-
ally mounted upon the said shaft and rotata-
ble within the said elliptical chamber, flange
members upon the shaft rotatable with said
15 piston, a supply-port leading from the sup-
ply-steam pocket in the case-head to the el-
liptical chamber on one side of the piston, and
in its course passing through one flange mem-
ber, and an exhaust-port leading from the ex-
20 haust-pocket to the elliptical chamber on the
other side of the piston, and in its course pass-
ing through the other flange member, substan-
tially as set forth.

5. In a steam-engine of the type herein
25 shown, the combination of a case or frame; an
elliptically-chambered pendulum having par-
allel sides supported thereby and oscillatory
therein; a shaft supported by and revoluble

in the said case or frame; a cylindrical pis-
ton eccentrically affixed on said shaft and rev- 30
oluble within the said elliptical chamber;
flanges mounted upon the said shaft covering
the parallel sides of the said pendulum and
the parallel ends of the said piston; and means
for conveying live steam to and exhaust-steam 35
from the said elliptical chamber substantially
as shown and described.

6. In a steam-engine of the type herein
shown, the combination of the case or frame,
an elliptical chambered pendulum supported 40
thereby and oscillating therein, a shaft sup-
ported by and revoluble in the said case or
frame, a cylindrical piston eccentrically af-
fixed to said shaft and rotatable within the
said elliptical chambered pendulum, flanges 45
mounted on said shaft and covering parallel
sides of the pendulum, said flanges being pro-
vided with ports and passages adapted to con-
vey live steam and exhaust-steam from the
said elliptical chamber, substantially as set 50
forth.

JAY W. POWERS.

In presence of—
H. M. FARNAM,
G. E. SMITH.