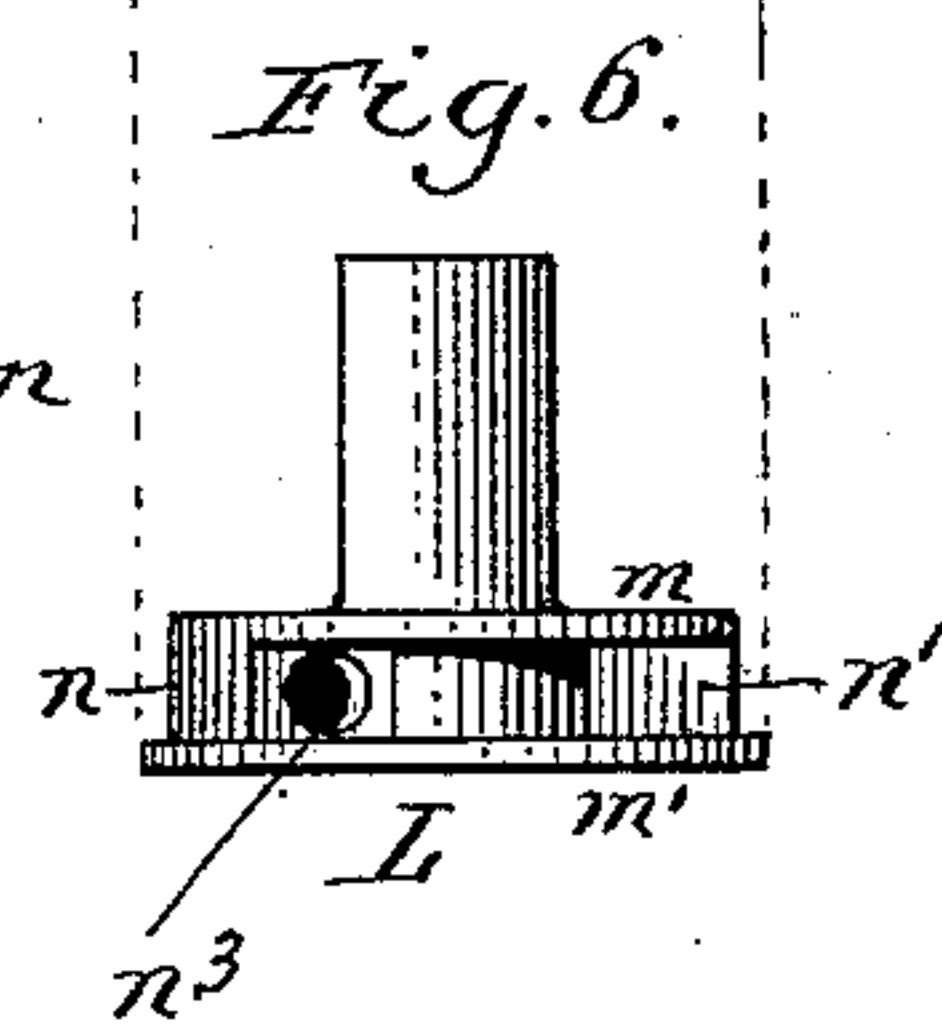
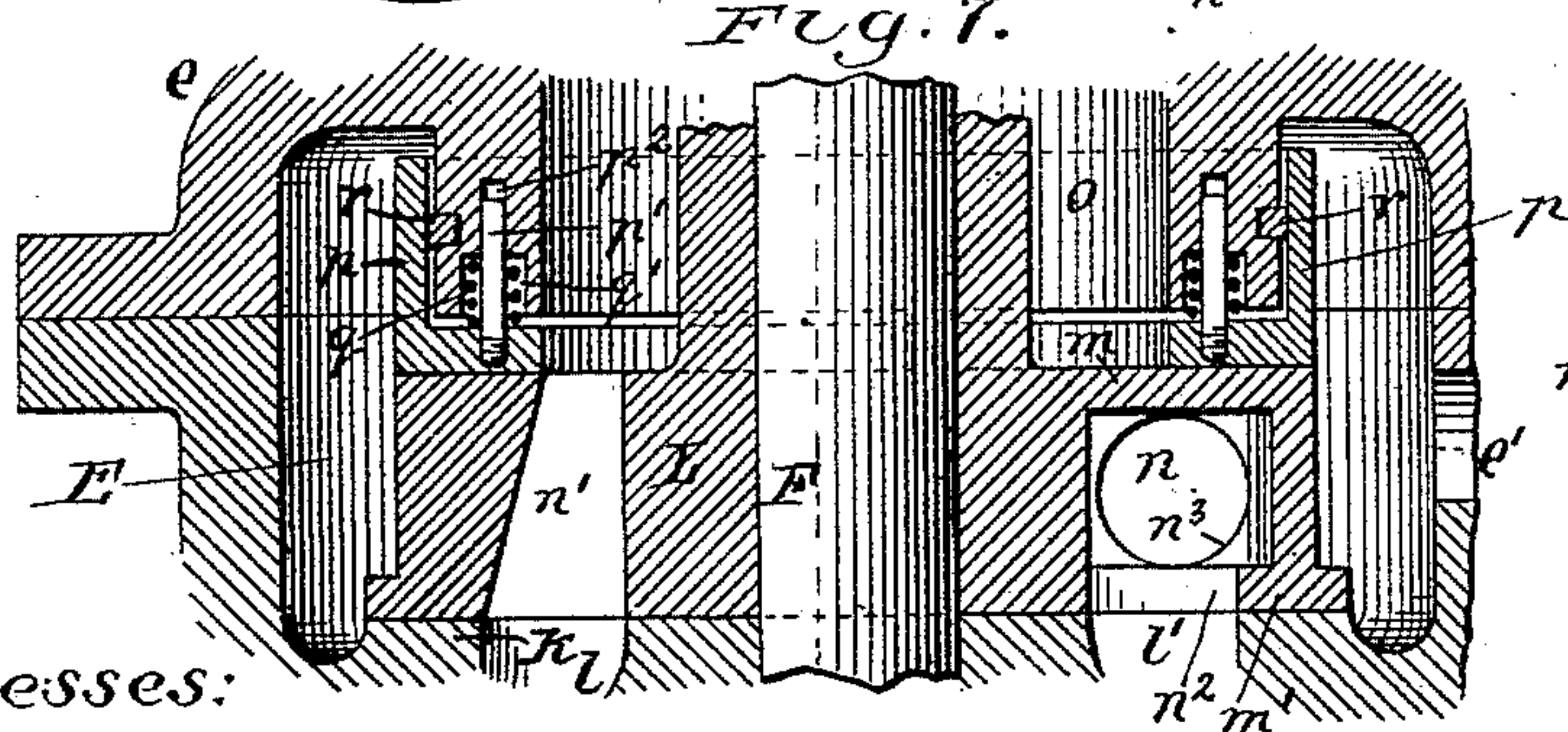
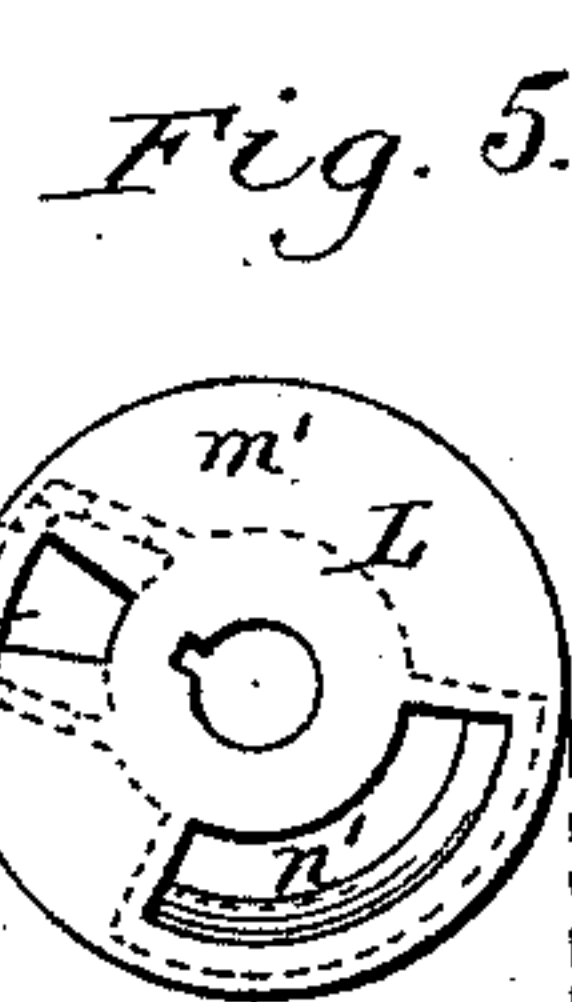
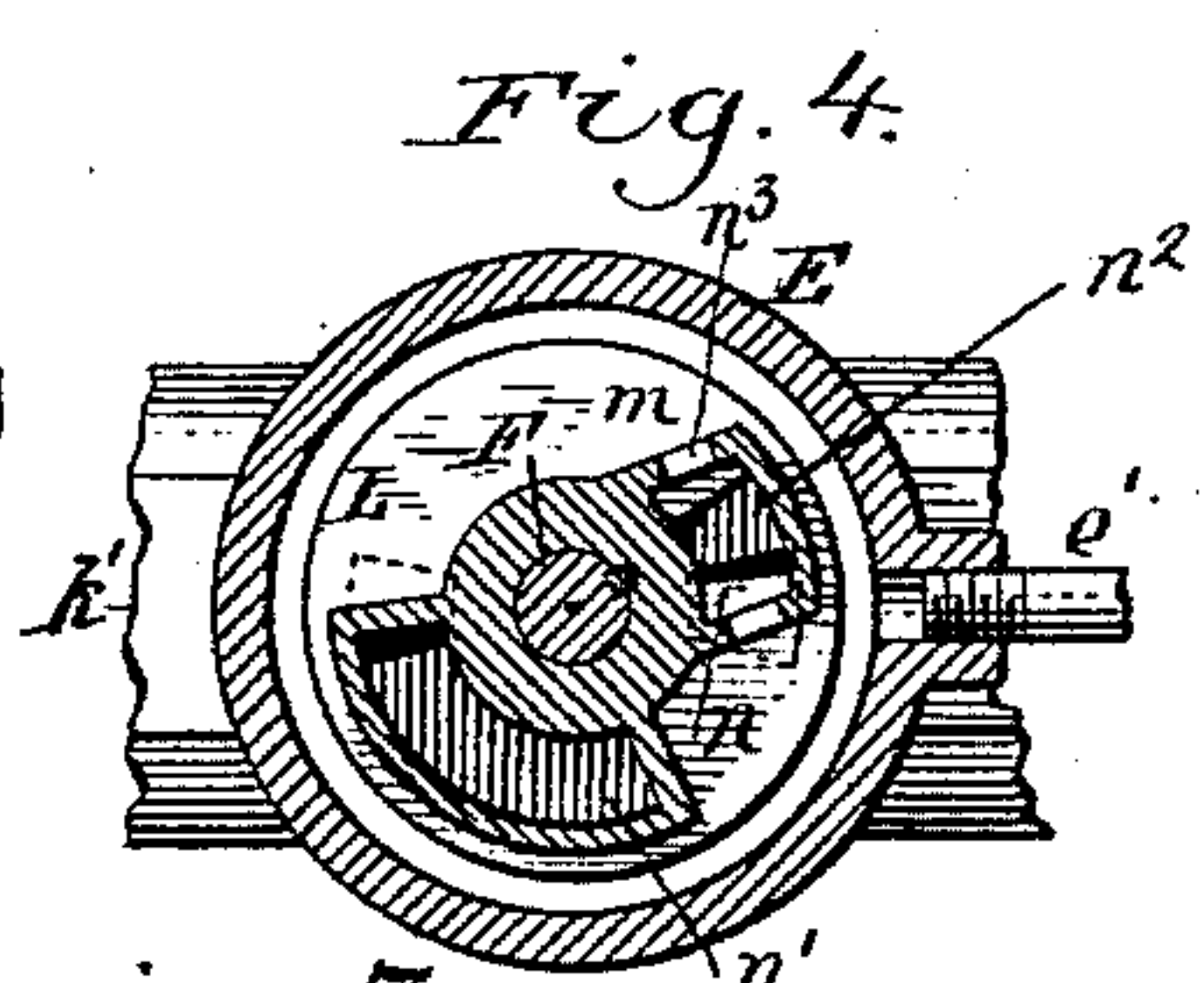
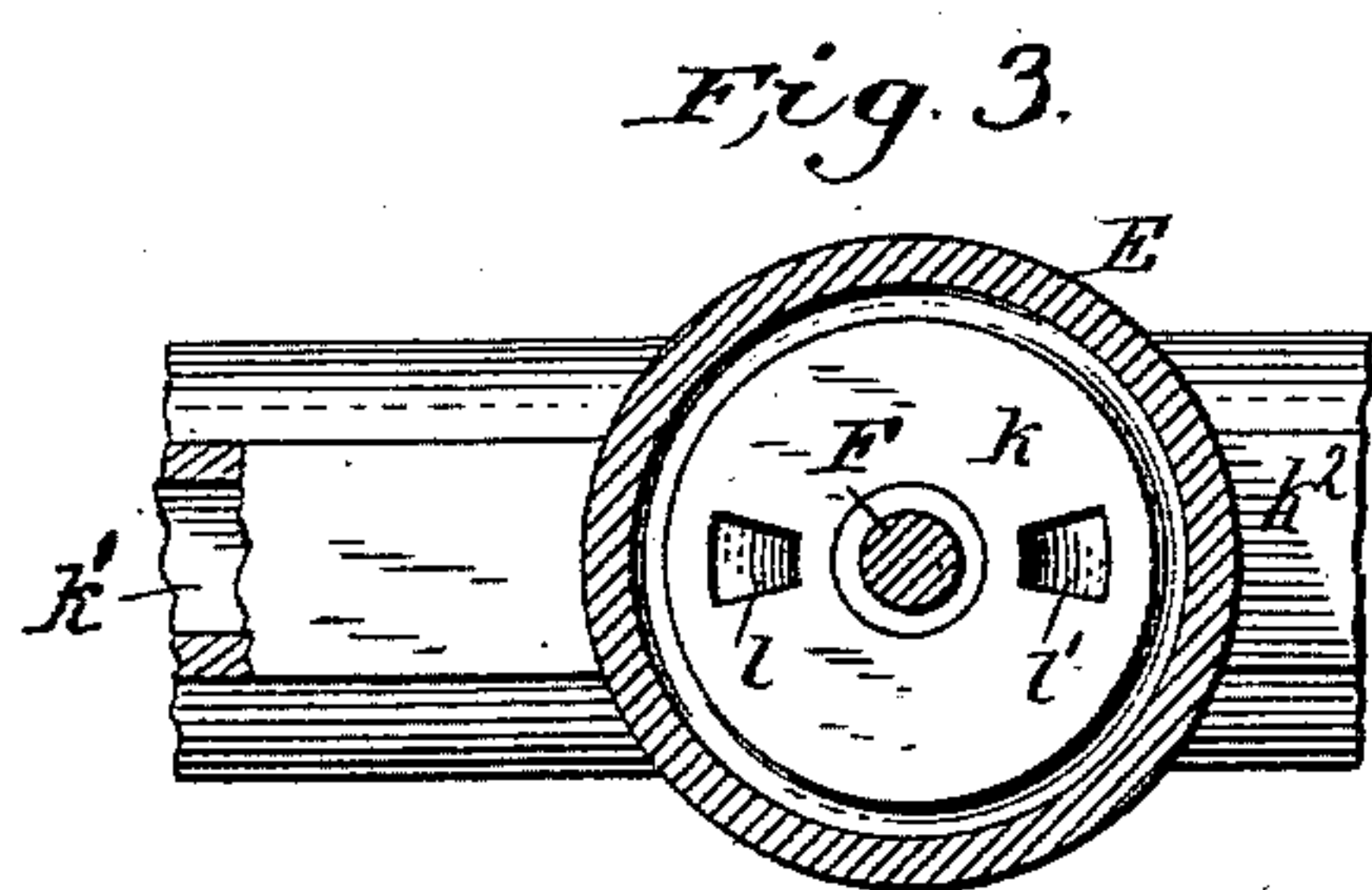
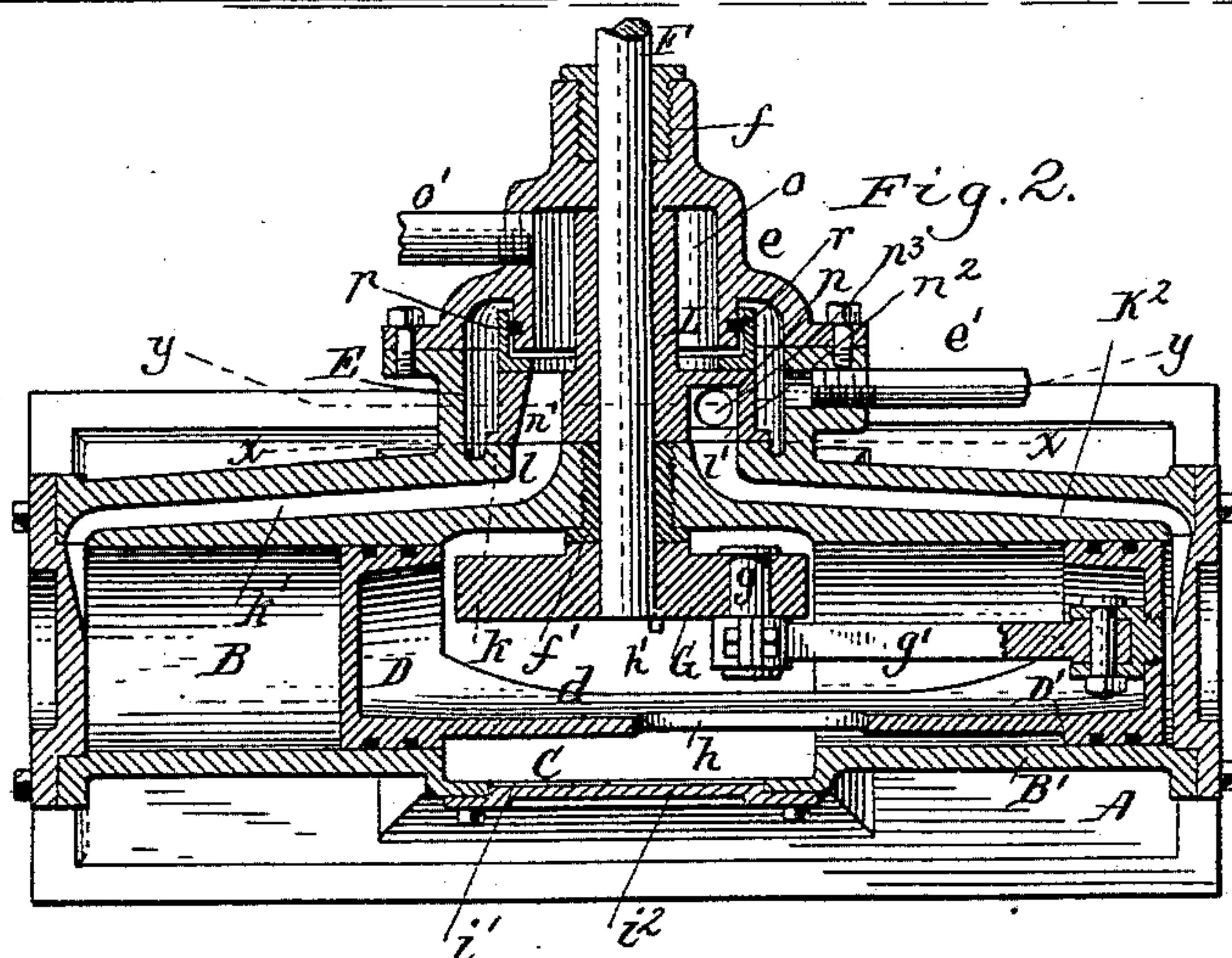
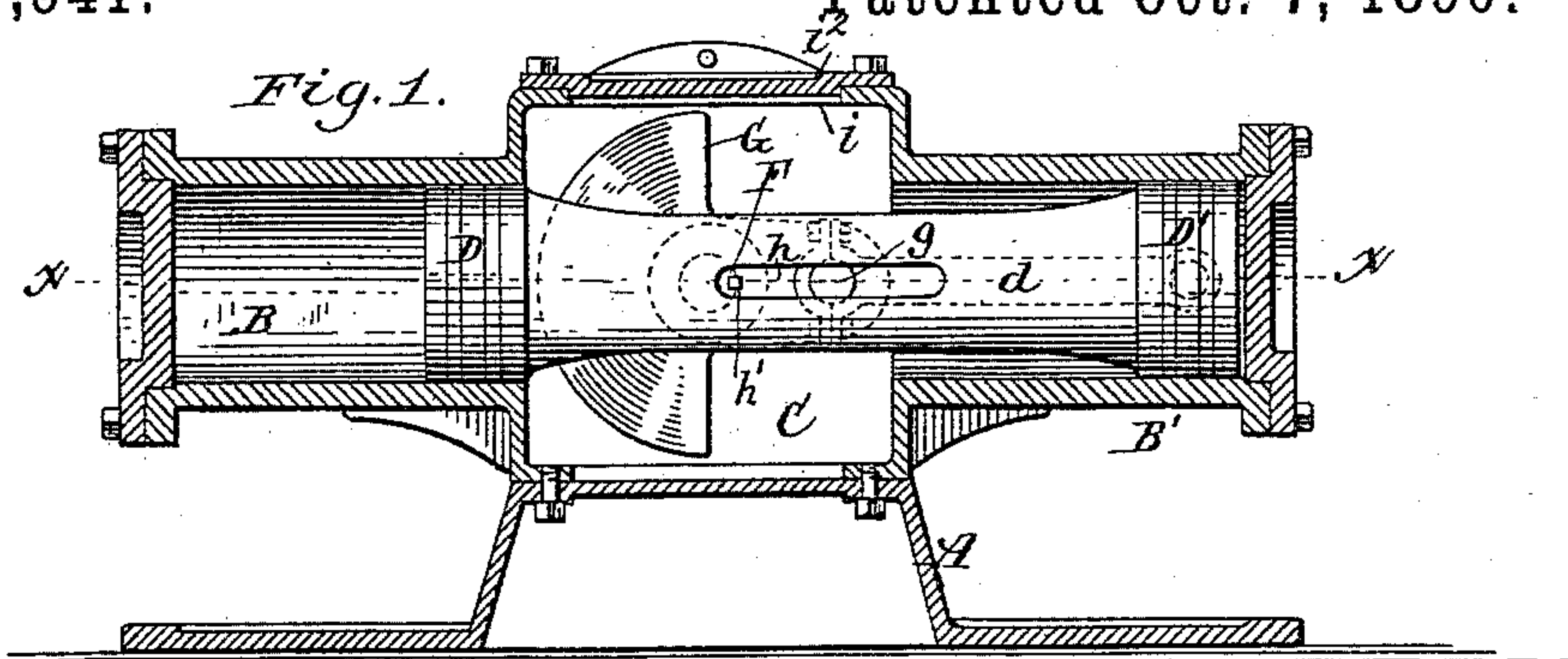


(No Model.)

F. A. SHOEMAKER.
STEAM ENGINE.

No. 437,941.

Patented Oct. 7, 1890.



Witnesses:

Chas. J. Buchheit
Emil. Neuhart

Inventor:

F. A. Shoemaker
By Wilhelm Thumier Attorneys.

UNITED STATES PATENT OFFICE.

FRANK A. SHOEMAKER, OF BUFFALO, NEW YORK, ASSIGNOR OF ONE-HALF
TO JOSEPH W. DENNIS, OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 437,941, dated October 7, 1890.

Application filed March 6, 1890. Serial No. 342,894. (No model.)

To all whom it may concern:

Be it known that I, FRANK A. SHOEMAKER, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Steam-Engines, of which the following is a specification.

This invention relates to that class of reciprocating steam-engines which are provided with two single-acting pistons secured together and moving in cylinders arranged in line with each other.

The object of my invention is to provide a simple, compact, and inexpensive engine of this character, in which all of the principal working parts are inclosed and nevertheless easily accessible, and to provide the engine with a practically-balanced rotary valve of simple construction.

The invention consists of the improvements which will be hereinafter fully set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of my improved steam-engine. Fig. 2 is a horizontal section in line *x x*, Fig. 1. Fig. 3 is a transverse section of the induction-chamber in line *x x*, Fig. 2, showing the valve-seat and inlet-ports. Fig. 4 is a similar view in line *y y*, Fig. 2. Fig. 5 is an inside elevation of the rotary valve. Fig. 6 is a plan view of the same. Fig. 7 is a horizontal section of the valve-chamber and connecting parts on an enlarged scale.

Like letters of reference refer to like parts in the several figures.

A represents the engine-bed; B B', two cylinders arranged in line with each other and communicating at their inner ends with an intermediate enlargement or chamber C. The latter is preferably rectangular and is secured at its base to the bed A, which forms the bottom of said chamber.

D D' represent two single-acting pistons arranged in the cylinders B B', respectively, and connected on the front side of the engine by a longitudinal web *d*, preferably cast integral with the pistons. This construction permits both pistons to be finished and perfectly aligned in the lathe at one operation, whereby the cost of manufacture is considerably reduced.

E represents the annular steam-chest or

valve-chest formed on the rear side of the intermediate chamber C and closed at its rear end by a hood or cap *e*.

e' represents the steam-supply pipe opening into the steam-chest E.

F represents the engine-shaft arranged transversely to and between the cylinders B B' and journaled in bearings *f f'*, formed in the cap *e* and intermediate chamber C, respectively. The shaft F projects a short distance into the intermediate chamber C and carries within the latter a counterbalanced crank G, having its wrist-pin *g* connected with the piston D' by a rod *g'*.

h represents a longitudinal slot or opening formed in the piston-web *d*, about midway of its length and opposite or in front of the shaft F, so that a suitable tool can be inserted through this opening to seat or unseat the key *h'*, whereby the crank G is secured to the shaft F.

By employing but a single connecting-rod and connecting the pistons, as above described, the wear on the wrist-pin is materially lessened and the life of the parts greatly lengthened.

i i' represent openings formed, respectively, in the top and front of the intermediate chamber C, through which the central portion of the engine can be conveniently reached for repairs, &c. The openings *i i'* are closed by suitable heads *i²*.

k represents the circular valve-seat formed in the steam-chest E, concentric with the shaft F, and *k' k²* represent steam-ports extending from the outer ends of the cylinders B B', respectively, to the face of the valve-seat *k*, where they terminate in arc-shaped openings *l l'*, as represented in Fig. 3.

L is a circular or disk valve mounted on the engine-shaft F within the steam-chest E, and seated with its inner face against the valve-seat *k*. The valve L is connected with the shaft by a key, which compels the valve to turn with the shaft, but leaves it free to move longitudinally on the shaft F toward the seat *k*, so as to remain in close contact with the latter at all times.

The valve L is provided with two integral disks *m m'*, a short arc-shaped inlet-chamber *n* arranged between said disks, and a long arc-shaped exhaust-passage *n'* passing through said disks. The valve inlet-chamber *n* is

closed at its outer side by the disk m and at its inner side by the disk m' , in which it is provided with an arc-shaped steam-port n^2 , adapted to communicate with either of the port-openings l l' .

n^3 represents one or more openings formed in the side walls of the inlet-chamber n for the purpose of admitting steam from the steam-chest to the chamber. The exhaust-passage n' extends through both disks, so as to place either of the port-openings l l' in communication with the cylindrical exhaust-chamber o . The latter is formed in the cap e , in rear of and concentric with the steam-chest E , and extends a short distance into the latter.

o' is the exhaust-pipe communicating with the exhaust-chamber o .

p represents a flanged partition-ring which surrounds the inwardly-projecting portion of the exhaust-chamber o and bears with its flanged front portion against the back of the valve L . This partition-ring separates the steam-chamber from the exhaust-chamber, and also relieves the back of the valve from the greater portion of the steam-pressure.

p' represents a series of rearwardly-projecting pins secured to the flange of the packing-ring p and guided in openings p^2 , formed in the inwardly-projecting portion of the exhaust-chamber o , whereby the ring p is held against turning.

q represents springs surrounding the pins p' , and arranged in sockets q' in the inner end of the projecting portion of the exhaust-chamber and bearing against the ring p , whereby the ring is pressed tightly against the valve L . These springs hold the partition-ring snugly against the valve and cause it to follow the longitudinal movements of the valve on the shaft and prevent the steam from entering between the back of the valve and the ring. These springs also assist in holding the valve L against its seat k .

r represents a packing-ring seated in an annular groove in the periphery of the inwardly-projecting portion of the exhaust-chamber o , and forming a tight joint between the latter and the inner side of the partition-ring p .

The inner disk m' of the valve L is made slightly larger in diameter than the outer disk m , and the area of this enlargement is about equal to the area of the back of the valve inlet-chamber n , so that the inward pressure of the disk m' balances the outward pressure against the back of the inlet-chamber.

By constructing the valve mechanism as above described all portions of the valve within the steam-chest are exposed to the same pressure in all directions, whereby the valve is practically or nearly balanced and friction between the valve and its contact-surfaces reduced to a minimum and the duty of the engine correspondingly increased.

In the position of the parts represented in the drawings the steam-inlet opening l' has just begun to be uncovered by the opening n^2 of the inlet-chamber n in the valve, so that steam is admitted through the port k^2 to the cylinder B' in front of the piston D' . The exhaust-passage n' has just begun to uncover the opening or port l , so that the steam in front of the piston D is being exhausted. The pressure against the piston D' causes both pistons to move toward the opposite ends of the cylinders B B' , and this movement continues until the pistons reach the end of the stroke, when the valve causes the steam to be admitted to the cylinder B in front of the piston D and to exhaust from the cylinder B' .

I claim as my invention—

1. The combination, with the cylinders, the pistons, and the shaft, of a rotating valve mounted upon the shaft and provided with an exhaust-passage extending through the valve from the face to the back thereof, a steam-chamber surrounding the valve, a cylindrical exhaust-chamber arranged at the back of the valve and projecting into the steam-chamber, and a partition-ring applied to the outer side of the exhaust-chamber within the steam-chamber and bearing against the back of the valve, substantially as set forth.

2. The combination, with the cylinders, the pistons, and the shaft, of a rotating valve mounted upon the shaft, and provided with an exhaust-passage extending through the valve from the face to the back thereof, a steam-chamber surrounding the valve, a cylindrical exhaust-chamber arranged at the back of the valve and projecting into the steam-chamber, a partition-ring applied to the outer side of the exhaust-chamber within the steam-chamber and bearing against the back of the valve, pins connecting the partition-ring with the exhaust-chamber, whereby the ring is prevented from turning with the valve, and springs whereby the ring is pressed against the valve, substantially as set forth.

3. The combination, with the cylinders, the pistons arranged therein, and the shaft connected with the pistons, of a steam-chest surrounding said shaft, a rotating valve mounted upon said shaft, a circular exhaust-chamber arranged at the back of said valve, a partition-ring bearing against the valve and surrounding the exhaust-chamber, pins whereby the partition-ring is held against turning, and springs whereby said ring is pressed against the valve, substantially as set forth.

Witness my hand this 3d day of March, 1890.

FRANK A. SHOEMAKER.

Witnesses:

CARL F. GEYER,
FRED. C. GEYER.