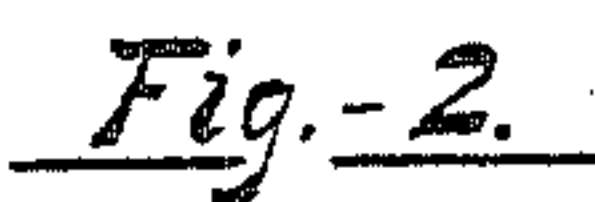


3 Sheets—Sheet 1.

No. 445,038.

Patented Jan. 20, 1891.



WITNESSES:

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(No Model.)

3 Sheets—Sheet 2.

S. G. BROSIUS.
ROTARY STEAM ENGINE.

No. 445,038.

Patented Jan. 20, 1891.

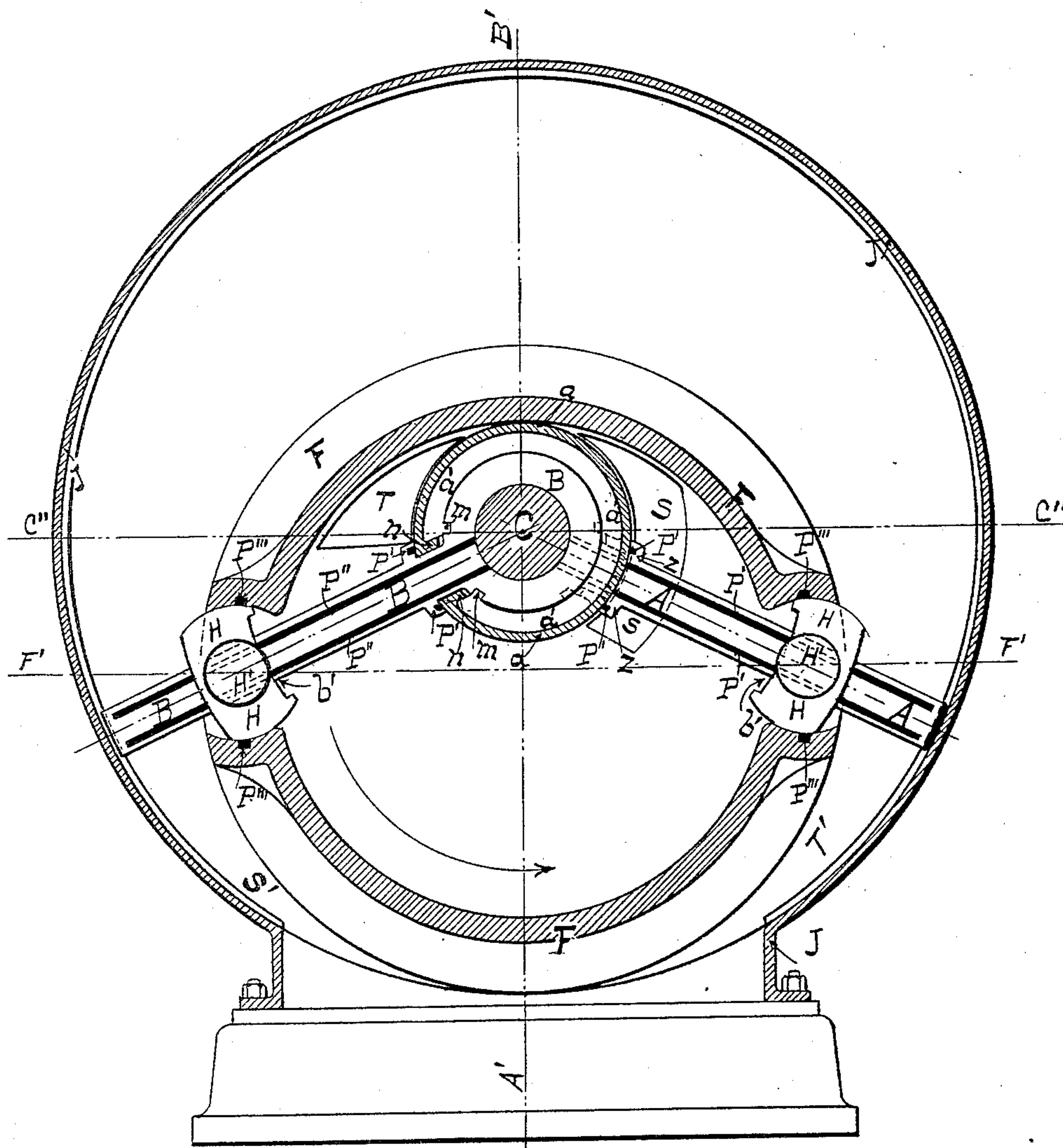


Fig. 3.

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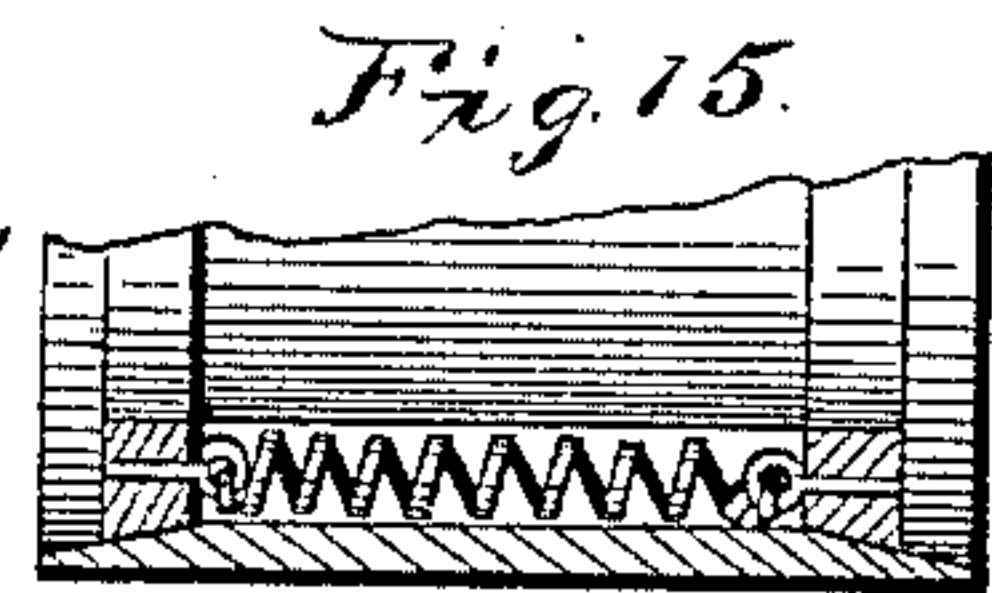
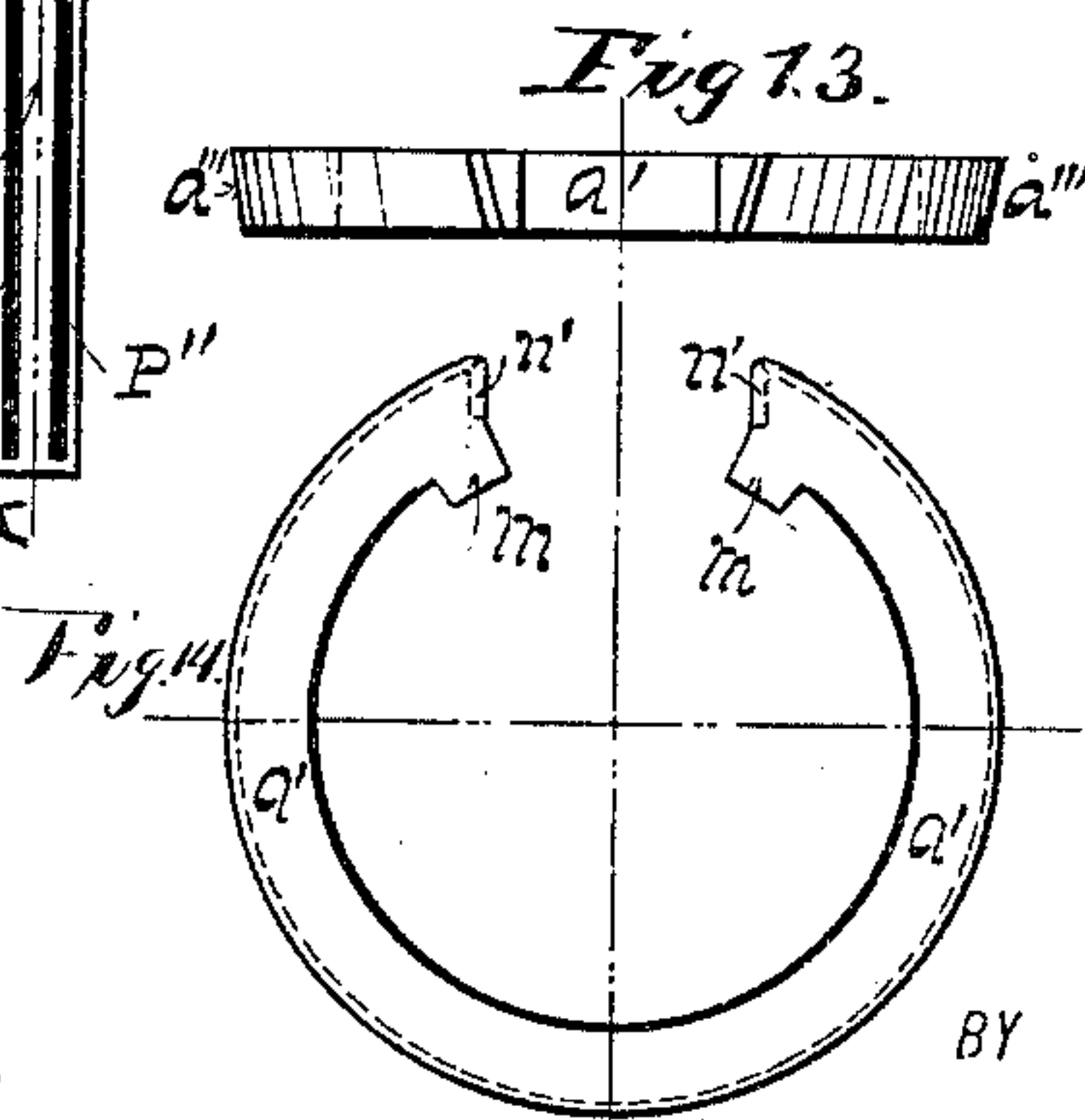
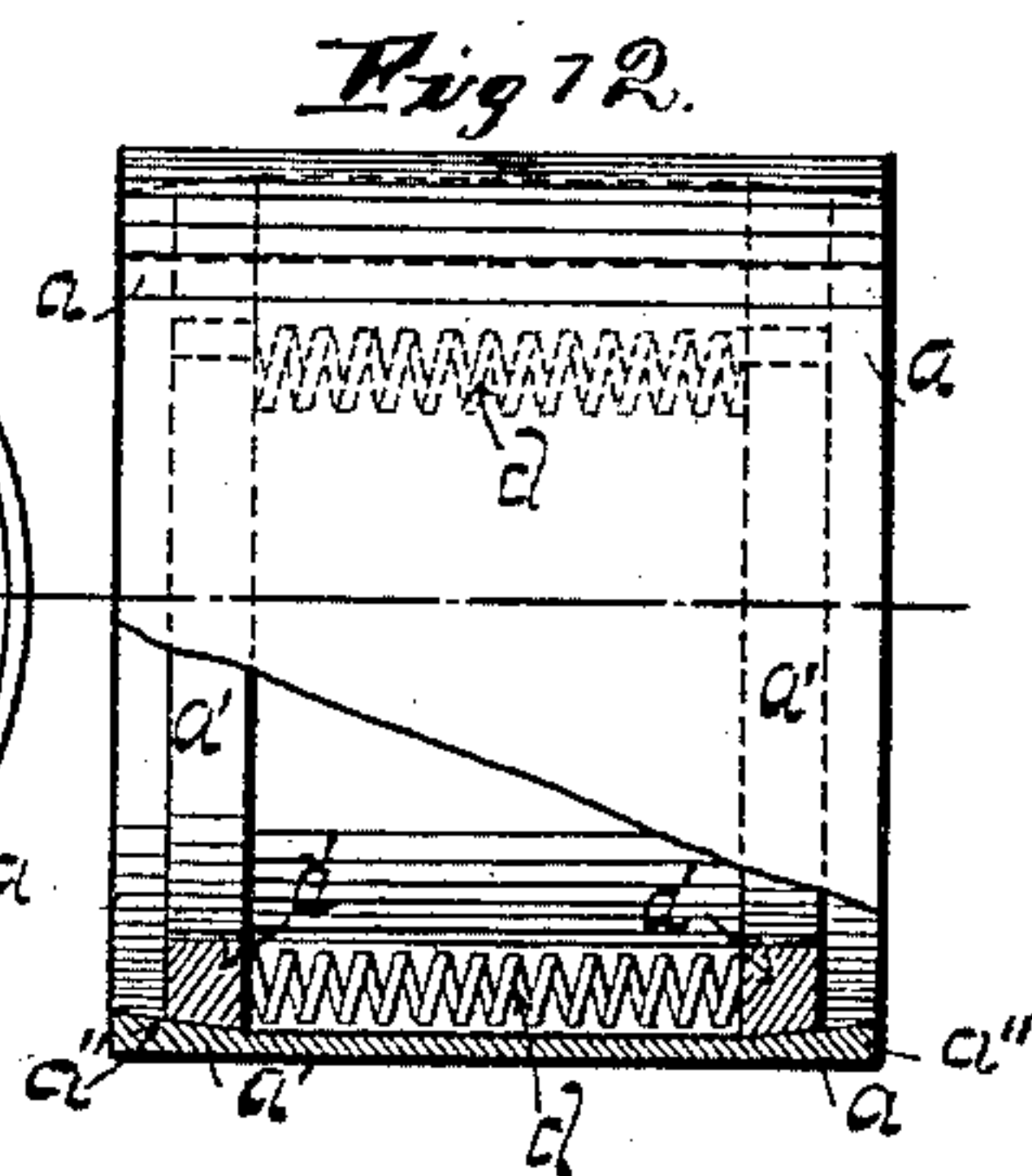
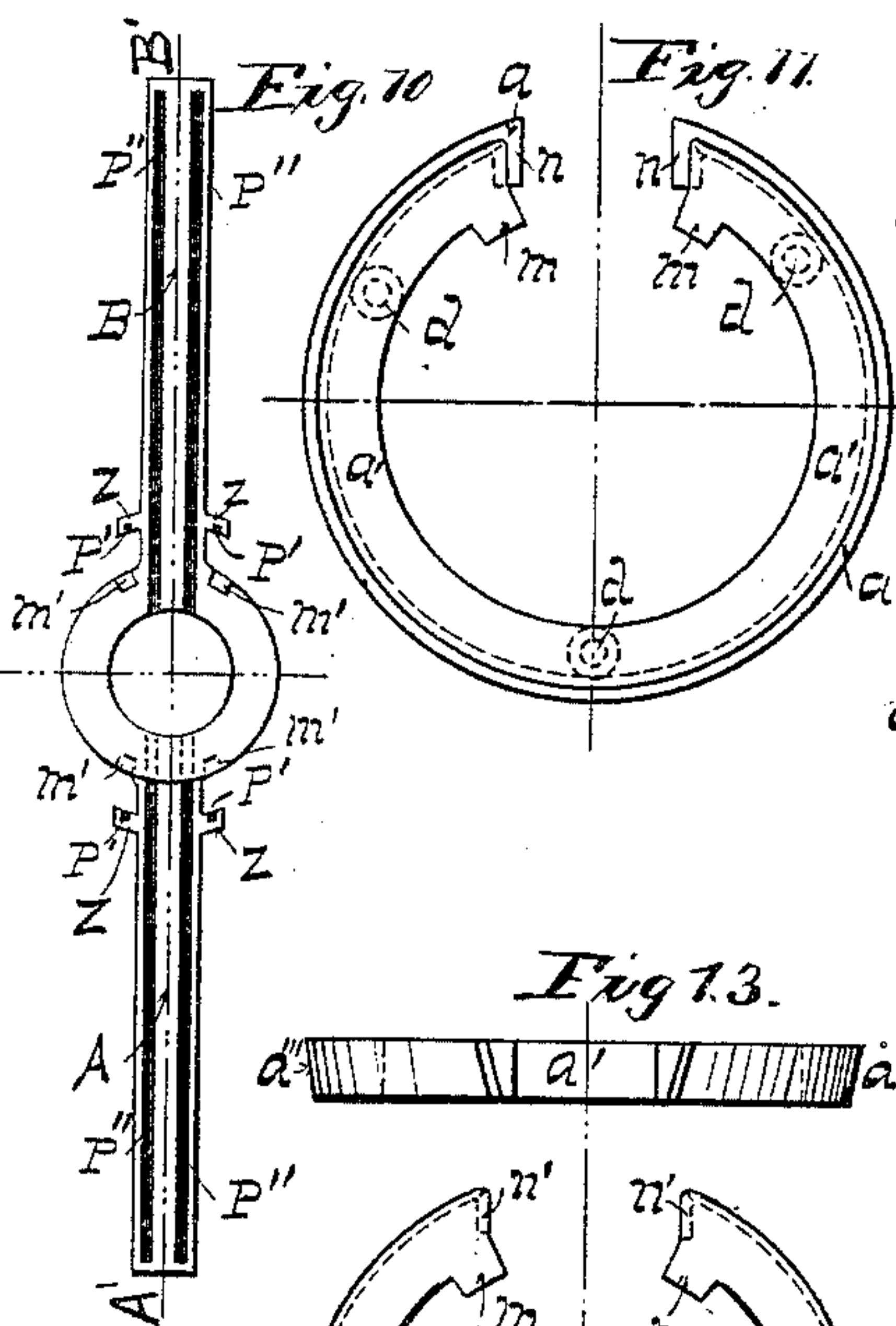
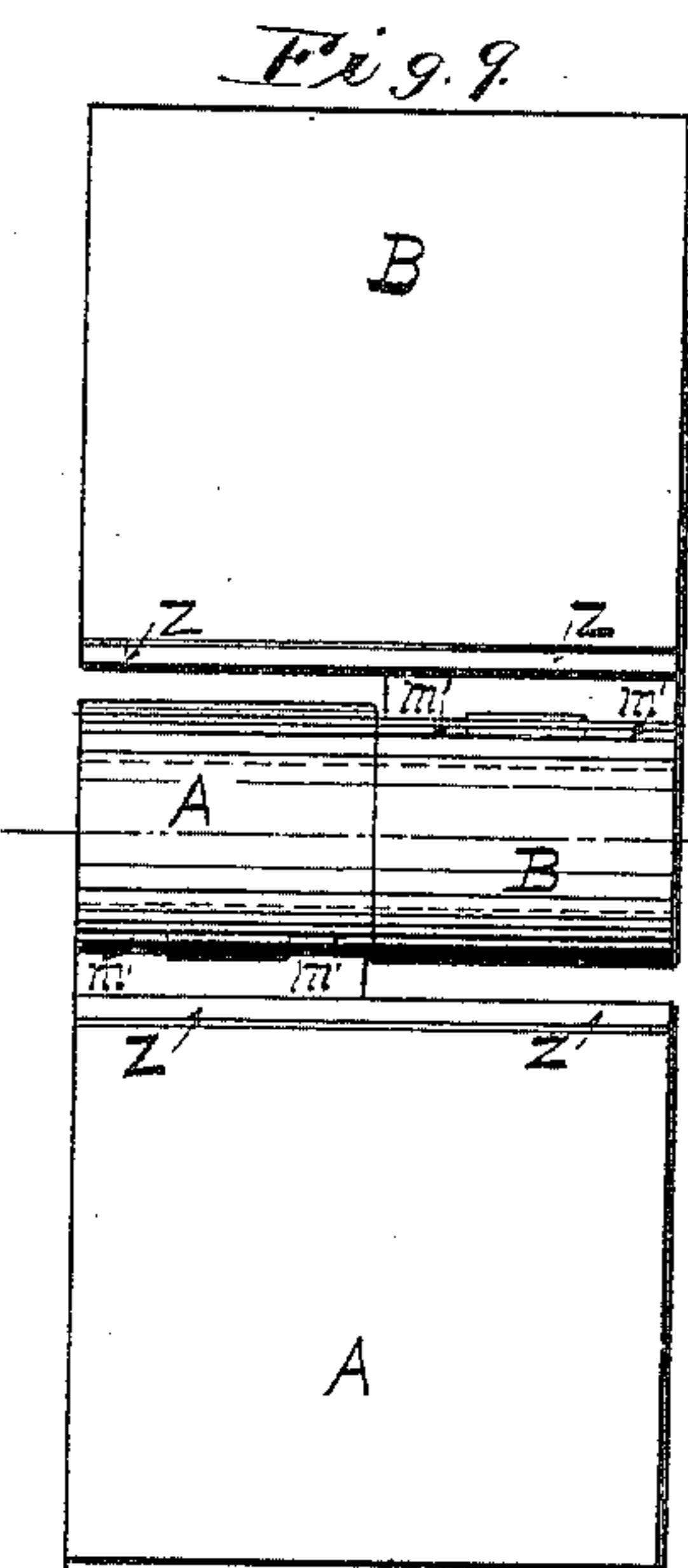
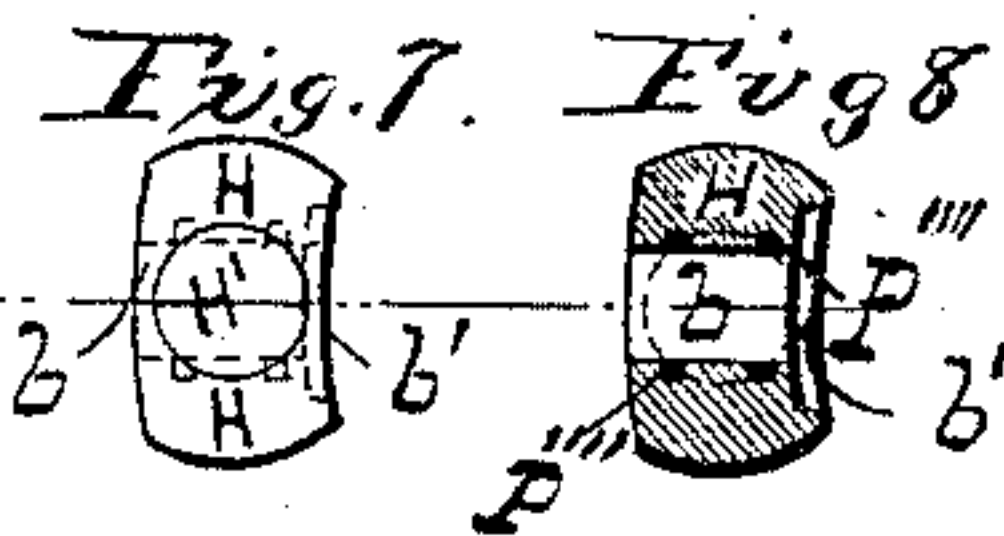
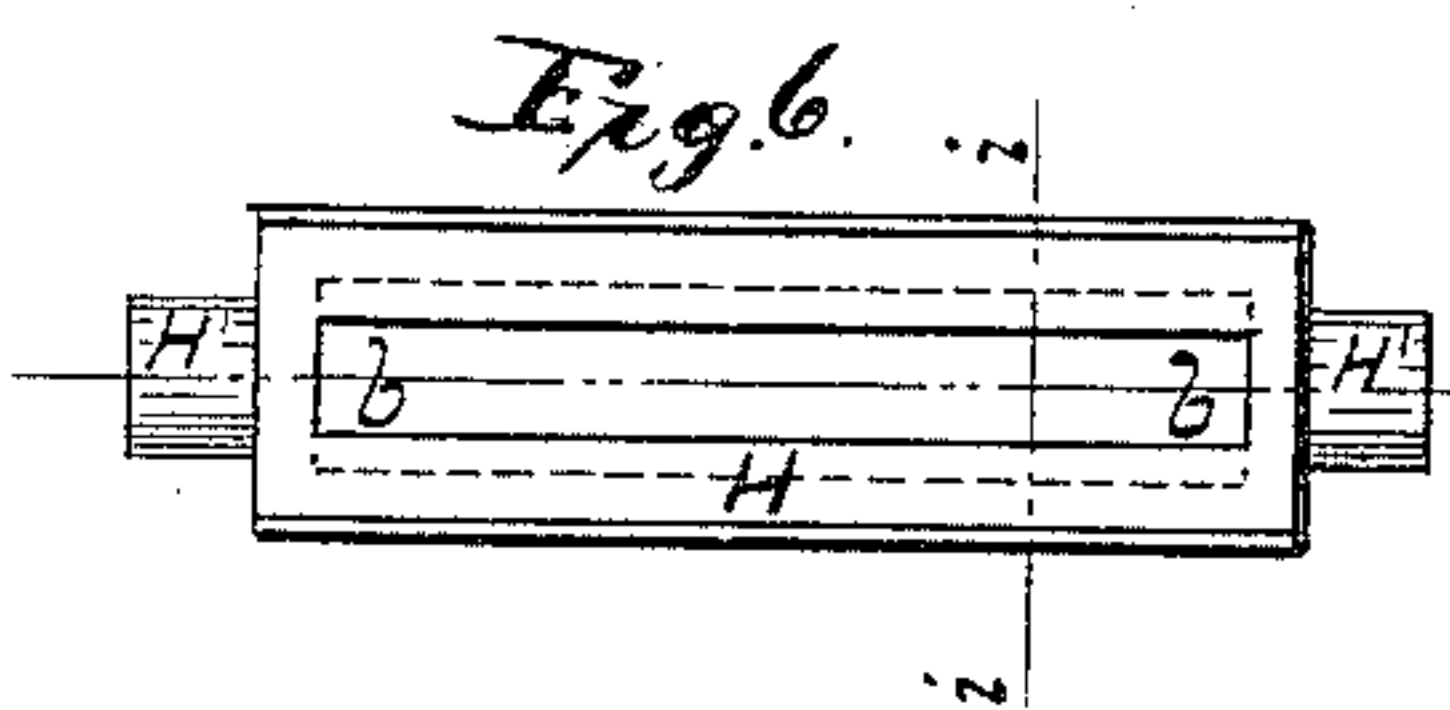
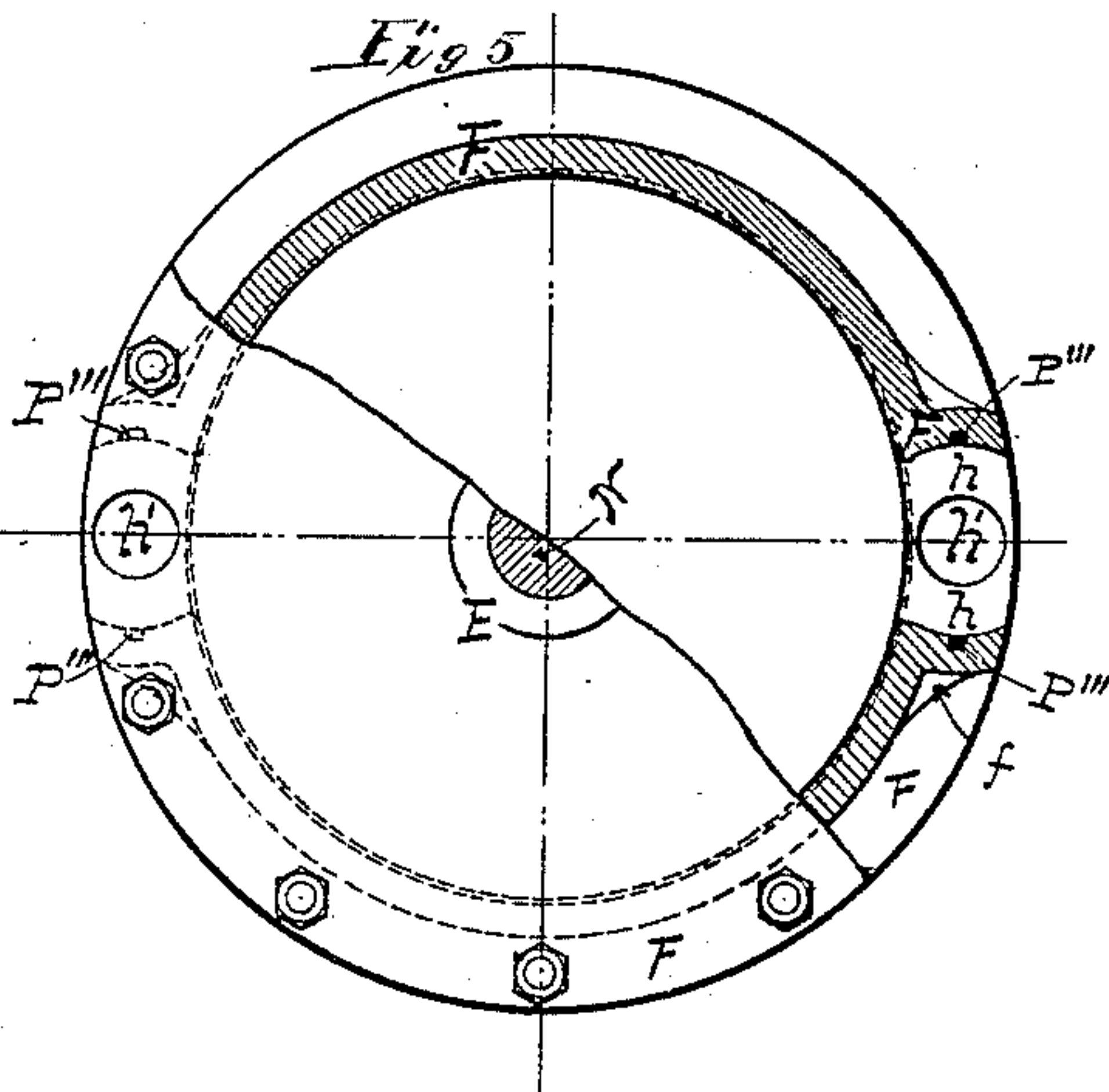
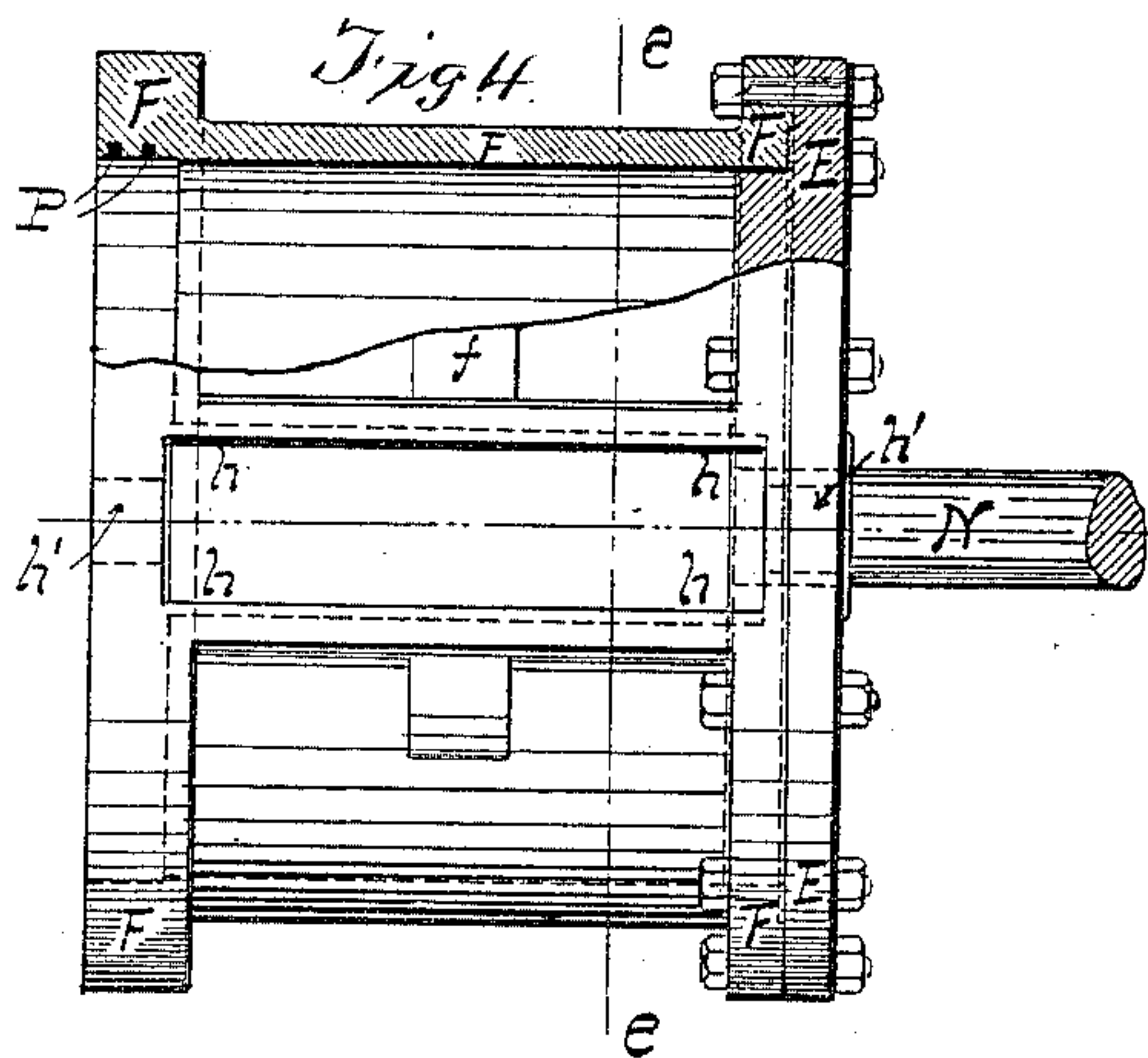
(No Model.)

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S. G. BROSIUS.
ROTARY STEAM ENGINE.

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WITNESSES:

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UNITED STATES PATENT OFFICE.

SAMUEL GLENVILLE BROSIUS, OF COLUMBUS, OHIO.

ROTARY STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 445,038, dated January 20, 1891.

Application filed February 17, 1890. Serial No. 340,828. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL GLENVILLE BROSIUS, of the city of Columbus, in the county of Franklin, State of Ohio, have invented a new and useful Improvement in Rotary Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in explaining its nature.

This invention relates to a novel construction of a rotary engine in which the cylinder rotates on its axis and the pistons (one or more may be used, but two are shown in the drawings) pass through the circumference of the cylinder, being held in position by cylindrical guides, which are journaled in the sides of the said cylinder. The pistons revolve on a shaft whose center is eccentric with the axis of the cylinder. The distance between these axes of the pistons and the rotating cylinder is such as to allow the hubs of the pistons to be packed steam-tight against the inside of the cylinder by an automatic packing.

In engines of this class as heretofore made the steam has been admitted between the outer casing and the periphery of the inner rotating cylinder. This cylinder performs, ordinarily, the functions of packing or abutment. Such a construction brings about great loss of steam, due to the condensation caused by the action of cold air upon the greater external surface of the outer casing.

One of the objects of my invention is to overcome this condensation and the consequent loss of efficiency by introducing the steam within the rotating cylinder.

Another object is to so pack the pistons around the hub and the ends as to practically insure steam-tight joints with little friction. These objects I accomplish by the constructions shown in the drawings, and hereinafter particularly pointed out in the claims.

In the drawings, Figure 1 is an end view of the rotary engine in elevation, showing the location of the steam-chest and exhaust-pipe. The cylinder and pistons with the cylindrical guides are also shown in broken lines. Fig. 2 is a side view of the rotary engine, part in elevation and part in section, on the

line A' B' of Fig. 1. Fig. 3 is a view in section on the line C' D' of Fig. 2, looking toward head D. Fig. 4 is a side view of the revolving cylinder, part in elevation and part in section. Fig. 5 is an end view of the revolving cylinder, partly in section. Fig. 6 is a side view of the cylindrical guides. Fig. 7 is an end view. Fig. 8 is a cross-section of these guides on line *i i*, Fig. 6. Fig. 9 is a view of the pistons in side elevation. Fig. 10 is an end view of the pistons, showing the packing. Fig. 11 is an end view of the automatic packing used around the hubs of the pistons. Fig. 12 is a side view thereof. Fig. 13 is a side view of the expansion-ring used in the automatic packing. Fig. 14 is an end view. Fig. 15 is a modification showing the packing-ring beveled in the opposite direction, the spreading-rings being drawn inward instead of pushed outward.

Like letters indicate like parts in all the figures.

D is the cylinder-head, which is held stationary, and forms one of the journals for cylinder F.

F is the cylinder, which revolves on, or is journaled at one end in, head D, and packed steam-tight in said head by packings P and P, while the other is firmly attached to shaft N by means of head E.

N is the driving-shaft, and is journaled in pillow-block K, so that cylinder F may be said to be journaled by shaft N, and in or on head D.

N is free to revolve with cylinder F and is driven by it, all as shown in Fig. 2. Cylinder F contains in its circumference the openings *h h h h* and the journal-boxes *h' h'* to receive the guides H and H, its journals H' and H', as shown in Figs. 4 to 8, inclusive.

The shaft C is fixed stationary in the head D, and is the axis on which the pistons revolve, as shown in Figs. 2 and 3.

A and B are the overlapping pistons, which are journaled on the shaft C and are held in position by the cylindrical guides H and H, these guides being journaled in the circumference of the cylinder F, and through which the pistons move freely, all as shown in Fig. 3.

In Figs. 9 and 10 the pistons are shown extended on the center line A' and B'. The

hub of each piston extends over one-half of that portion of the shaft C which protrudes into the cylinder F. The pistons are provided with the flanges $z z$ to receive the packings P' and P', which pack the automatic packing-rings a and a steam-tight in the hub and against the overlapping wing of the piston. These pistons are packed steam-tight against the heads D and E by the packings P'' and P''. The pistons are flat and made to fit the slots $b b$ of the guides H and H, through which they pass, and are packed steam-tight by packings P''' and P''', all as shown in Figs. 6 to 10, inclusive.

The cylindrical guides H and H are journaled in the circumference of the cylinder F. These guides may be made in one or more pieces, and provision may be made to take up the wear both in the guide and in the cylinder F in any of the common ways of adjustment for wear.

$b b$ and $b b$ are the slots in the guides through which the pistons move, the joint between said guides and pistons being made steam-tight, as shown at P''' and P'''. The guides are free to revolve upon their axes, but do not make a revolution. They adjust themselves to the positions of the pistons during each revolution of the engine. On their concave sides the guides contain the recess b' and b' , which allows the flanges z and z of the pistons to pass when the guide and piston come in contact in passing the center line A' B', all as shown in Figs. 3 to 8, inclusive.

a and a are the packing-rings, which pack the hubs of the pistons A and B steam-tight against the inside of the cylinder F and the wings of the opposite piston. These rings are held in position by the expansion-rings a' and a' , and are beveled, as shown at a'' and a'' . Rings a' and a' are beveled in the same manner as shown at a''' and a''' , so as to allow the packing-rings a and a to be pressed against the inside of the cylinder F by means of the expansion-rings a' and a' , pushed apart by springs $d d$ and d , while the flanges n and n of the packing-ring a are beveled and bent over the ends of the expansion-rings. These ends n' and n' are beveled to suit the bevels on flanges n and n of rings a and prevent the packing-rings a and a from going out too far and binding between the inside of the cylinder and the packing. The bevels at a''' on the expansion-ring are in the same proportion to the sum of the bevels at n' and n' as the diameter of a circle is to the circumference. The same is necessarily true of packing-ring a . The tendency of ring a' to spread by reason of the pressure exerted upon it by ring a is overcome by the flanges m and m being fitted into slots m' and m' in the hubs of the pistons, but are allowed to move sidewise. The construction and number of the springs $d d$ and d is merely a matter of detail. As shown in the drawings, these rings serve as an abutment between the steam inlet and exhaust ports.

T is the steam-port, and S S is the exhaust-

port. The exhaust-port should be so located that the steam may escape at the moment that the surface of the back-pressure on the following piston B is nearly or just equal to the surface of steam-pressure on the leading piston A. It is obvious that the pistons are alternately leading and following. The steam enters at port T and drives the piston in the direction of the arrow and escapes at port S S. The pistons cause the cylinder F to revolve, thereby driving shaft N, which is attached to cylinder F by means of head E.

P, P', P'', P''', and P'''' are packings used to pack the several parts steam-tight, as shown in Figs. 2, 3, 6, 7, and 8. These packings may be made in the ordinary way and of any suitable material.

J is the casing, (which is not essential, but is shown as a guard.) It may be used for the purpose of holding the boxes of the rocker-shaft G. This casing protects the machinery from deposits of dirt, sediment, &c., and also protects the cylinder from the cold air and prevents rapid radiation and the condensation of steam within the cylinder, the air in the space between the cylinder and the casing being heated by radiation from the cylinder.

R is the eccentric which operates the cut-off by means of the rocker-shaft G.

Y and Y' are the exhaust and exhaust-pipe.

X is the steam-chest, and X' is the steam-pipe.

K is the pillow-block, and M is the driving-pulley.

J, R, G, X, Y, K, and M are mere matters of detail, and in no way affect the principles involved in this engine, being only shown to complete the machine.

It is not necessary to use a cut-off, except to gain advantage of the expansion of the steam. Any kind of cut-off may be used at either the steam or the exhaust port, or both. While I have shown the steam as entering at T and exhausting at S, yet it is obvious that S may be made the steam inlet-port and T the exhaust-port.

I do not confine myself to this identical construction, as it is obvious that slight changes may be made in detail without departing from the spirit of my invention.

It is not necessary to have the center of the revolving cylinder F directly under the shaft C, as shown in Fig. 3—that is to say, the center line A' B' may be inclined at any angle to the perpendicular.

I am aware that the overlapping piston and also the revolving cylinder have been used prior to my invention. I therefore do not claim them, but use them in combination, as described.

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. In a rotary steam-engine, a cylinder having one end fixed to a driving-shaft and the other end journaled upon a fixed head, in

combination with pistons mounted eccentrically to said cylinder and extending through the circumference of said cylinder, and packing-rings surrounding and fixed to the hubs of said pistons, said packing ring or rings serving as an abutment between the steam inlet and exhaust ports.

2. In a rotary engine, a rotating cylinder, in combination with pistons mounted upon a shaft eccentric to said cylinder, and packing-rings surrounding and fixed to the hubs of said pistons, said packing ring or rings serving as an abutment between the steam inlet and exhaust ports.

3. A rotary engine having a rotating cylinder, in combination with pistons mounted upon a shaft eccentric to said cylinder and provided with suitable piston-guides in the circumference thereof, and packing-rings surrounding and engaging the piston-hub.

4. In a rotary engine having a rotating cylinder, the combination, with pistons mounted upon a shaft within said cylinder, of packing-rings around the hubs of said pistons, consisting of a slotted cylinder or cylinders having the ends internally beveled, and interior rings correspondingly beveled, and springs bearing against said interior rings for forcing them outward along said beveled ends, whereby the packing-rings are pushed outward as wear takes place to maintain steam-tight joints.

5. In a rotary engine having the necessary co-operating parts, the combination, with the hubs of the pistons, of packing-rings consisting of slotted cylinders having inwardly-turned flanges for holding interior rings in place, which interior rings have projections which fit in cavities in the hubs for holding the packing in place.

6. In a rotary engine having the necessary co-operating parts, the combination, with the hubs of the pistons, of packing-rings around the hubs consisting of slotted cylinders having inwardly-turned flanges along the slot for holding interior spreading-rings in place, which interior rings are partly cut away and have inward projections at the points where cut away, which fit into cavities in the hubs of the pistons, and projections or flanges on the pistons bearing against the slotted cylinders, whereby the packing is held in place.

7. A rotary engine having a rotating cylinder, in combination with pistons mounted upon a shaft eccentric to said cylinder and provided with packing around the hubs of said pistons, which packing consists of a slotted cylinder or cylinders having the ends internally beveled, rings correspondingly be-

veled, and springs bearing against said interior spreading-rings for forcing them outward along said beveled ends, whereby the slotted cylinders are spread out as wear takes place to keep steam-tight joints.

8. In a rotary engine, a rotating cylinder having inlet and outlet steam ports which communicate with the interior of the cylinder, in combination with pistons mounted upon a shaft eccentric to said cylinder, and packing-rings surrounding and engaging the hubs of said pistons, said packing-rings serving as an abutment between the steam inlet and exhaust ports.

9. In a rotary engine, a rotating cylinder having inlet and outlet steam ports which communicate with the interior of the cylinder, in combination with pistons mounted upon a shaft eccentric to said cylinder, said inlet-port being provided with a suitable valve, and packing-rings surrounding and engaging the hubs of said pistons, said packing ring or rings serving as an abutment between the steam inlet and exhaust ports.

10. In a rotary engine, an outer inclosing casing and an inner rotating cylinder having inlet and exhaust ports which communicate with the interior of the cylinder, in combination with pistons mounted upon a shaft eccentric to said cylinder, and packing-rings surrounding and engaging the hubs of said pistons, said packing ring or rings serving as an abutment between the steam inlet and exhaust ports.

11. In a rotary engine, an outer inclosing casing and an inner rotating cylinder having one end fixed to a driving-shaft and the other end journaled upon a fixed head, in combination with pistons mounted upon a shaft eccentric to said cylinder and extending through the circumference of said cylinder, and packing-rings surrounding and engaging the hubs of said pistons, said packing ring or rings serving as an abutment between the steam inlet and exhaust ports.

12. In a rotary engine, a rotating cylinder having pistons mounted upon a shaft eccentric to said cylinder, in combination with guides journaled in the circumference of said cylinder and through which the pistons pass, said guides being cut away on their inner sides, so as to fit over flanges which hold the packing ring or rings around the hubs of the pistons.

SAMUEL GLENVILLE BROSIUS.

Witnesses:

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