

No. 713,448.

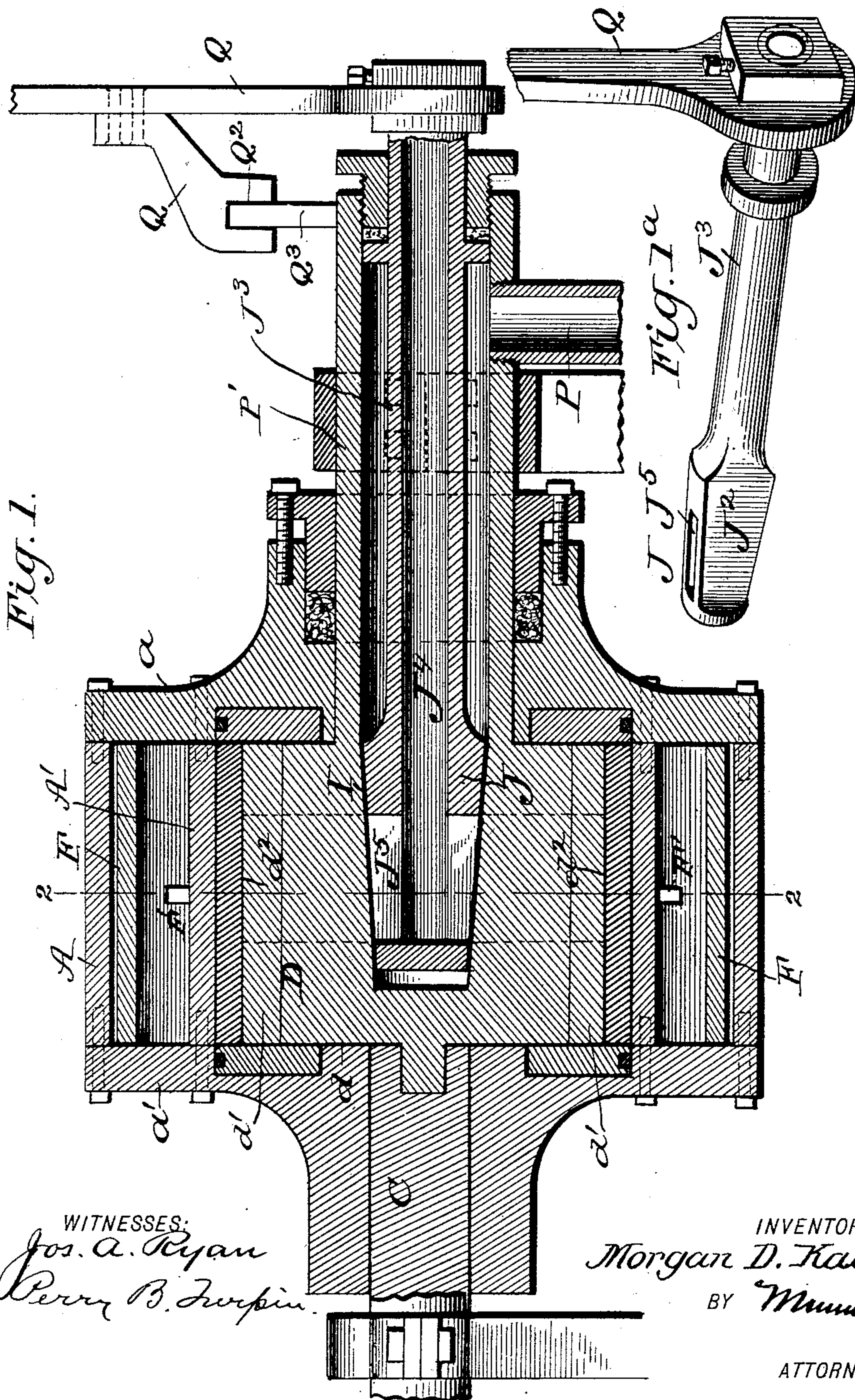
Patented Nov. 11, 1902.

M. D. KALBACH.
ROTARY ENGINE.

(Application filed Aug. 5, 1902.)

(No Model.)

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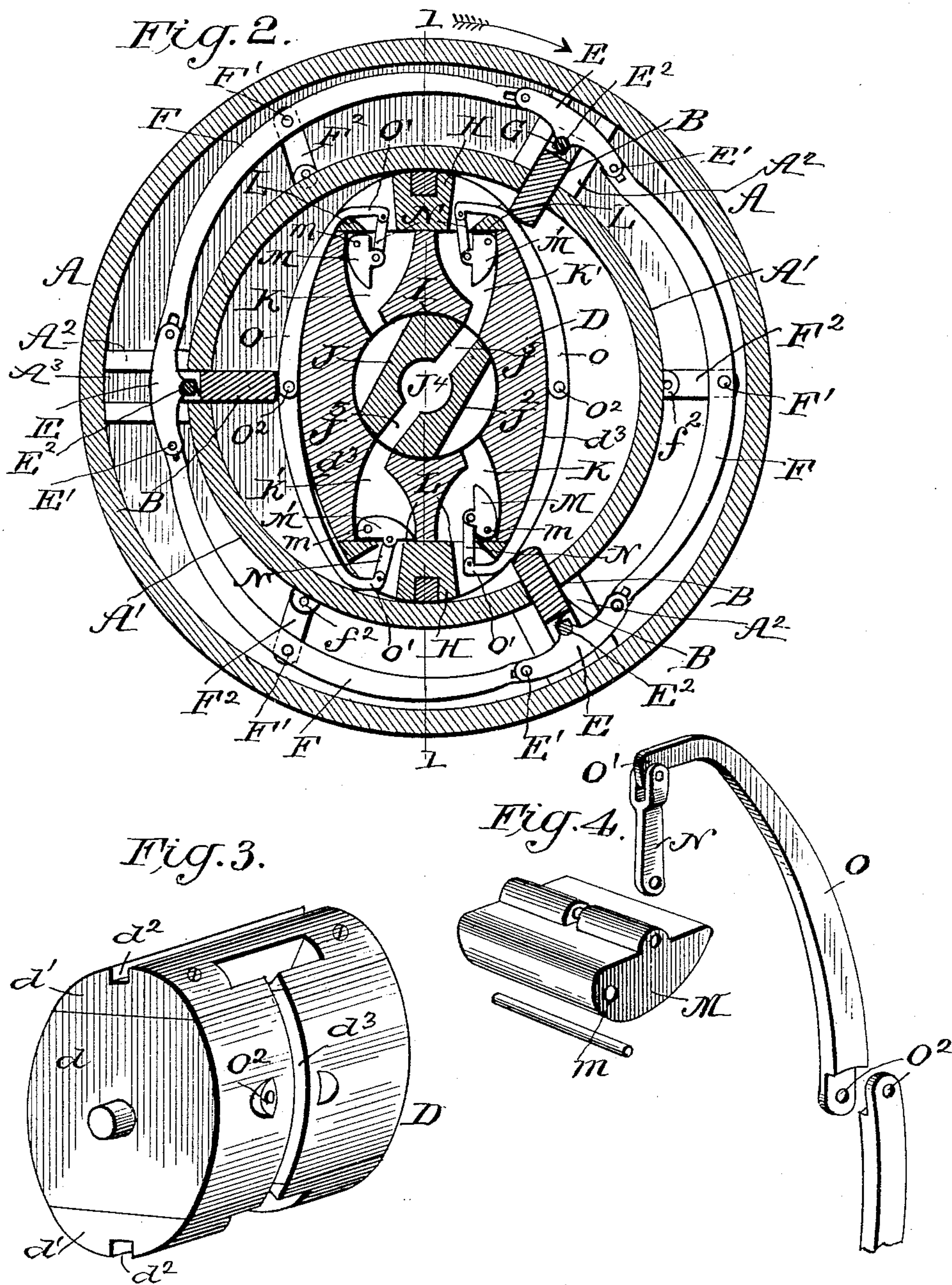


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ROTARY ENGINE.

(Application filed Aug. 5, 1902.)

(No Model.)

3 Sheets—Sheet 2.



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Fig. 5.

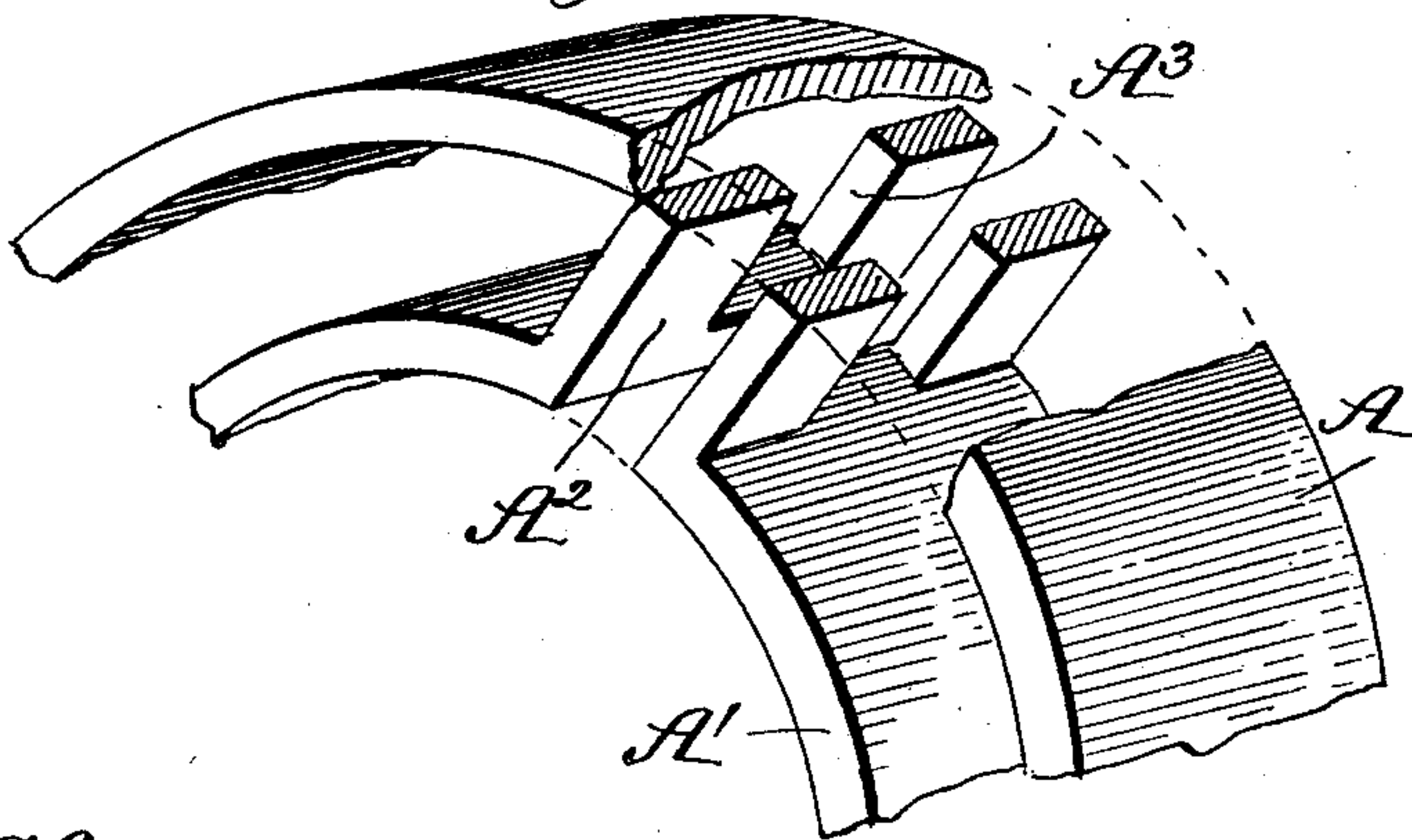


Fig. 6.

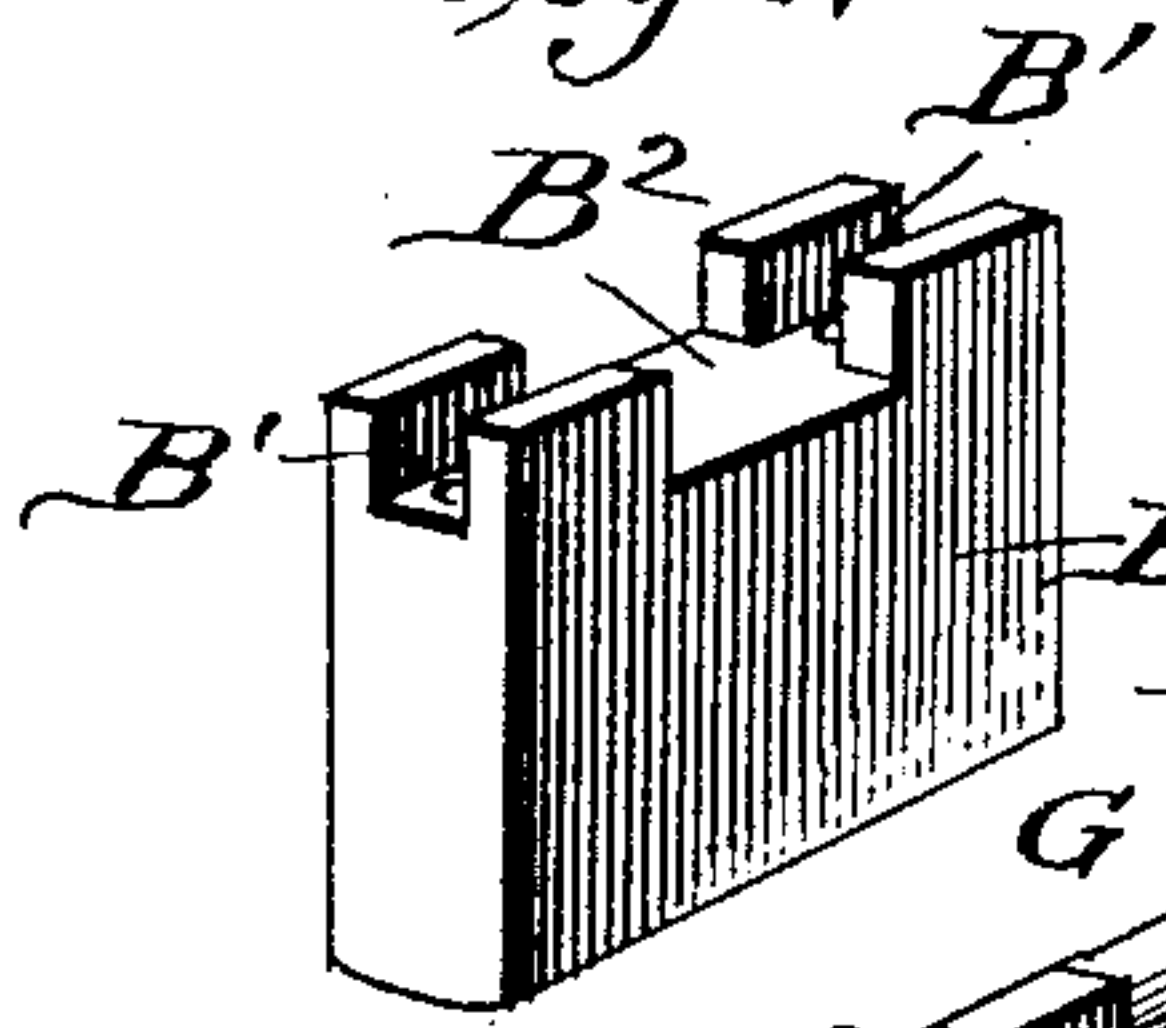


Fig. 7.

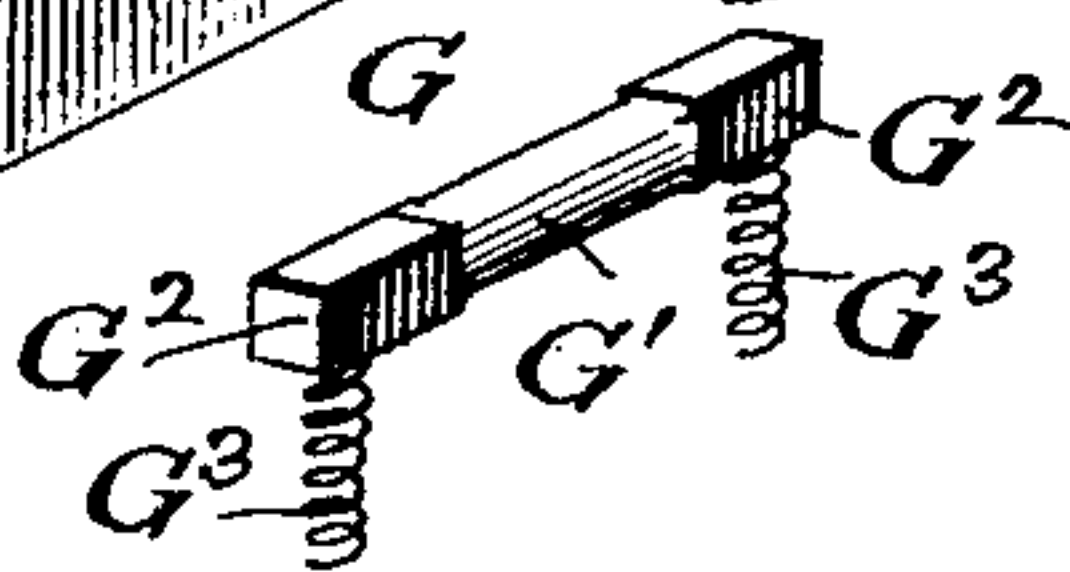


Fig. 8.

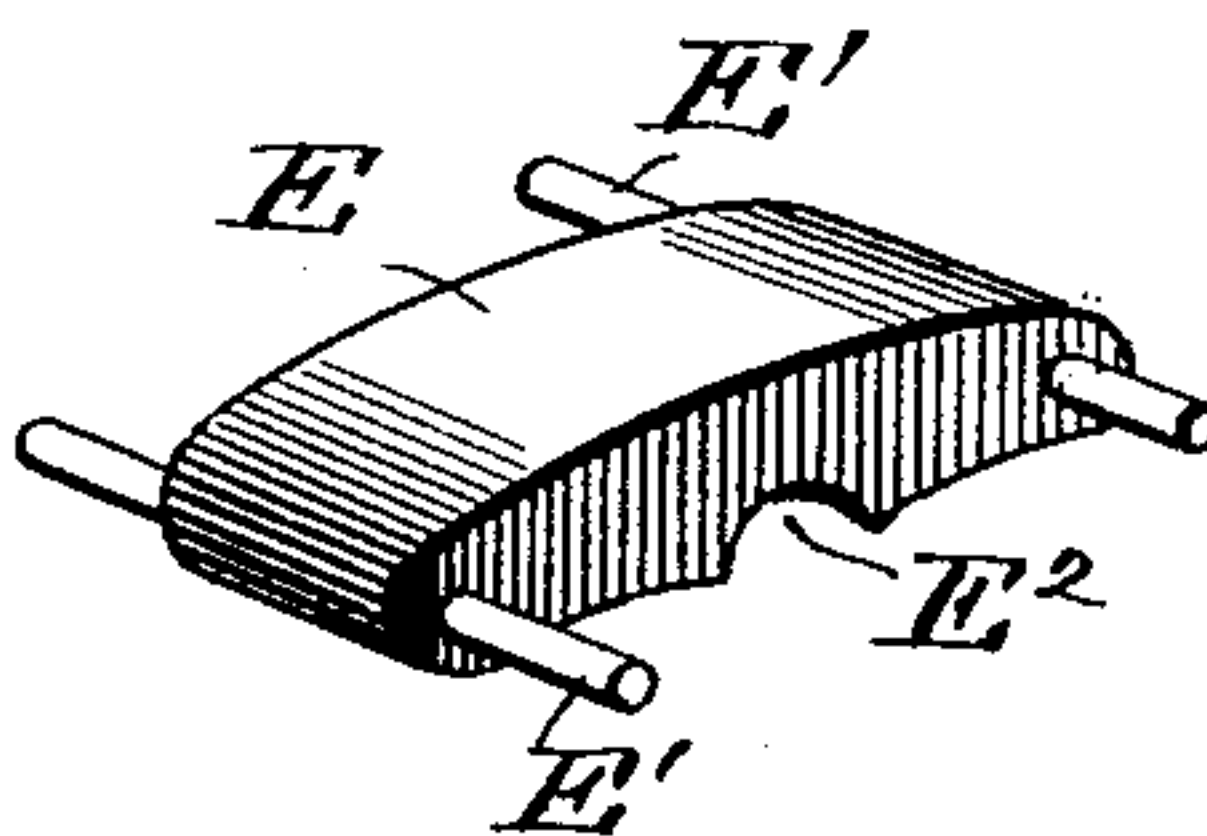
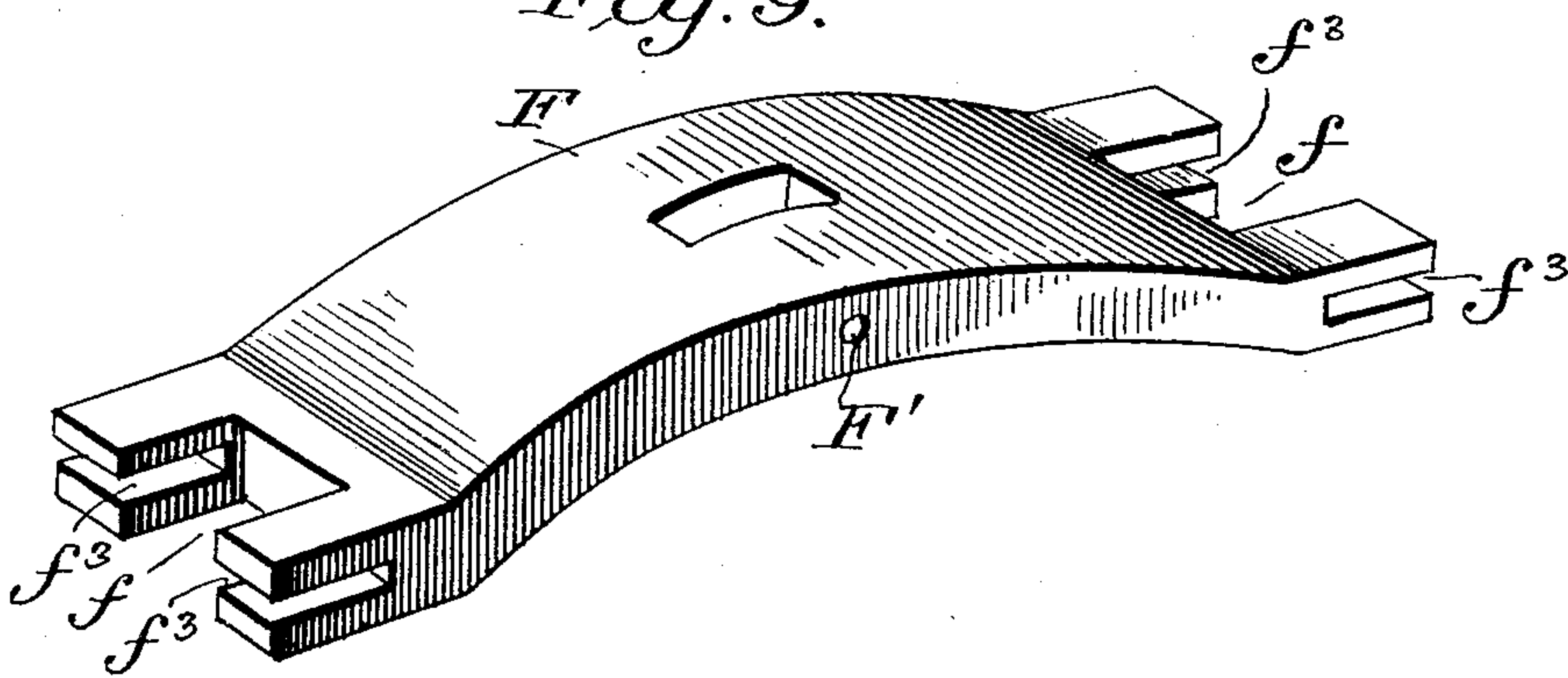


Fig. 9.



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UNITED STATES PATENT OFFICE.

MORGAN D. KALBACH, OF LEBANON, PENNSYLVANIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 713,448, dated November 11, 1902.

Application filed August 5, 1902. Serial No. 118,465. (No model.)

To all whom it may concern:

Be it known that I, MORGAN D. KALBACH, a citizen of the United States, residing at Lebanon, in the county of Lebanon and State of Pennsylvania, have made certain new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention is an improvement in rotary engines; and it consists in certain novel constructions and combinations of parts, as will be hereinafter described and claimed.

In the drawings, Figure 1 is a longitudinal section of my engine on about line 1 1 of Fig. 2. Fig. 1^a is a detail perspective view of the feed-tube and the reversing-valve thereon. Fig. 2 is a cross-section on about line 2 2 of Fig. 2. Fig. 3 is a detail perspective view of the body portion of the valve-head. Fig. 4 is a detail perspective view illustrating one of the cut-off valves and the devices for operating the same. Fig. 5 is a detail perspective view of a fragment of the casing, partly in section, showing the guides for the blades. Fig. 6 is a detail perspective view of one of the blades. Fig. 7 is a detail perspective view of one of the spring-actuated rods interposed between the blades and the yokes. Fig. 8 is a detail perspective view of one of the yokes, and Fig. 9 is a detail perspective view of one of the levers which connect the adjacent yokes.

In carrying out my invention I employ a casing which in operation revolves around the valve-head and is composed of the outer cylinder A, the inner cylinder A', and the radial plates A², which connect the inner and outer cylinders and form guides for the blades B, which operate radially in the said casing and are movable into and out of the interior or bore of the inner cylinder A', as will be understood from Fig. 2 of the drawings. The casing also has ends or heads *a* and *a'*, the latter being suitably secured to the shaft C, which may be supplied with a pulley or other means for transmitting the motion of the casing, which latter revolves around the valve-head in the operation of the engine. The head *a* turns upon the projecting tubular stem D' of the valve-head D, presently described.

The blades B, of which I employ three equidistant from each other, operate between the adjacent connecting-plates A² and move inward and outward by the operation of the le-

ver devices and the bearing of the inner edges of the said blades upon the surface of the valve-head. The partitions or connecting-plates A² are provided between their ends with the recesses A³, in which operate the ends of the yokes E, as shown in Fig. 2. These yokes are provided at their ends with the laterally-projecting pins or studs E' for engagement with the lever F and have in their under sides, between their ends, the groove or seat E², which receives the central rounded portion G' of the pin G. The pin G is provided at its ends with the square portions G², which operate in the grooves B' in the outer edge of the blade B, at the opposite sides of the latter, such blade being provided in its outside with a central recess B², within which operates the central portion of the yoke E in certain positions of the parts. The springs G³ bear between the non-circular ends G² of the pins G and their respective blades and operate to press such blades normally toward and against the valve-head D and at the same time permit a yielding joint between the said plates and their respective yokes. The levers F pivot between their ends at F' to the outer ends of rocking bars F², whose inner ends are pivoted at *f*² to the inner cylinder A', and the opposite ends of the levers F are slotted at *f* to receive the ends of the yokes E, and the arms F³, formed by said slots *f*, are slotted at *f*³ to receive the pins E' of the yokes, so the levers and yokes may operate as desired and may have a sliding movement along each other at their meeting ends, as will be understood from Figs. 2, 8, and 9. By the described construction it will be noticed the movement of the blades B are related to each other, and the movements of one will effect a proper relative movement of the others, so that each blade controls the others and is in turn controlled thereby.

The valve-head D is approximately oval in cross-section, with its major axis of a length approximately equal to the inner diameter of the inner cylinder A', and is provided at its ends with what for convenience of reference I term the "abutments" H, which bear snugly within the inner cylinder and form abutments for the steam, which operates between them and the blades in the operation of the engine. This valve-head has a body portion

(shown in detail in Fig. 3) preferably composed of the central section d and the end sections d' , suitably secured to the central section, this construction being preferred for convenience in manufacturing the head and in producing the chambers and ports therein, as will be presently described. I also preferably provide the portions d' with grooves d^2 to receive suitable packing-strips, as will be understood from Fig. 2 of the drawings. The valve-head D has the integral tubular stem D' and is provided at the inner end of the bore of said stem with a chamber I for the reversing-valve J. This chamber I is circular in cross-section, so the reversing-valve can be turned therein, and steam-passages K and K' lead from the valve-chamber I outwardly and open on opposite sides of the abutments H, such steam-passages being provided at L with seats for the cut-off valves M and M', which operate, respectively, in the steam-passages K and K', as will be understood from Fig. 2 of the drawings.

The cut-off valves are pivoted at m , so they can lock to the different positions shown in Fig. 2, and they are connected by links N with the swinging ends O' of levers O, which levers are arranged in pairs and are pivoted at their adjacent ends O² to the body-section d of the valve-head. The valve-head is grooved at d^3 to receive the levers O, as shown in Fig. 3.

The reversing-valve J is flattened on opposite sides at J² to discharge the exhaust, and said valve is on the inner end of the tubular feed-pipe J³, the bore J⁴ having discharge-ports J⁵, which may be adjusted into register with the steam-passages K or K', as shown in Fig. 2. The exhaust passes from the passages K or K' along the flat sides J² of the reversing-valve and thence into the tubular stem D' of the valve-head and out through a discharge-pipe P, as shown in Fig. 1. Means are provided for shifting the position of the reversing-valve, consisting, as shown, of a lever Q on the feed-shaft J³ and having an arm Q', grooved at Q² to slide along the sector Q³, mounted on the stem D', as will be understood from Fig. 1 of the drawings.

Suitable stuffing-boxes and packing-strips may be provided wherever necessary.

In operation when the parts are in the position shown in Fig. 2 the steam will be delivered from the reversing-valve to the steam-passages K' and the steam-passages K will be opened to the exhaust-ports provided along the flat sides of the reversing-valve. The blade B at the upper right-hand side of Fig. 2 will bear upon its lever O and will open the cut-off valve which controls the upper passage K, so the live steam will be supplied to operate between the upper abutment and the said blade B and cause the casing to turn in the direction indicated by the arrow in Fig. 2. The lower cut-off valve M will be opened and permit the discharge of the exhaust from in front of the blade B at the

lower right-hand side of Fig. 2, while the blade at the left in Fig. 2 will have completed its operating stroke and will have adjusted to such position as to permit the lower cut-off valve M' to close, the steam then operating expansively between the lower abutment and the blade at the left in Fig. 2 until the blade at the lower right-hand side of Fig. 2 reaches a point where it will operate upon the lever of the lower cut-off valve M' and open said valve to permit the passage of live steam as desired. To reverse the engine, it is only necessary to turn the reversing-valve from the position shown in Fig. 2 to a position where its ports J⁵ will register with the steam-passages K, when the live steam will pass out through the passages K and the exhaust will pass through the passages K'.

By my invention I provide an engine whose direction is readily controlled and in which the blades will so control the cut-off valve as to secure advantage of the direct action and the expansion of the steam in a simple and effective manner.

It will be understood that, as best shown in Fig. 1, the tube of the valve-head is clamped fast to avoid revolving in the opposite direction from that of the outer casing or cylinder, to which end the tube may be clamped in the bearing shown at the right in Fig. 1.

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

1. The improvement in rotary engines herein described, comprising the revolving casing, having inner and outer cylinders, and provided with radial guides for the blades, and with a space between the inner and outer cylinders for the operation of the blade-yokes and connecting-levers, the yokes engaged with the blades, the levers connecting the yokes, the rocking supports to which said levers are pivoted between their ends, the valve-head arranged within the inner cylinder and having a central valve-chamber, abutments at its opposite ends and steam-passages leading from the valve-chamber and opening adjacent to the abutments and on opposite sides thereof, the cut-off valves for controlling said steam-passages, the levers pivoted to the valve-head and connected with the cut-off valves, to operate the same, and arranged for operation by the blades carried by the casing, and the reversing-valve operating in the valve-chamber of the said head and having ports for communicating with the steam-passages and also having exhaust-channels along its sides, substantially as and for the purposes set forth.

2. The combination in a rotary engine with the casing, having inner and outer cylinders connected together and a space between the said cylinders, and provided with guides for the blades, the yokes arranged centrally to operate upon the blades, and the levers connecting the adjacent yokes, the levers and yokes being arranged for operation in the

space between the inner and outer cylinders of the casing, and the head within the inner cylinder, substantially as set forth.

3. The combination in a rotary engine, with the valve-head having abutments and steam-passages, of the casing inclosing said head and having inner and outer cylinders and blade-guides, and the blades and devices connecting the adjacent blades, said devices being located between the inner and outer cylinders of the casing, substantially as set forth.

4. A rotary engine, comprising the head having abutments, and the casing having inner and outer cylinders and fitting over the head, the blades operating in the casing, and bearing at their inner ends against the head, and devices between the inner and outer cylinders for connecting the adjacent blades, substantially as set forth.

5. A rotary engine comprising the valve-head having cut-off valves, the casing revolving on the head and having blades and means whereby the blades may positively open the cut-off valves in the operation of the engine, substantially as set forth.

6. The combination with the casing having blades, of the head operating in the casing and having abutments and steam-passages opening adjacent thereto, the cut-off valves and the levers connected with the cut-off valves and arranged for operation by the blades, substantially as set forth.

7. A rotary engine, comprising the casing having inner and outer cylinders, and connecting-plates between said cylinders and forming guides for the blades and for the blade-yokes, the blades guided by said plates, the blade-yokes arranged between the inner and outer cylinders, the levers connecting the adjacent yokes, and the head operating within the inner cylinder, substantially as set forth.

8. A rotary engine provided with a casing having inner and outer cylinders, blades operating therein and lever devices between the adjacent blades and located between the inner and outer cylinders of the casing, substantially as set forth.

9. The combination in a rotary engine, with the inner and outer casing-cylinders, of the blades, yokes for said blades, the spring-actuated pins having sliding connection with the blades and bearing against the yokes, and the levers connecting the opposite ends of the yokes with the adjacent yokes, substantially as set forth.

10. The combination with the casing and the blades, of the yokes, connections between the said yokes and the blades, the yokes being provided at their opposite ends with the lateral studs or pins, and the levers connecting the adjacent yokes and having their ends slotted to receive the ends of the yokes and provided in the arms formed by said slots with slots receiving the pins of the yokes, substantially as set forth.

11. In a rotary engine the combination with the inner and outer casing-cylinders, of the

blades sliding in the inner cylinder, the yokes for said blades, the levers connecting the adjacent yokes, and rocking bars to which said levers are pivoted at their middles, substantially as set forth.

12. In a rotary engine, the combination with the casing, having the blades, of the valve-head having a central chamber for the reversing-valve, and provided with opposite abutments and with the passages leading from the valve-chamber adjacent to said abutments, the cut-off valves and the levers connected with said cut-off valves for operation by the blades, substantially as set forth.

13. A rotary engine comprising the casing, the blades sliding in the casing, the yokes rockable between their ends upon the blades, and means connecting the ends of the adjacent yokes, substantially as set forth.

14. In a rotary engine, the combination with the casing, of the sliding blades, the yokes for said blades rockable in connection therewith, the levers connecting the adjacent yokes, and movable supports to which said levers are pivoted between their ends, substantially as set forth.

15. In a rotary engine, the valve-head having a central valve-chamber, abutments and passages leading from the valve-chamber adjacent to the abutments, the valve controlling said chamber and the cut-off valves for controlling the steam-passages, substantially as set forth.

16. In a rotary engine, the casing, the valve-head therein having abutments and passages opening on opposite sides of the abutments, cut-off valves controlling said passages, and means operating within the casing-head to operate the cut-off valves.

17. The combination with the head having opposite passages for the discharge of live and exhaust steam, cut-off valves for controlling said passages, and a reversing-valve turning within the head, substantially as set forth.

18. In a rotary engine, a valve-head having central portions provided with the valve-chamber, and provided with steam-passages, and the abutment-sections having steam-passages registering with those in the body-section, and cut-off valves controlling said passages, substantially as set forth.

19. The combination in a valve-head with the main section having the steam-passage of the abutment-section having a steam-passage registering with that in the main section, a cut-off valve operating in the passage of the main section and seating against the inner end of the abutment-section and means for operating the cut-off valve, substantially as set forth.

20. The combination of the valve-head having a valve-chamber, and steam-passages leading therefrom, the cut-off valve controlling said passages, the levers pivoted at one end to the head and connected at their other ends with the cut-off valves, and means op-

erating upon said levers for opening the valves, substantially as set forth.

21. The combination of the casing, the valve-head having a valve-chamber and a tubular stem for the discharge of the exhaust-steam, and provided with abutments and with steam-passages leading from the valve-chamber and discharging adjacent to said abutments, and with cut-off valves and means for operating the same from the casing, and the reversing-valve operating in the valve-chamber and connected with the feed-pipe and having chambers at its opposite sides for the discharge of the exhaust-steam, substantially as set forth.

22. The combination of the valve-head having the opposite abutments and provided with the central steam-chamber and the pas-

sages leading therefrom, and opening adjacent to the abutments, the reversing-valve operating in the central chamber, the cut-off valves operating in the steam-passages, the levers pivoted at one end to the head and connected at their other ends with the cut-off valves, and arranged for operation by the blades, the blades, the casing having inner and outer cylinders and provided with guides for the blades, the yokes, intermediate devices between the yokes and their respective plates, and the levers connecting the adjacent yokes, substantially as and for the purposes set forth.

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