

No. 719,163.

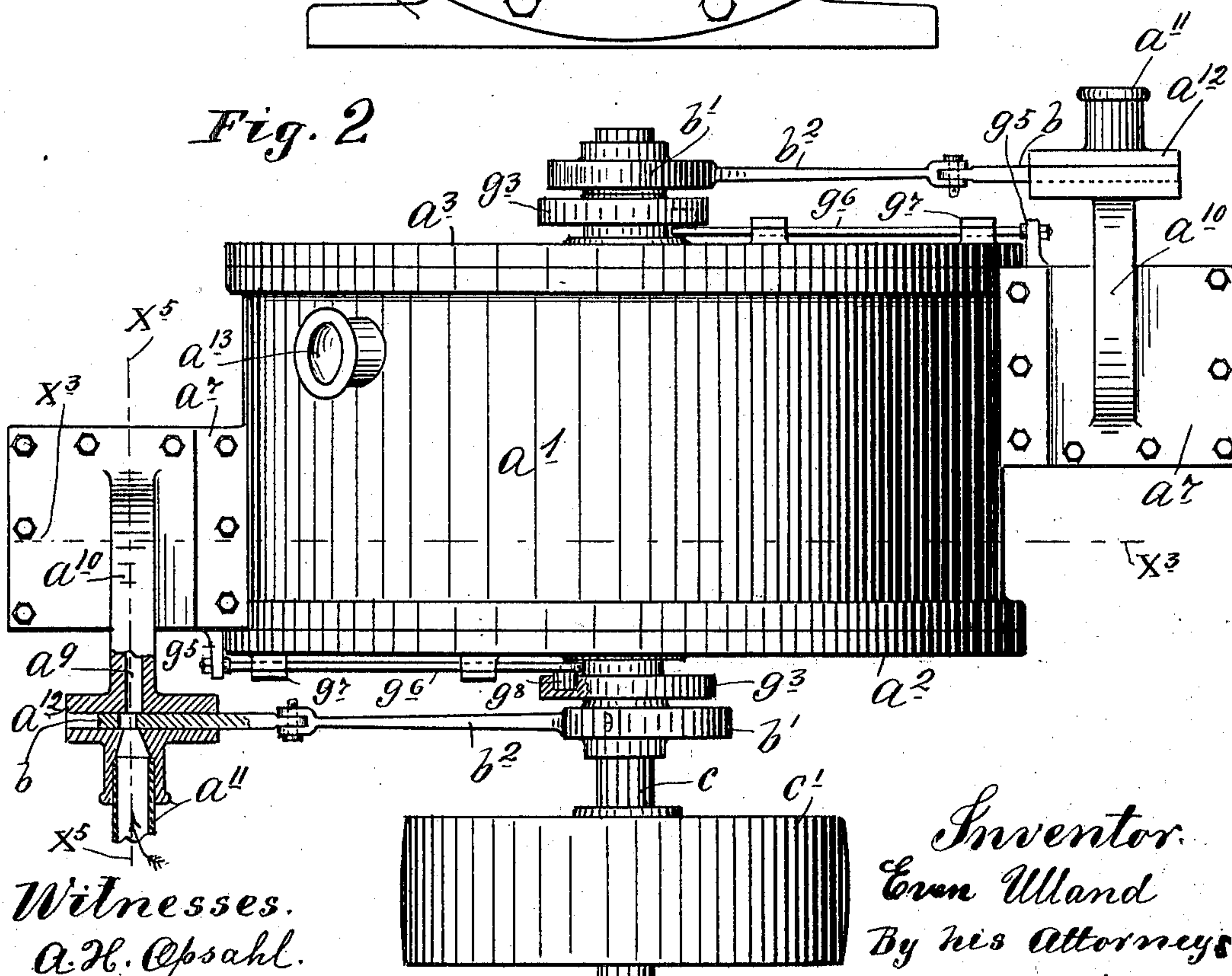
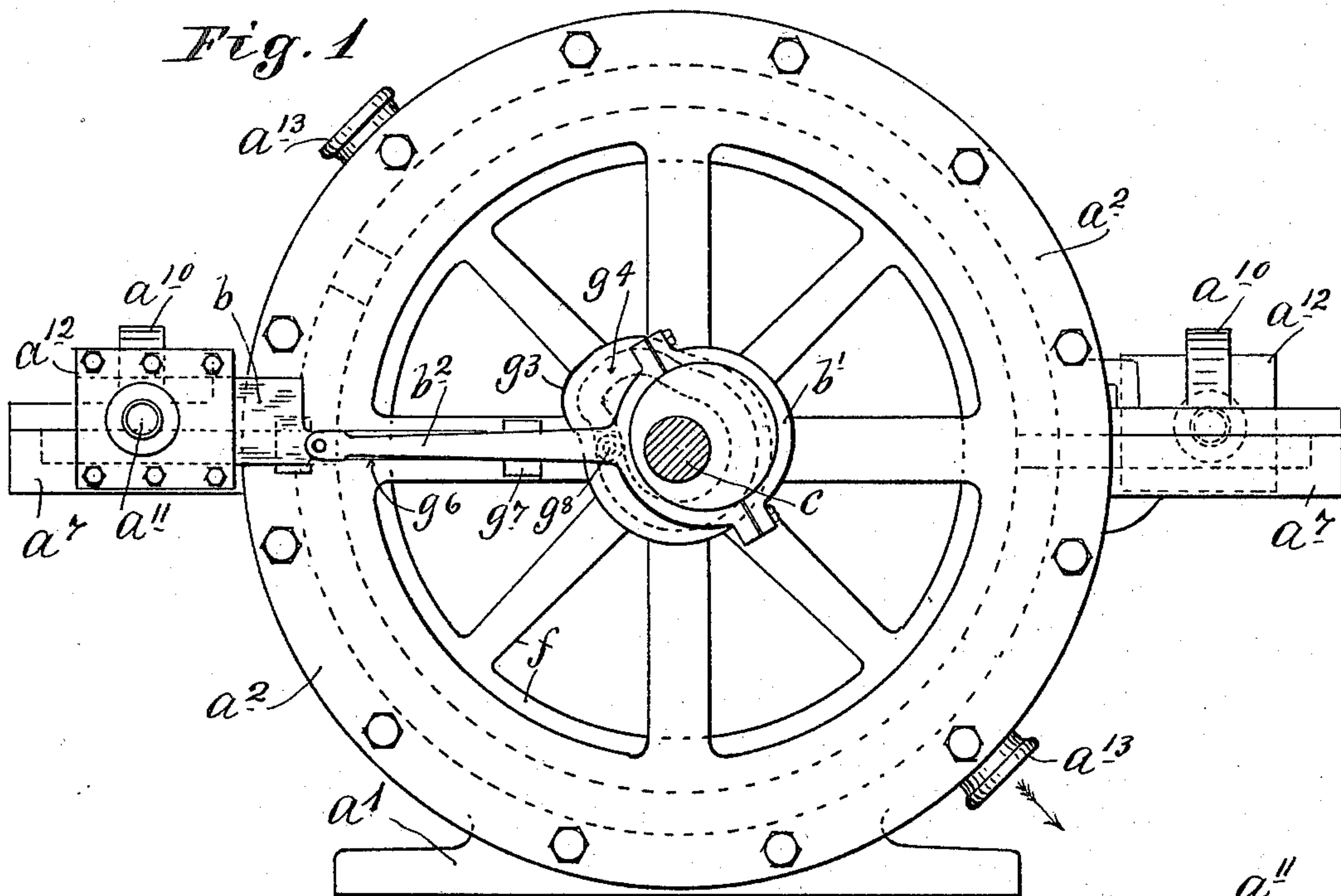
PATENTED JAN. 27, 1903.

E. ULLAND.
ROTARY ENGINE.

APPLICATION FILED NOV. 11, 1901.

NO MODEL.

3 SHEETS—SHEET 1.



Witnesses.
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H. D. Kilgore

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3 SHEETS—SHEET 2.

Fig. 3.

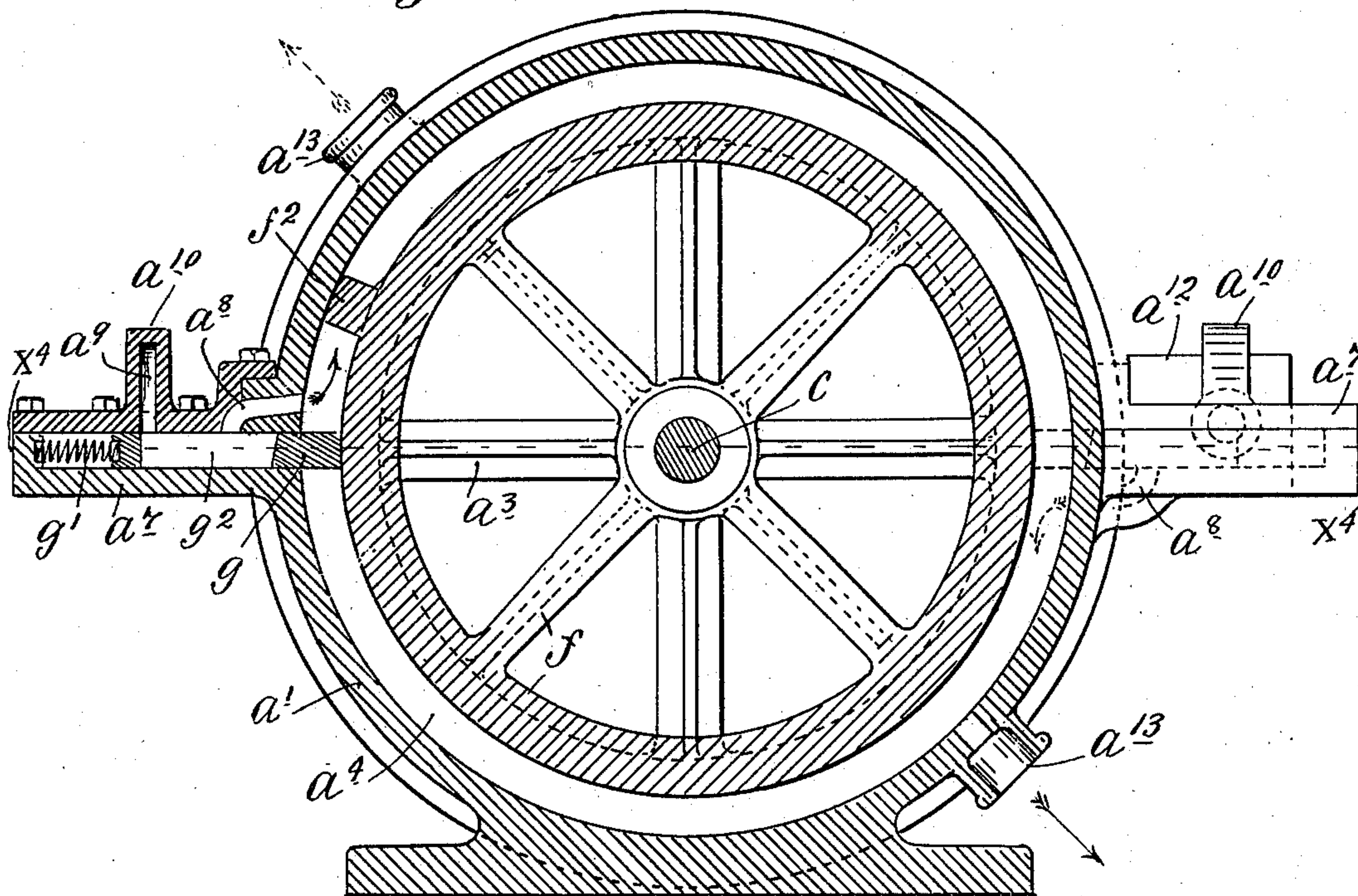
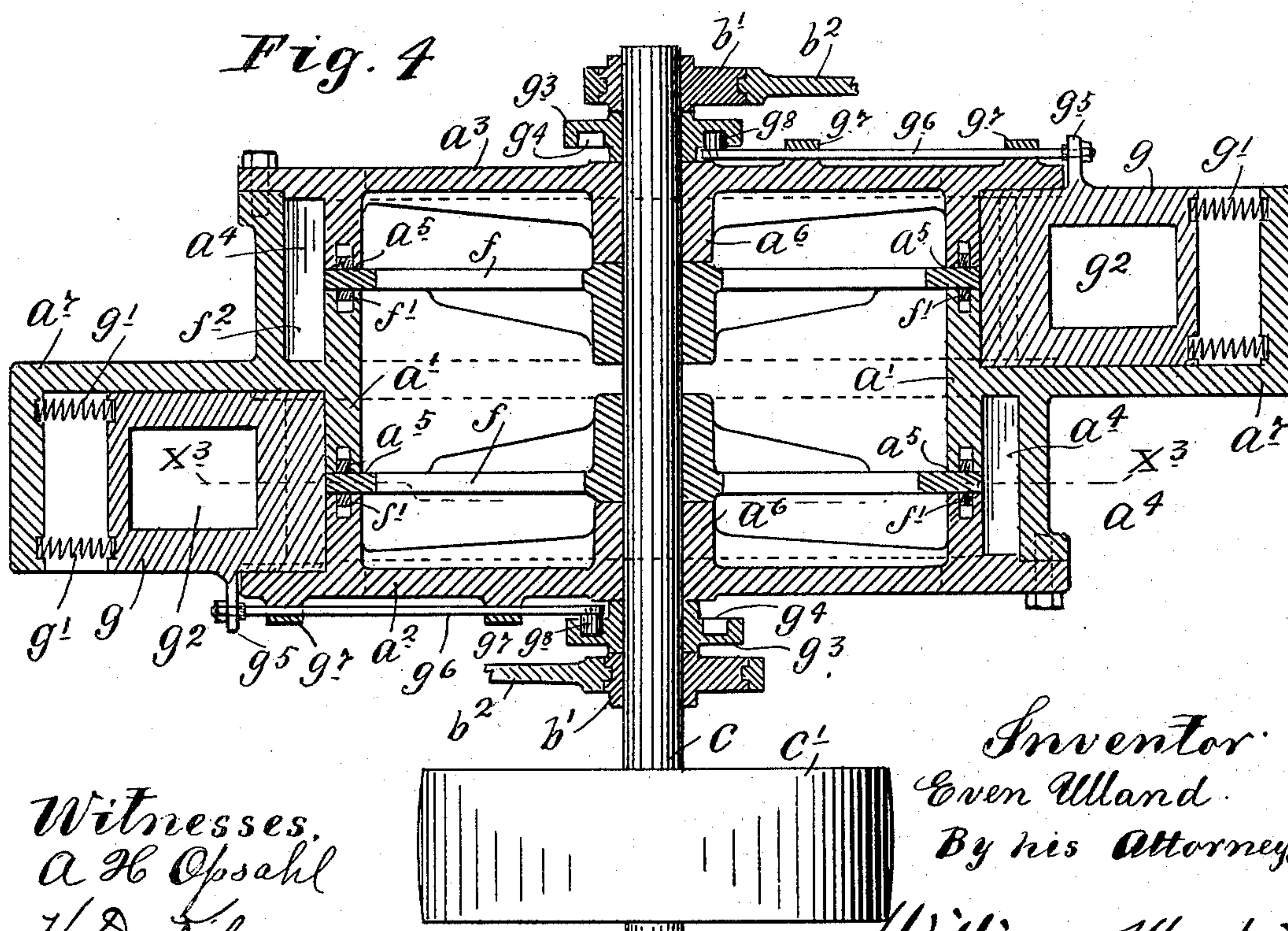


Fig. 4



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3 SHEETS—SHEET 3.

Fig. 6.

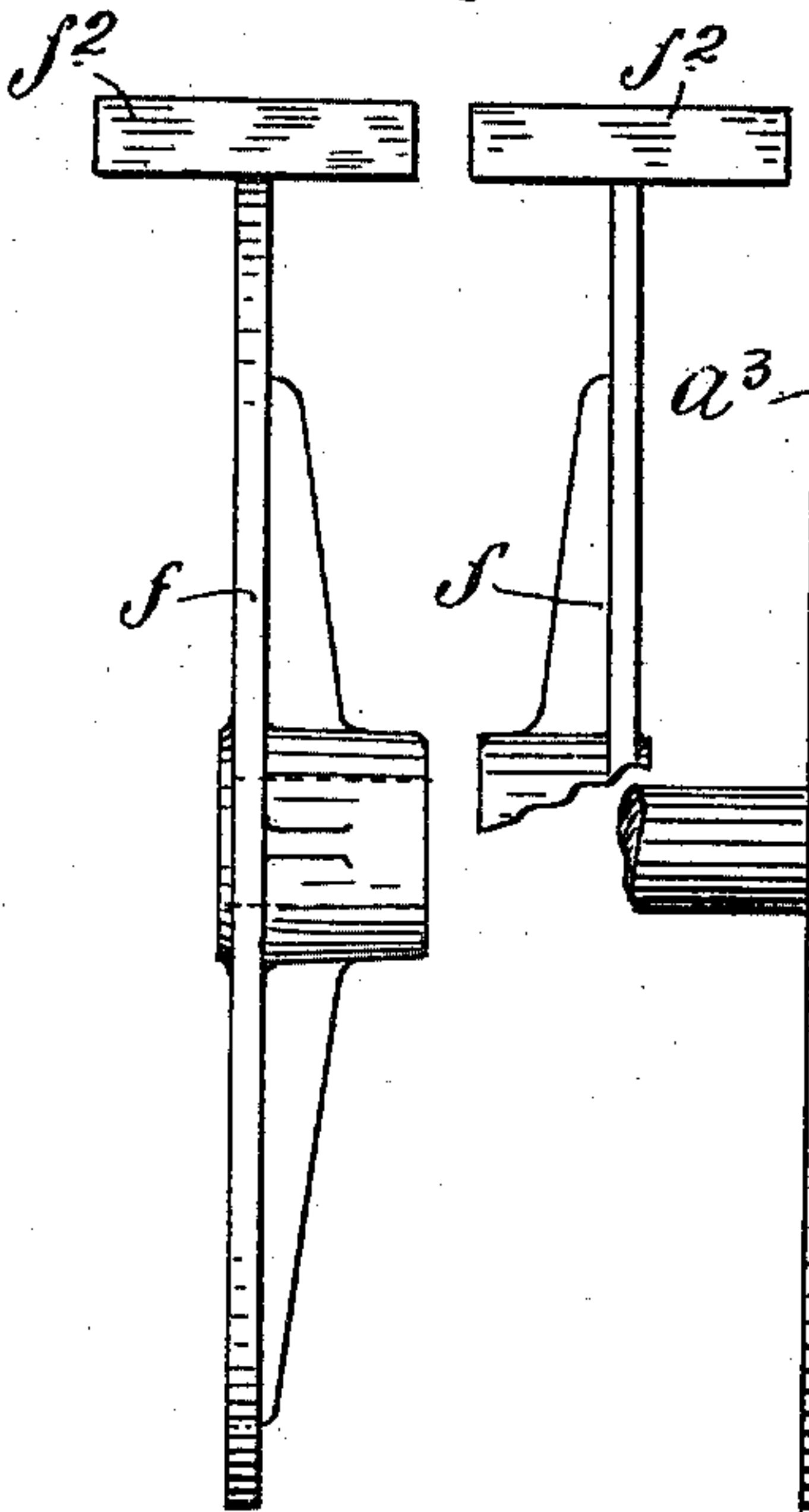


Fig. 5.

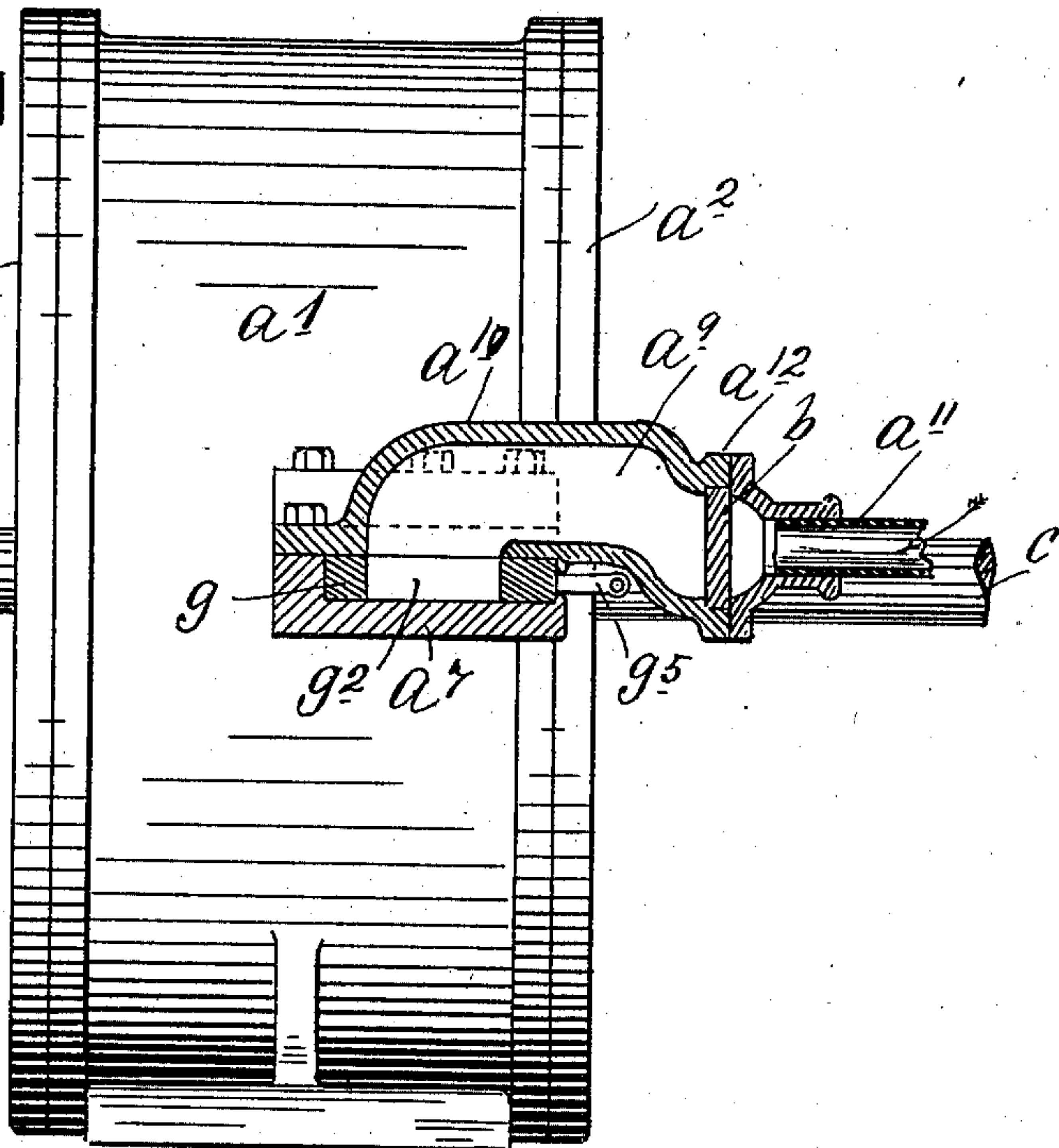
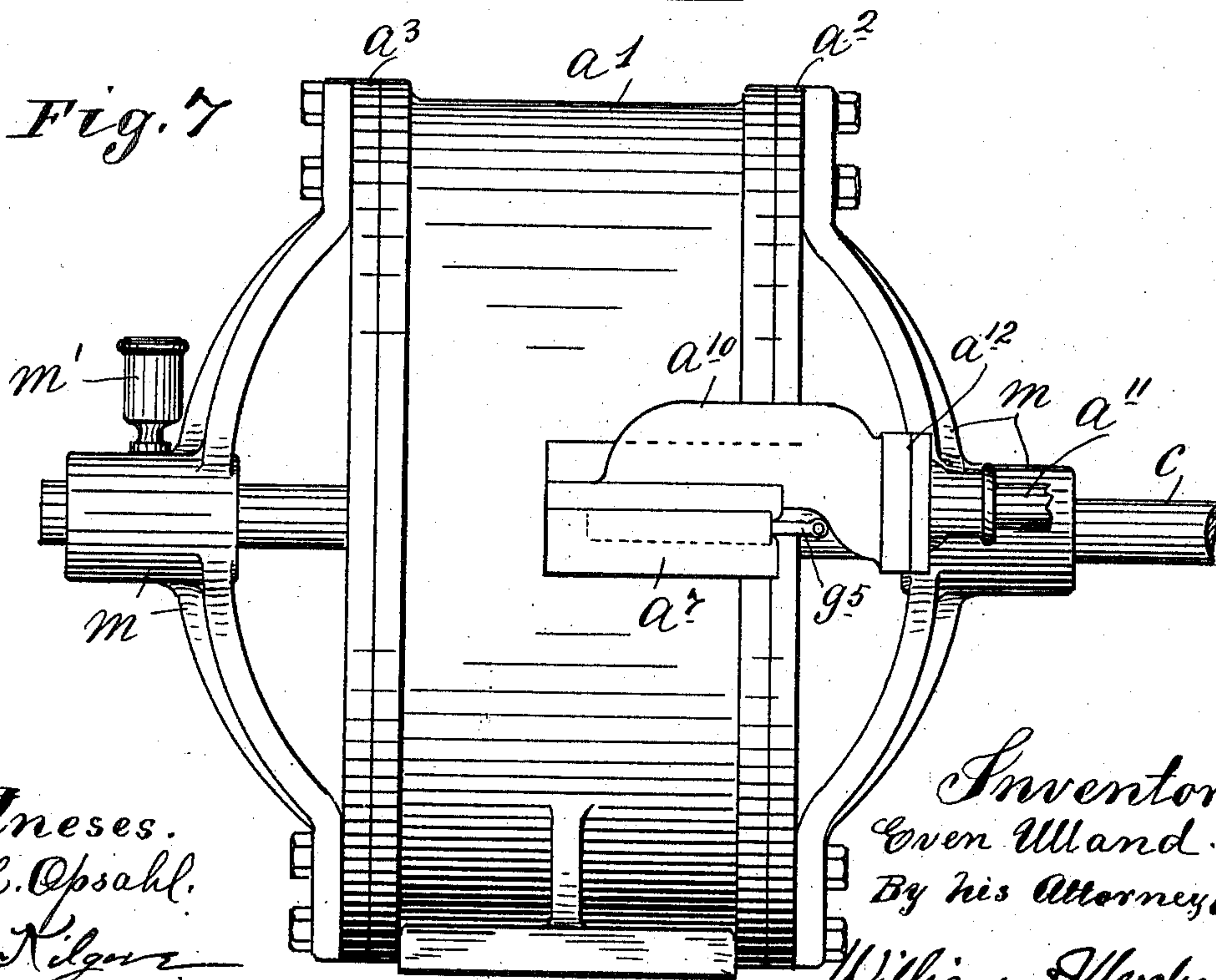


Fig. 7.



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UNITED STATES PATENT OFFICE.

EVEN ULLAND, OF MINNEAPOLIS, MINNESOTA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 719,163, dated January 27, 1903.

Application filed November 11, 1901. Serial No. 81,822. (No model.)

To all whom it may concern:

Be it known that I, EVEN ULLAND, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Rotary Engines; and I do hereby 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.

My invention relates to rotary engines, and has for its object to improve the same in the several particulars hereinafter noted.

The invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a right side elevation showing an engine embodying my invention. Fig. 2 is a plan view of the engine with some parts broken away. Fig. 3 is a vertical section on the line $x^3 x^3$ of Figs. 2 and 4. Fig. 4 is a horizontal section on the line $x^4 x^4$ of Fig. 3. Fig. 5 is a view, partly in elevation and partly in section, on the line $x^5 x^5$ of Fig. 2. Fig. 6 is a detail view in plan and with some parts broken away showing the pair of rotary pistons removed from working position; and Fig. 7 is a view corresponding to Fig. 5, but with all parts shown in full and illustrating a slightly-modified construction of the shaft-bearings.

The cylinder-casting is made up of three sections $a^1 a^2 a^3$ and is formed with a pair of annular piston-seats a^4 . The sections $a^1 a^2 a^3$ are bolted or otherwise rigidly but detachably secured together, and at their inner portions they are spaced apart at a^5 to form narrow annular passages for the piston disks or wheels, as will be hereinafter made clear. The outer piston members $a^2 a^3$ are connected by radial arms with bearing-hubs a^6 . The intermediate piston member a^1 is provided at diametrically opposite points with radially-projecting abutment-seats a^7 , which open one into each of the annular piston-seats a^4 . Admission-ports a^8 open from the intermediate portions of the abutment-seats a^7 into the corresponding pis-

ton-seats a^4 ahead of the said piston-seats with respect to the direction of travel of the pistons. Steam-supply ports a^9 , formed in narrow neck portions a^{10} , open into the abutment-seats a^7 , and steam-supply pipes a^{11} open into the said supply-passages a^9 . Suitable cut-off valves b work in suitable seats a^{12} in the said neck portions a^{10} . These cut-off valves b are operated as hereinafter described.

a^{13} indicates exhaust-ports which open at diametrically opposite points, one from each of the annular piston-seats a^4 .

c indicates the engine-shaft, which is suitably mounted in the bearing-hubs a^6 , previously noted, and is shown as provided at one end with a pulley c' , from which power may be transmitted through a belt. (Not shown.) Rigidly secured to the shaft c between the bearing-hubs a^6 is a pair of so-called "piston-wheels" f , the peripheral portions of which are annular and work closely within the annular seats a^5 . Suitable annular packings f' form steam-tight joints between these annular portions of the wheels f and the annular sides of said seats a^5 . Each wheel f has rigidly secured to its peripheral portion a transversely-extended piston head or block f^2 , which closely fits within the corresponding annular piston-seat a^4 . Suitable packings (not shown) may be carried by the piston-heads f^2 to form steam-tight joints between the same and their seats.

A radially-movable abutment g works freely within each abutment-seat a^7 . These abutments are yieldingly forced inward by springs g' , and they are cut away at their central portions at g^2 to afford passages which always leave the steam-ports a^8 and a^9 in communication.

On each end of the shaft c , just outward of the cylinder-castings, is a cam g^3 , which has a profile cam-groove g^4 , the outline of which is best indicated in Fig. 1. Also on each end of said shaft c is an eccentric b' . The eccentrics b' are set eccentrically on the same radial lines, and they are connected by pitmen or eccentric-straps b^2 , one to each of the cut-off valves b . As the said cut-off valves are located at diametrically opposite points, it is evident that the eccentrics b will cause said valves to open and close in reverse order—

that is, the one is one hundred and eighty degrees in advance of the other with respect to the rotation of the piston-wheels.

Each abutment g has a laterally-projecting lug g^5 , to which is secured the outer end of a stem g^6 , mounted to move in guide-lugs g^7 on the adjacent section of the cylinder and provided at its inner end with a roller or stud g^8 , which works in the cam-groove g^4 of the corresponding cam g^3 . The offset portions of the cam-grooves g^5 extend on the same radial lines, so that the abutments g will be moved the one one hundred and eighty degrees in advance of the other with respect to the movement of the piston-wheels. Under the actions of the said cam-grooves and connections described the abutments as the respective piston-heads f^2 closely approach them are moved outward entirely out of the annular piston-seats a^4 , thereby permitting the said piston-heads to freely pass, and are then quickly moved again inward to their normal positions, (indicated in Figs. 3 and 4,) so that they then serve as abutments. When the parts stand in the position indicated in Figs. 1, 2, and 3, for example, live steam is admitted from the supply-pipe a'' through the ports a^9 , g^2 , and a^8 into the forward piston-seat a^4 between the abutment g and coöperating piston-head f^2 . When the rotary pistons have traveled about ninety degrees, the coöperating admission-valve b will be moved so as to cut off live steam and cause the said rotary piston to be driven under expanding steam until it passes the coöperative exhaust-port a^{13} . From what has above been stated it will of course be understood that while the one piston-head is traveling from the exhaust-point on to the point where it again is subjected to the action of the live steam the other piston-head is being driven either under the action of live steam or caged steam under expansion. Otherwise stated, there is no dead-point in the action of the engine—that is, no point at which the engine may be stopped and not started by the admission of steam. The action of the engine is also rendered continuous and steady.

It is very important to note that the wheel or disk which carries the so-called "piston

head or block" is very narrow as compared with the width of the said head or block, thereby reducing to a minimum the lateral pressure or thrust which is thrown upon the engine-shaft.

It will of course be understood that the engine above specifically described is capable of many modifications as to details of construction within the scope of my invention as herein claimed.

In Fig. 7 the shaft c is shown as mounted in the hubs of laterally-projecting bearing-brackets m , bolted or otherwise rigidly secured to the sides of the cylinder-casting.

m' indicates an oil-cup, shown as mounted on one of the bearings m .

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a rotary engine, the combination with the cylinder-casting made up of the sections $a' a^2 a^3$ having the abutment-seats a^7 , annular piston-seats a^4 with annular slits a^5 , and admission-ports leading into said seats a^4 through said seats a^7 , of the piston-wheels f working in said slits a^5 and provided with piston-heads f^2 fitting said seats a^4 , means for operating said abutments in reverse order, which abutments operate as valves to control the admission of steam, substantially as described.

2. In a rotary engine, the combination with the cylinder-casting made up of the sections $a' a^2 a^3$ having the abutment-seats a^7 with ports a^8 and a^9 , and having the annular piston-seats a^4 with annular slits a^5 and annular packings f' , of the abutments $g g^2$ working in said abutment-seats, the piston-wheels f filling said slits a^5 and provided with piston-heads f^2 fitting said seats a^4 , the cut-off valves b controlling the admission of steam to said ports a^9 , and means for operating said two abutments and said two cut-off valves in reverse order, said abutments acting as valves, substantially as described.

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

EVEN ULLAND.

Witnesses:

ELIZABETH KELIHER,
F. D. MERCHANT.