

G. A. METCALF & W. C. & L. T. ROCHELEAU.  
 ROTARY STEAM ENGINE.

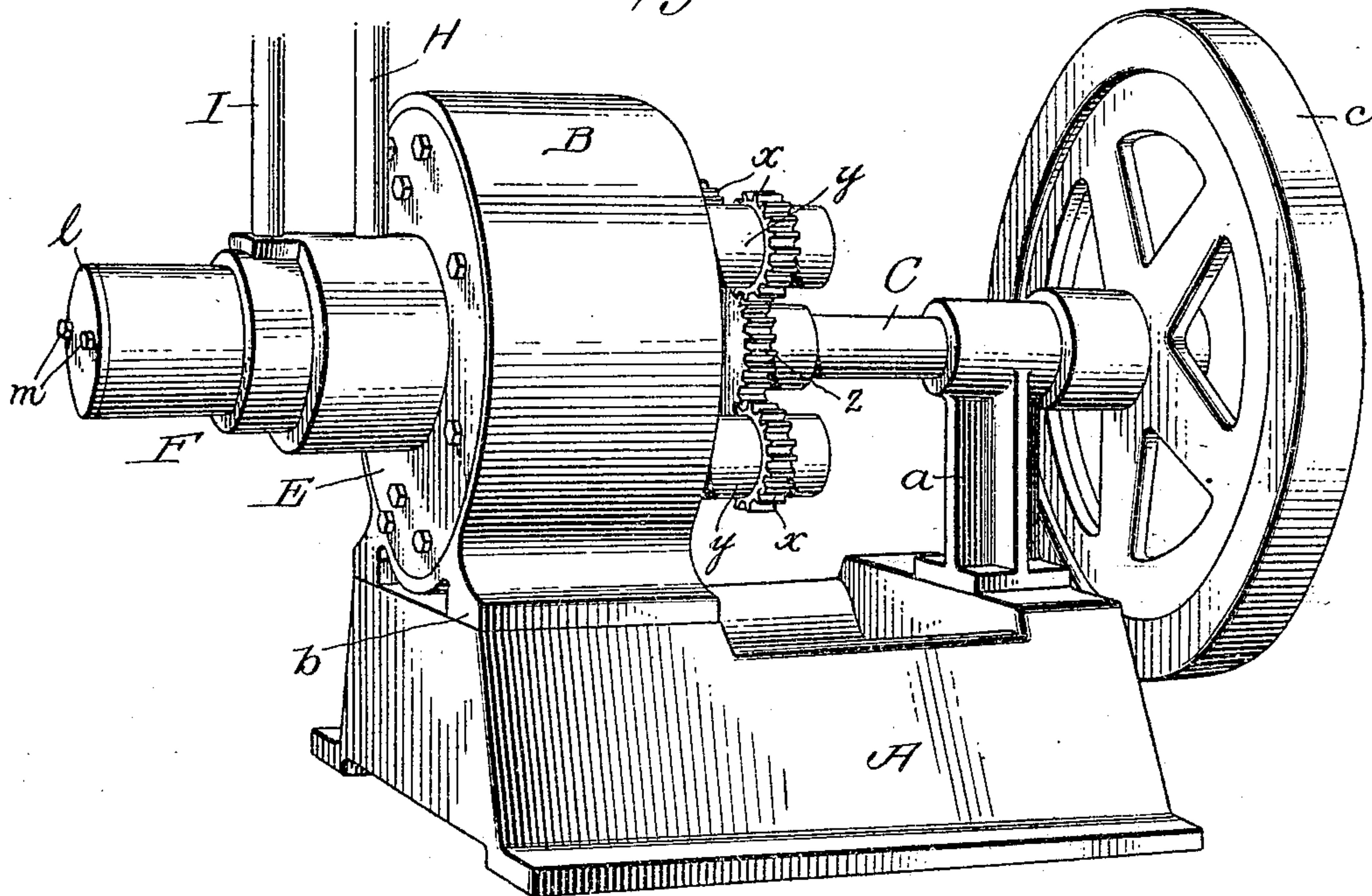
APPLICATION FILED DEC. 27, 1909.

958,416.

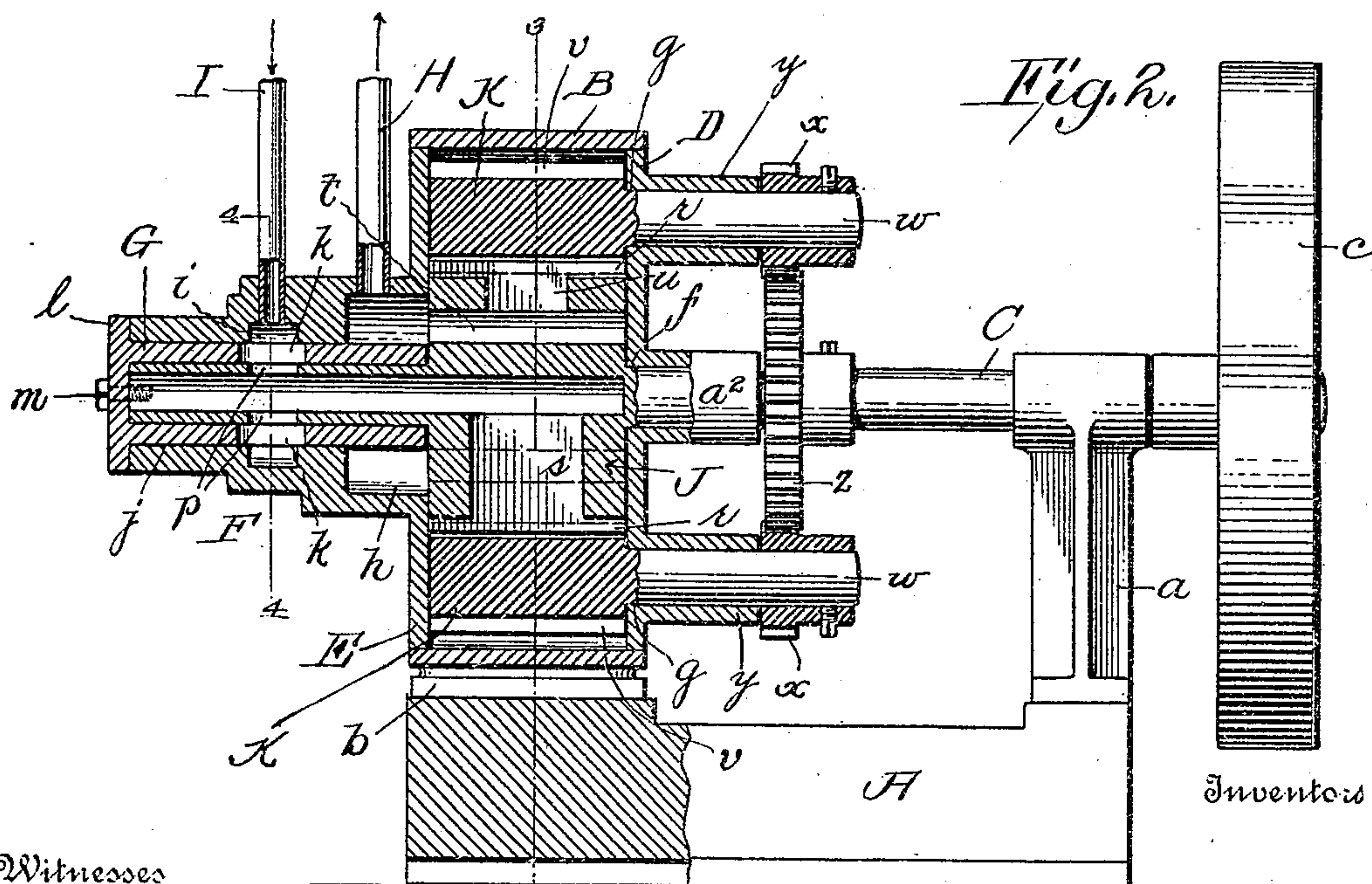
Patented May 17, 1910.

2 SHEETS—SHEET 1.

*Fig. 1.*



*Fig. 2.*



Witnesses

*Oliver M. Holmes*  
*W. C. Deady*

3

*G. A. Metcalf, W. C. Rocheleau & L. T. Rocheleau*  
 For

*James J. Shubert*

Attorney



G. A. METCALF & W. C. & L. T. ROCHELEAU.

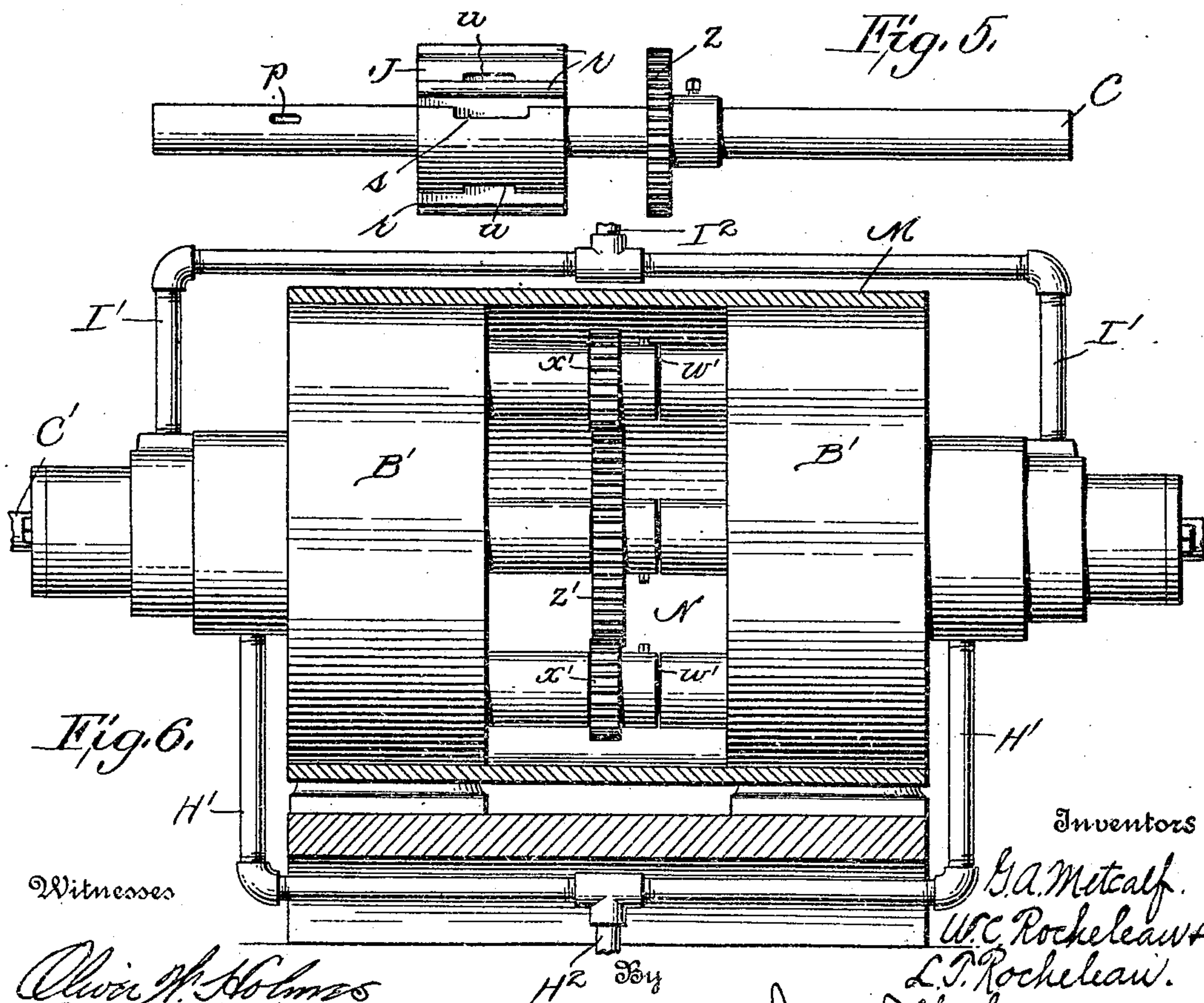
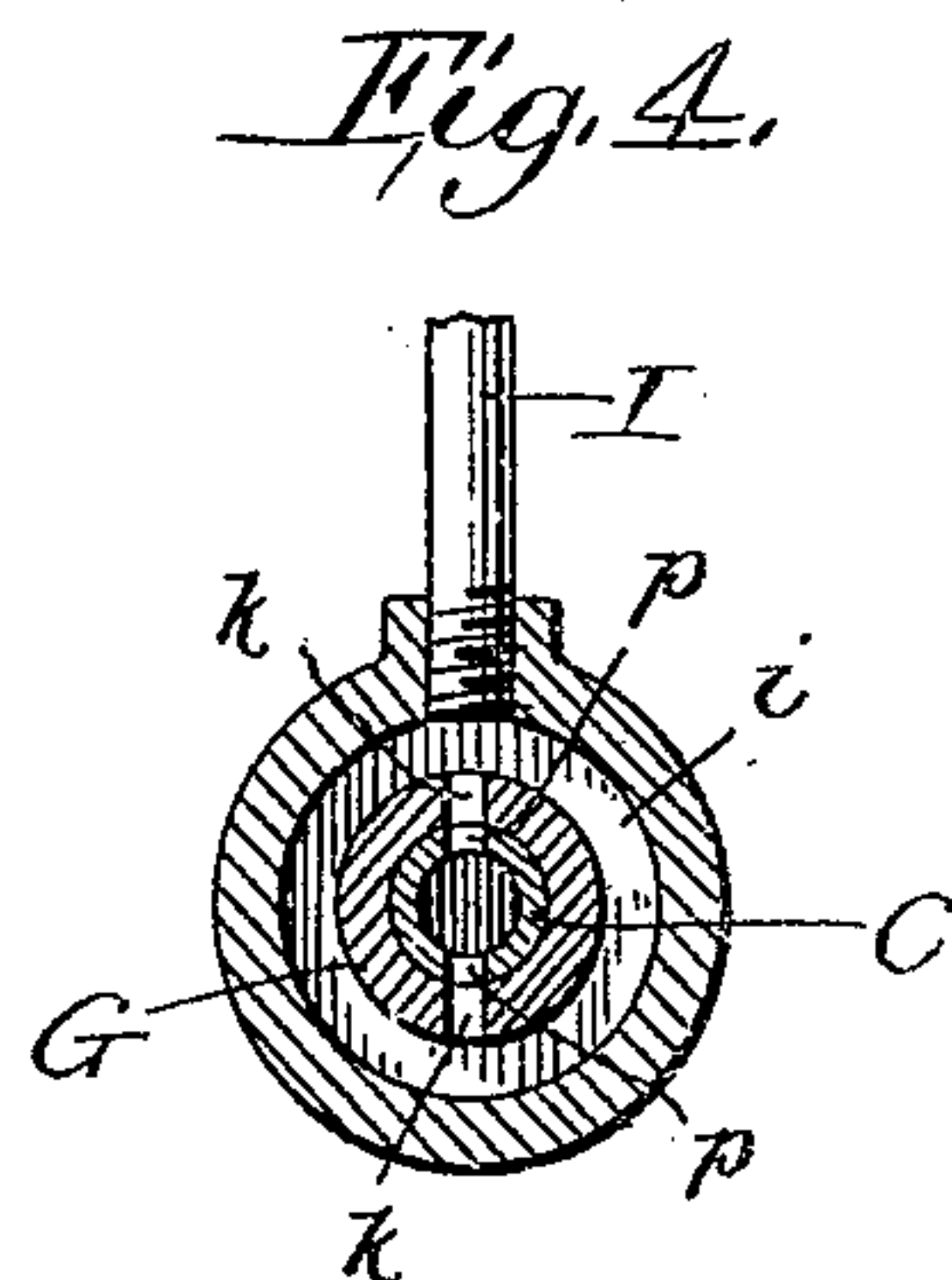
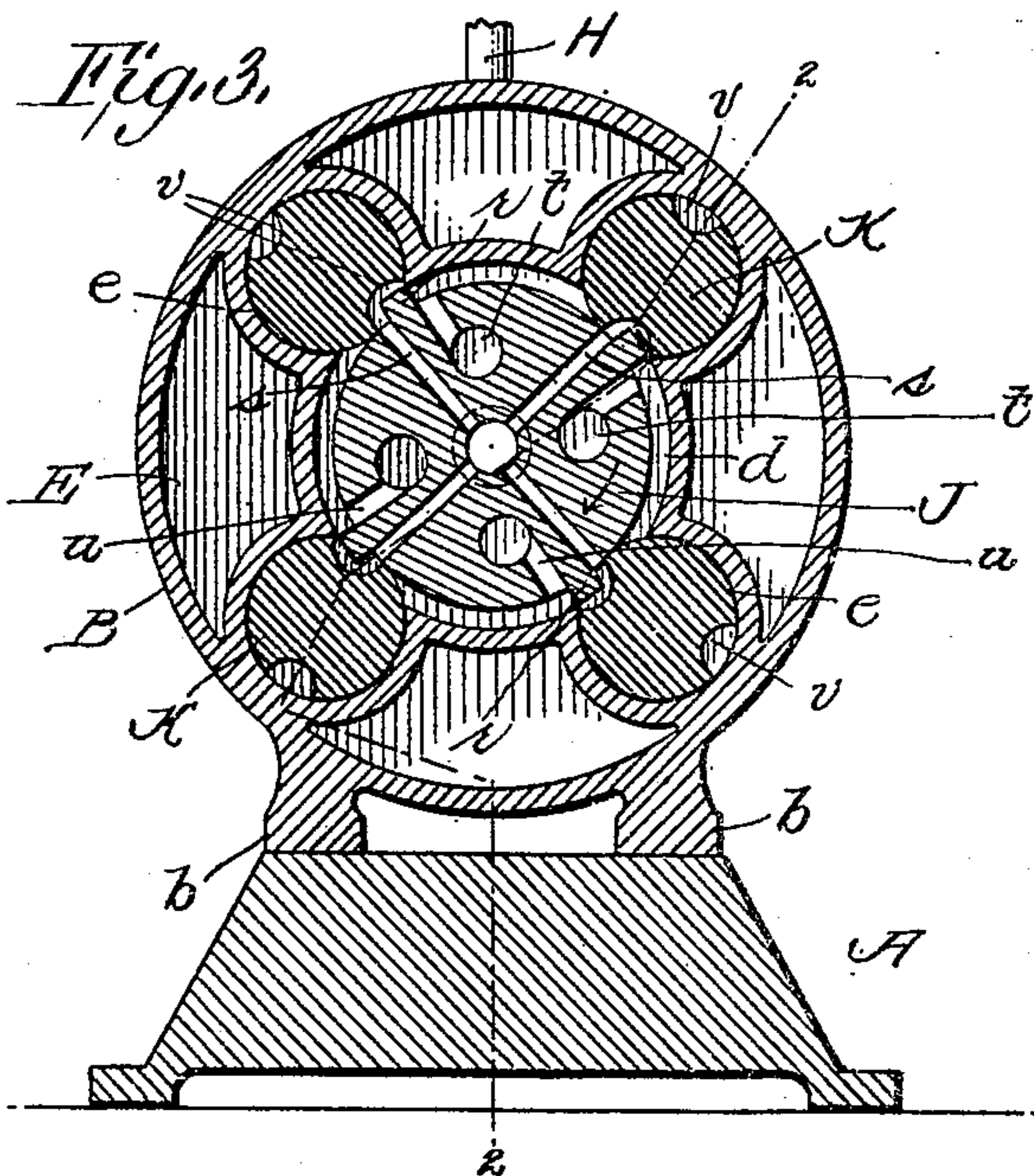
ROTARY STEAM ENGINE.

APPLICATION FILED DEC. 27, 1909.

958,416.

Patented May 17, 1910.

2 SHEETS—SHEET 2.



Witnesses

*Oliver M. Holmes*  
*W. C. Dealy*

Inventors

*G. A. Metcalf.*  
*W. C. Rocheleau &*  
*L. T. Rocheleau.*

*James Shusky* Attorney



# UNITED STATES PATENT OFFICE.

GEORGE A. METCALF, WALTER C. ROCHELEAU, AND LOUIS T. ROCHELEAU, OF  
WOONSOCKET, RHODE ISLAND.

## ROTARY STEAM-ENGINE.

958,416.

Specification of Letters Patent.

Patented May 17, 1910.

Application filed December 27, 1909. Serial No. 535,118.

*To all whom it may concern:*

Be it known that we, GEORGE A. METCALF, WALTER C. ROCHELEAU, and LOUIS T. ROCHELEAU, citizens of the United States, residing at Woonsocket, in the county of Providence and State of Rhode Island, have invented new and useful Improvements in Rotary Steam-Engines, of which the following is a specification.

Our invention pertains to rotary engines, and has for one of its objects to provide a simple, inexpensive and compact rotary engine, and one that is capable of developing considerable horse-power in proportion to its weight.

Another object of the invention is the provision in a rotary engine, of supporting and inclosing means, cylinders disposed therein, and pistons contained in the cylinders and connected together; the cylinders being placed together "quartering," with a view of obviating difficulty in starting the engine.

Other advantageous features of the invention will be fully understood from the following description and claims when the same are read in connection with the drawings, accompanying and forming part of this specification, in which:

Figure 1 is a perspective view of a rotary steam engine constructed in accordance with our invention. Fig. 2 is a view, partly in elevation and partly in longitudinal vertical section of the same; the sectional portion of said view being taken on the line 2—2 of Fig. 3. Fig. 3 is a transverse section, taken in the plane indicated by the line 3—3 of Fig. 2. Fig. 4 is a detail transverse section taken on the line 4—4 of Fig. 2. Fig. 5 is an elevation of the main shaft of the engine, removed. Fig. 6 is a view, partly in elevation and partly in section, showing two cylinders and pistons supported and relatively arranged and connected together in accordance with our invention and in such manner that no difficulty is experienced in starting the engine from any point.

Referring by letter to the said drawings, and more particularly to Figs. 1 to 5 thereof: A is a suitable support having a standard *a*.

B is a cylinder suitably fixed in a bed *b* on the support, and C is the main shaft which is suitably mounted in the standard *a* and cylinder B, and may be equipped with a fly wheel *c*, as shown, and any other de-

sirable appurtenances such as a pulley or gear (not shown) for use in transmitting motion from the shaft to machinery to be driven.

As best shown in Fig. 3, the cylinder B contains an integral frame in which are formed a central circular chamber *d* and a plurality of comparatively small circular spaces *e*; the said spaces *e* being grouped about and arranged in communication with the chamber *d*. It will also be observed by a comparison of Figs. 1 and 2, that the cylinder B is provided with opposite heads D and E, which are bolted together or otherwise suitably fixed with respect to the cylinder. The head D is provided with a central opening *f* for the passage of the main shaft C, and is also provided, about the said central opening, with a plurality of openings *g*. The head E is provided with a central, lateral projection F, and in the said projection is formed a chamber *h* that is directly open to the interior of the cylinder, an annular chamber *i* arranged at the opposite side of the chamber *h*, with reference to the interior of the cylinder, and a bore *j* which extends outward from the interior of the cylinder to the end of the projection. In the said bore is arranged a bushing G having diametrically opposite ports *k* and also having an end flange *l* that is connected by lag screws *m* or other suitable means to the end of the projection. The chamber *h* serves for the connection of an exhaust pipe H, and the chamber *i* for the connection of a steam supply pipe I.

As best shown in Fig. 2, the portion of the main shaft C that extends through the cylinder B and the lateral projection F thereof, is hollow and is provided, in vertical alinement, with the chamber *i*, with diametrically opposite ports *p*, designed during the rotation of the shaft to move into and out of registration with the ports *k* in the bushing G. It will also be observed by comparison of Figs. 2, 3 and 5, that the shaft C is provided with a piston J which is preferably formed integral therewith and is of a less diameter than the chamber *d* of the cylinder frame, in about the proportion illustrated. Said piston J has equidistant blades *r* on its periphery, and also has ports or passages *s* each of which leads outward from the hollow portion of the shaft C to the periphery of the cylinder J at a point



immediately behind one of the blades  $r$ , with reference to the direction of rotation of the piston, as indicated by arrow in Fig. 3. The piston  $J$  is also provided with passages  $t$  which extend longitudinally therein, at points about the center, and communicate at one end with the chamber  $h$  in the cylinder projection  $F$ . Each of the said passages  $t$  is connected by a port  $u$  with the space in front of one of the blades  $r$  of the piston.

Mounted in the circular spaces  $e$  of the cylinder frame are abutments  $K$  of the rolling type, which are provided with opposite recesses  $v$  designed to meet and permit of the passage of the blades  $r$  of the piston. The said rolling or rotary abutments have stems  $w$ , Fig. 2, and on said stems are fixed spur gears  $x$  which are preferably spaced from the adjacent cylinder head  $G$  by sleeves  $y$ . The said spur gears  $x$  are grouped about and intermeshed with a larger spur gear  $z$  that is fixed on the main shaft  $C$  and is preferably spaced from the cylinder head  $D$  by a sleeve  $a^2$ .

It will be gathered from the foregoing that our novel engine does not embody packing around the working parts, this being advantageous inasmuch as it obviates considerable friction and utilizes the small amount of leakage to properly lubricate the said parts. It will also be gathered that the engine is simple, compact and inexpensive and being adapted to develop considerable power in proportion to its weight, may be used to advantage in the propulsion of motor vehicles.

In the embodiment illustrated in Fig. 6, the cylinders  $B'$  are identical in construction with the cylinder  $B$  of Figs. 1 to 3, and the piston and rotary abutments in said cylinders  $B'$  are similar to the piston  $J$  and abutments  $K$  of Figs. 2 and 3, with the exception that the two pistons are carried on a common shaft  $C'$  and the aligned rotary abutments are carried at the opposite ends of stems  $w'$ ; the said stems having fixed thereon spur gears  $x'$  which are intermeshed with a larger spur gear  $z'$  fixed on the main shaft  $C'$ . The cylinders  $B'$  are placed together "quartering", with a view of adapting the engine to start without difficulty from any point. It will also be observed that the cylinders  $B'$  are arranged in a suitably supported casing  $M$  which holds the cylinders in position and serves to retain the heat adjacent the cylinders, and in that way prevents condensation of the steam to a considerable extent. It will also be noted that in the said casing and intermediate the cylinders  $B'$ , a chamber  $N$  is afforded for holding oil in which the gears  $x'$  and  $z'$  work. The pipes  $I'$  for supplying steam to the chambers  $i$  of the two cylinders, are preferably connected with a pipe  $I^2$  for leading live steam from a suitable source of supply,

while the pipes  $H'$  for leading exhaust steam from the chambers  $h$  of the cylinders, are preferably connected to a pipe  $H^2$ , designed to lead to a suitable point of discharge.

While we have shown and described two forms of our invention, it is to be understood that we are not limited to the details or the form or relative arrangement of parts disclosed, but that modifications may be made therein without departing from the spirit thereof.

Having described our invention, what we claim and desire to secure by Letters-Patent, is:

1. The combination in a rotary steam engine, of a cylinder having at one side a lateral central projection in which are formed an annular chamber that communicates with the interior of the cylinder, and a second annular chamber arranged at the opposite side of the first-named chamber, with reference to the cylinder, and in which is also formed a bore; a bushing arranged in the bore of the cylinder projection and having opposite ports in communication with the second-named chamber in said projection; means for leading steam from the first-named chamber; means for supplying live steam through the second-named chamber; rotary abutments mounted in the cylinder and grouped about the center thereof and having opposite recesses and also having stems which extend without the cylinder; spur gears mounted on said stems; a main shaft extending through the cylinder and the lateral projection thereof and having a hollow portion and ports for connecting the interior of said portion with the ports in the bushing, a piston fixed with respect to the said main shaft and arranged in the cylinder and having peripheral blades and passages leading from the hollow portion of the shaft to points behind said blades and also having longitudinal passages which communicate with the first-named chamber, and ports leading from said longitudinal passages to points in front of the blades; and a spur gear fixed on the main shaft and intermeshed with the spur gears on the stems of the rotary abutments.

2. In a rotary steam engine, the combination of a cylinder having at one side a lateral projection containing an inner annular chamber in communication with the interior of the cylinder and also containing an outer annular chamber and a bore that is open at its outer end; a bushing arranged in the said bore and extending through the said chambers and having its interior connected with the outer chamber; means for exhausting steam from the inner chamber; means for supplying steam to the outer chamber; a main shaft having a hollow portion the interior of which communicates at intervals with the outer chamber; a piston



fixed on said shaft and arranged in the cylinder and having peripheral blades and passages leading from the interior of the hollow shaft portion to points behind said  
 5 blades, and also having longitudinal passages in communication with the inner chamber, and ports leading from said longitudinal passages to points in front of the blades, rotary abutments mounted in the cylinder about the piston and having recesses  
 10 to receive and permit the passage of the piston blades; and means intermediate the main shaft and the abutments for rotating the latter by the former.

15 3. In a rotary steam engine, the combination of a suitably supported casing, cylinders arranged in said casing and spaced apart whereby a chamber is formed between them in the casing; said cylinders being  
 20 placed together "quartering", a main shaft extending through the cylinder and having a hollow portion, pistons arranged in the cylinders and having peripheral blades and passages leading from the interior of the  
 25 hollow portion of the shaft to points behind

the blades and also having longitudinal passages connected by ports with points in front of the blades, chambers communicating with the outer ends of the said longitudinal passages of the pistons and having exhaust  
 30 ports, chambers surrounding the hollow portion of the shaft, means for supplying steam to the latter chambers, means for effecting connection between the latter chambers and the interior of the hollow shaft during the  
 35 rotation of the latter, rotary abutments grouped about the pistons in the cylinders, and means intermediate the main shaft and the said abutments for rotating the latter by the former; said means being located in  
 40 the chamber between the cylinders.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

GEORGE A. METCALF.  
 WALTER C. ROCHELEAU.  
 LOUIS T. ROCHELEAU.

Witnesses:

GEORGE M. DE COSTA,  
 EDGAR L. SPAULDING.