

No. 607,678.

Patented July 19, 1898.

F. E. BRAINERD.
ROTARY ENGINE.

(Application filed June 11, 1897.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1,

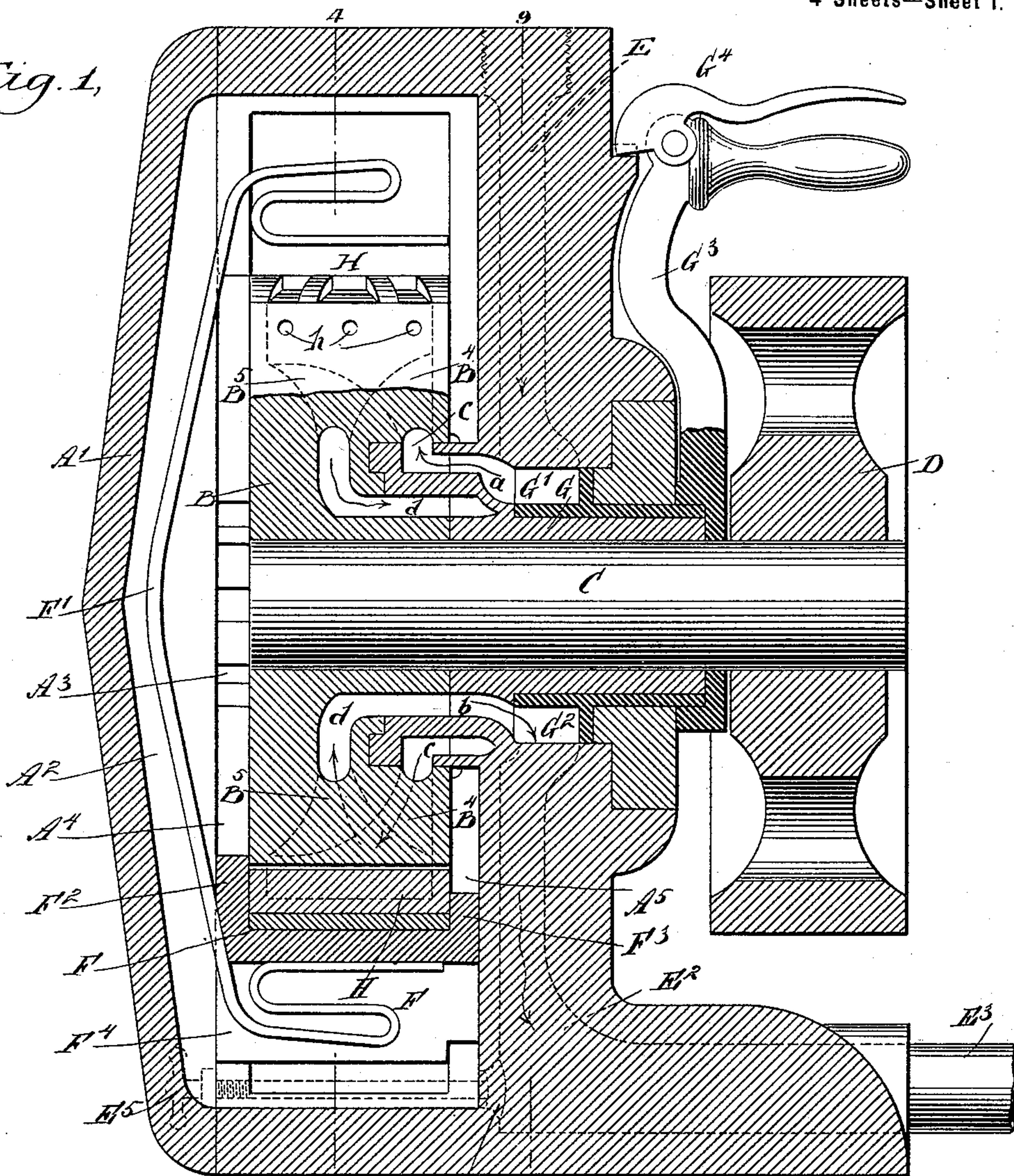
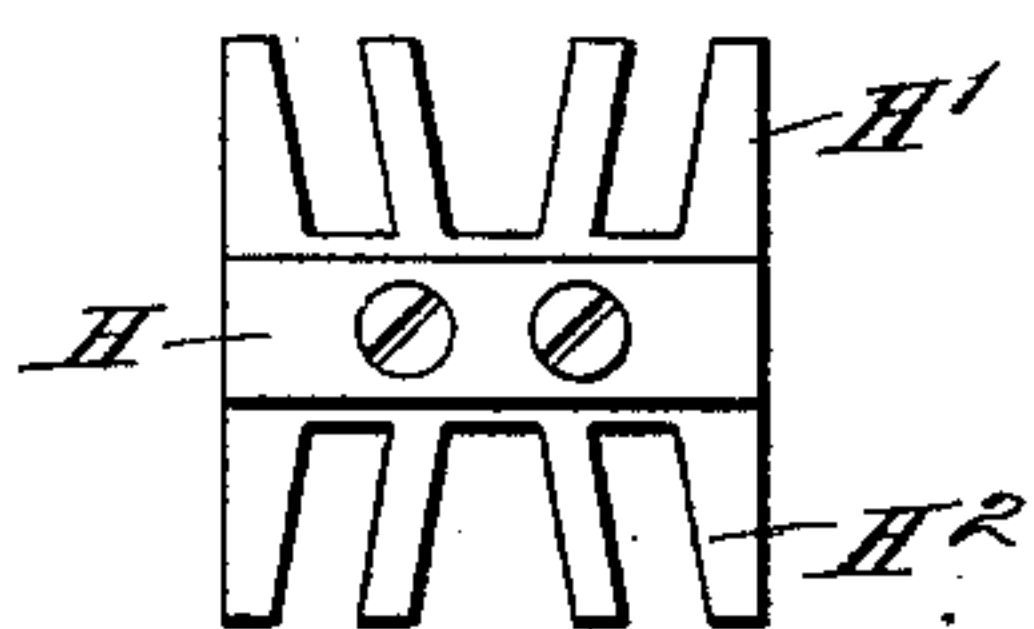


Fig. 3,



WITNESSES:

H2

Fig. 2,

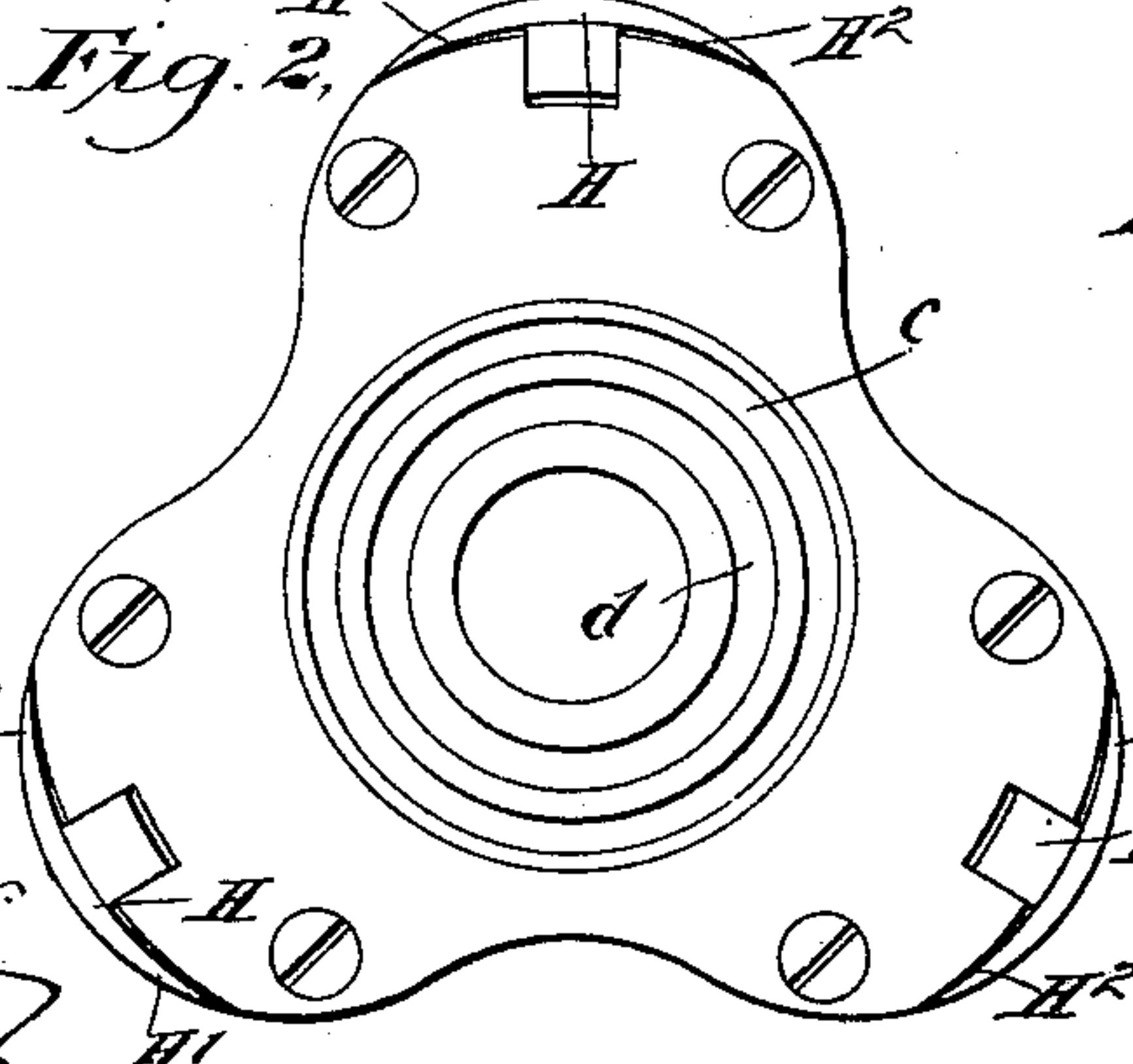
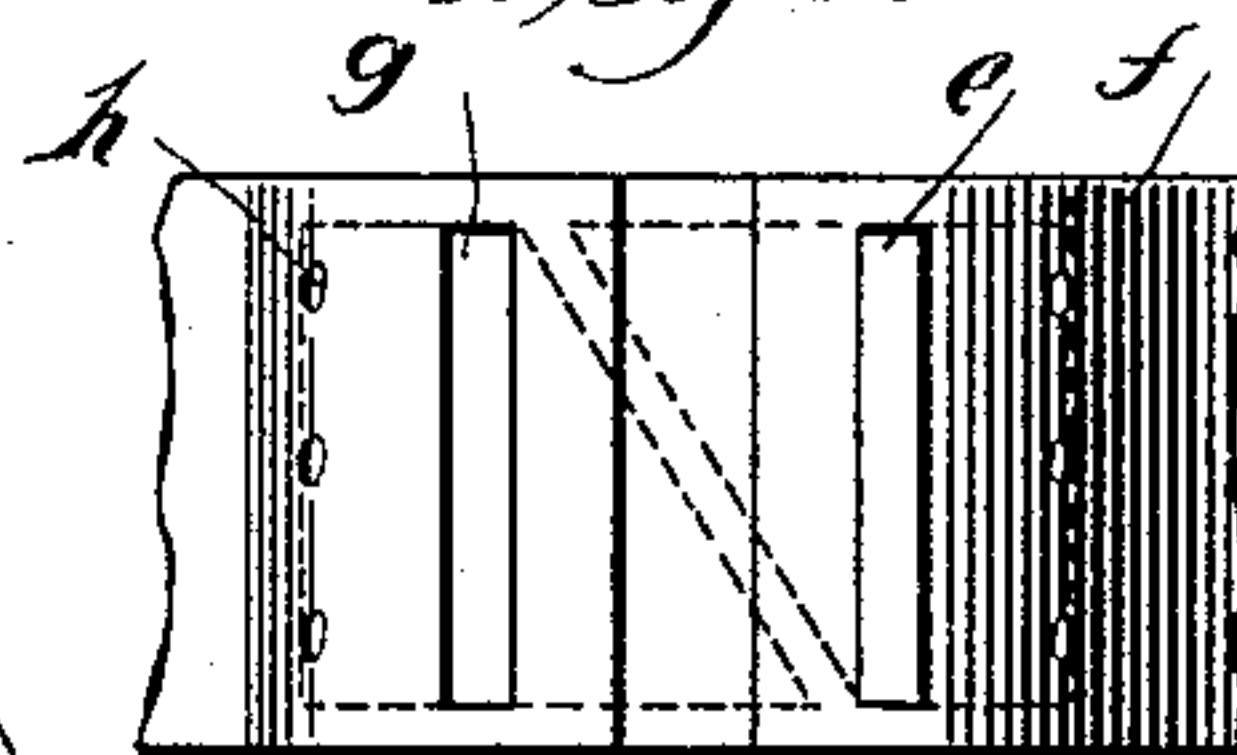


Fig. 12.



INVENTOR

F. E. Brainerd.

BY

Munn

ATTORNEYS.

Edward Thorpe
Per. G. Hovell

No. 607,678.

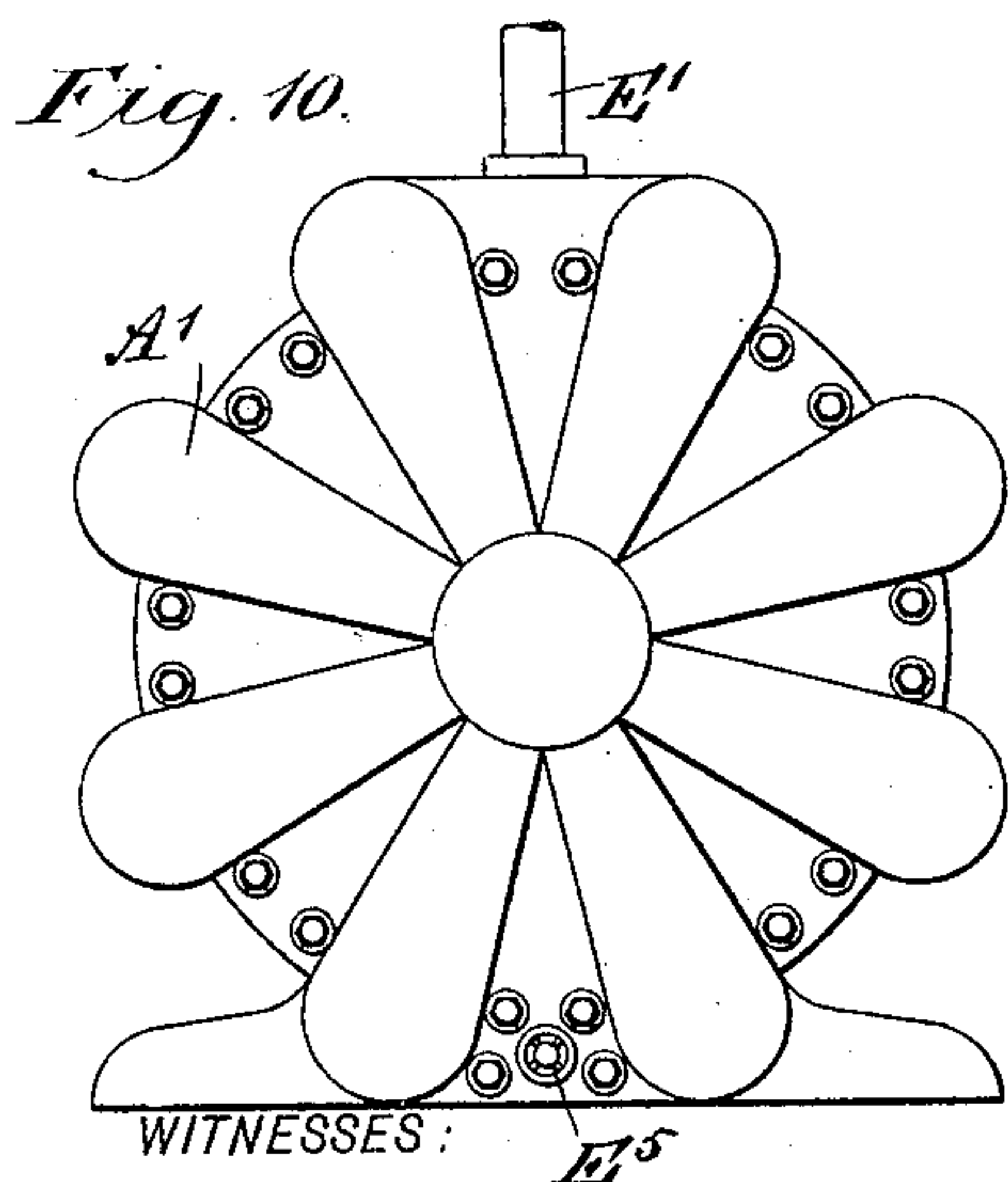
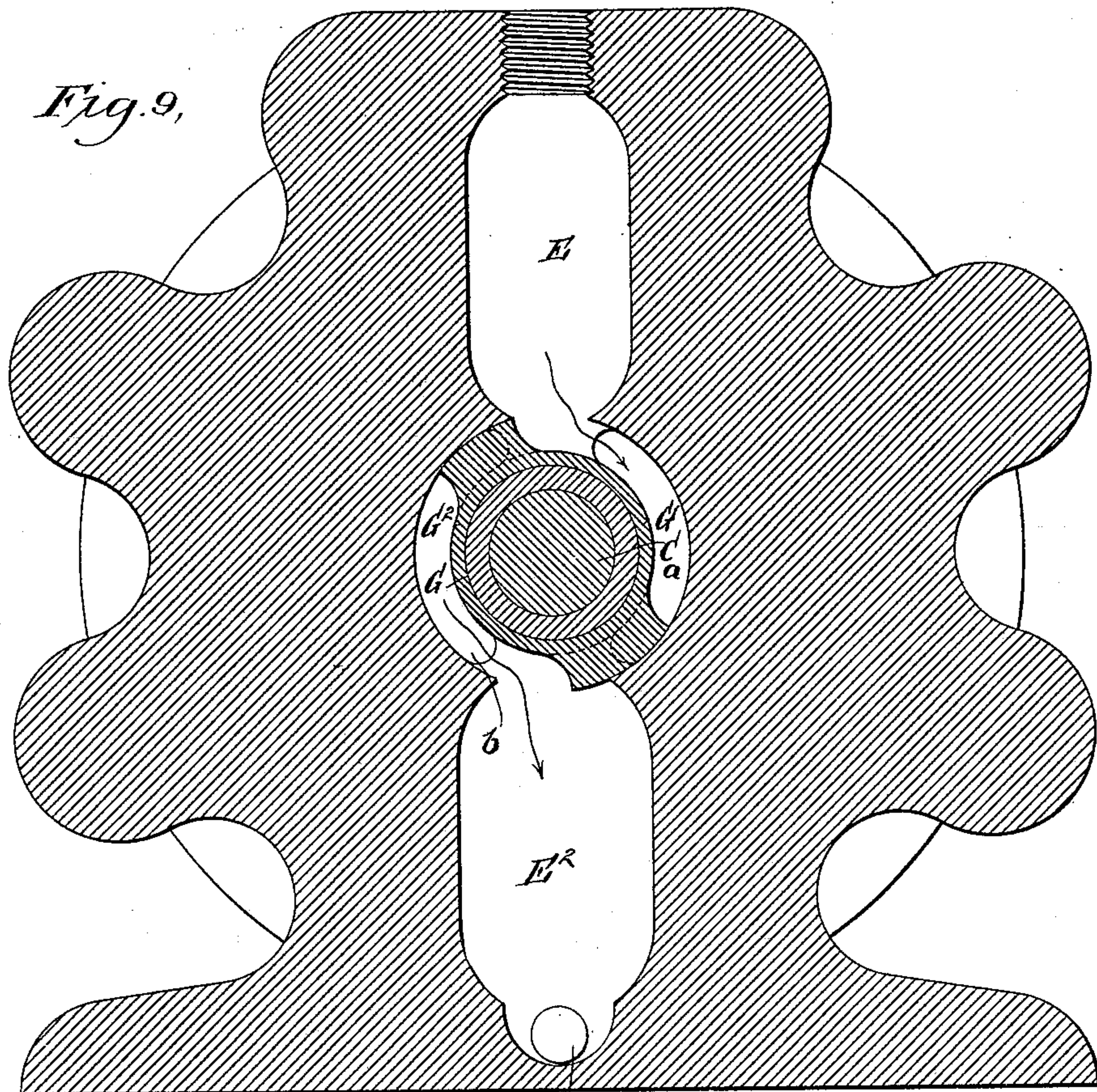
Patented July 19, 1898.

F. E. BRAINERD.
ROTARY ENGINE.

(Application filed June 11, 1897.)

(No Model.)

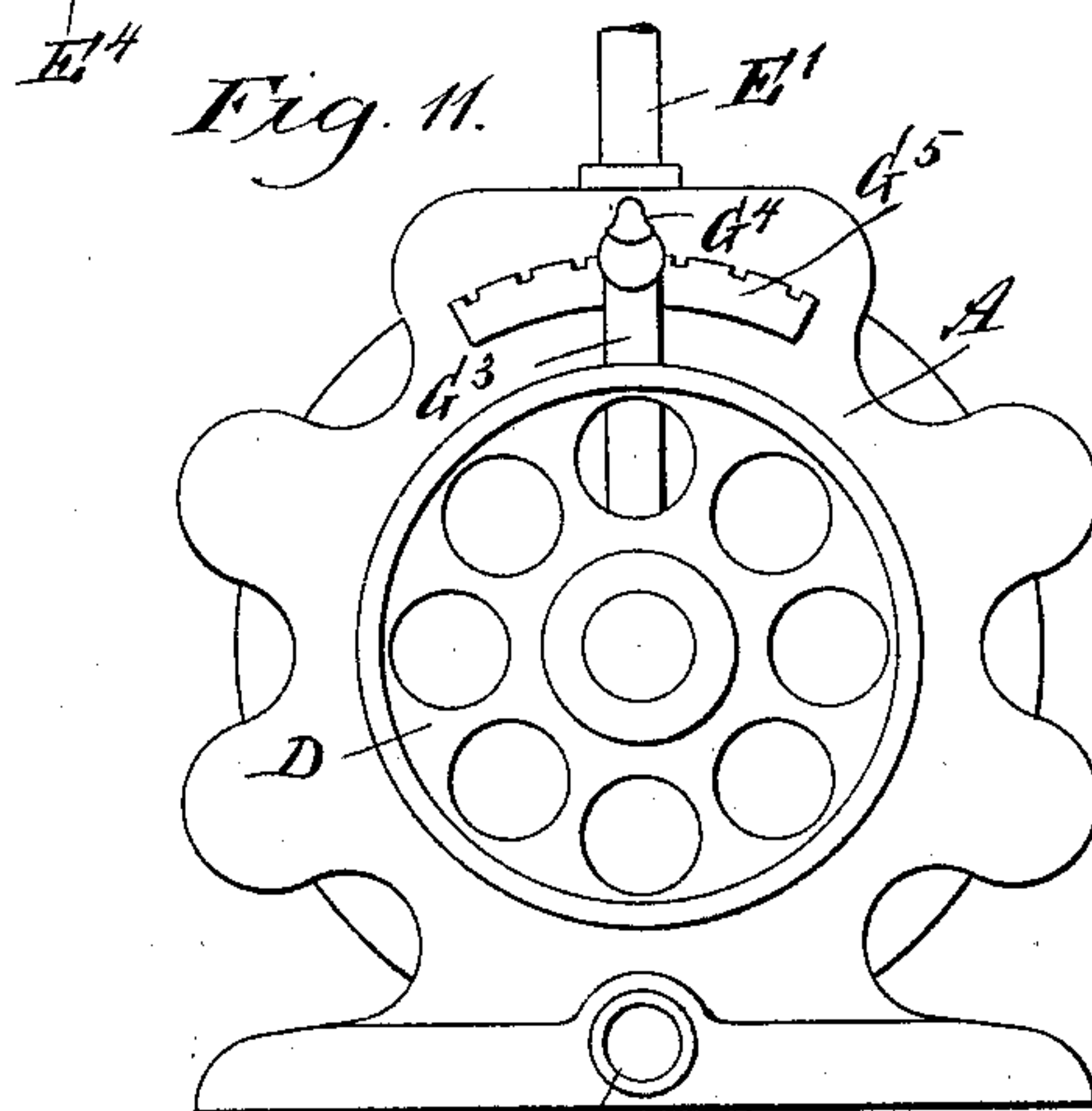
4 Sheets—Sheet 3.



WITNESSES :

*E*⁵

Edward Thorpe
Rev. J. Keble



INVENTOR

F. L. Brainerd.

BY

ATTORNEYS.

No. 607,678.

Patented July 19, 1898.

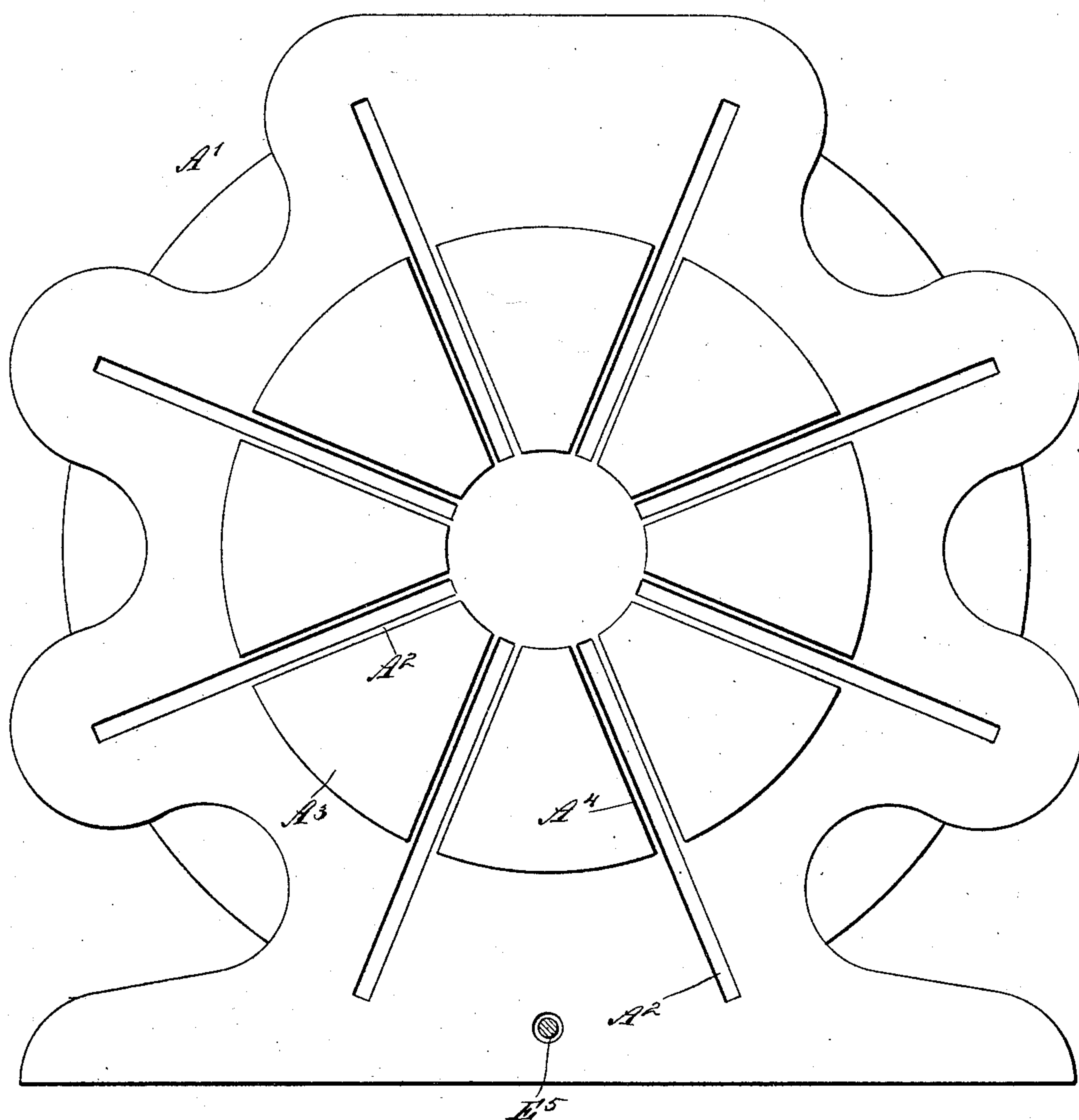
F. E. BRAINERD.
ROTARY ENGINE.

(Application filed June 11, 1897.)

(No Model.)

4 Sheets—Sheet 4.

Fig. 13.



WITNESSES:

Edward Thorpe
Rev. G. H. Foster

INVENTOR

F. E. Brainerd

BY

Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

FRED ERNEST BRAINERD, OF CARBONDALE, ILLINOIS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 607,678, dated July 19, 1898.

Application filed June 11, 1897. Serial No. 640,313. (No model.)

To all whom it may concern:

Be it known that I, FRED ERNEST BRAINERD, of Carbondale, in the county of Jackson and State of Illinois, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved rotary engine which is simple and durable in construction, very powerful in operation, and arranged to utilize the motive agent—such as steam, air, gas, or like fluid—to the fullest advantage and to reduce friction to a minimum.

The invention consists principally of a cylinder connected with a motive-agent supply and provided with an exhaust, a piston mounted to turn in the said cylinder and having a plurality of heads, and a series of abutments arranged in pairs, each pair having its abutments diametrically opposite each other and connected with each other by a spring.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claim.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal section of the improvement. Fig. 2 is a reduced face view of the piston. Fig. 3 is a plan view of the piston-head packing. Fig. 4 is a cross-section of the improvement on the line 4 4 of Fig. 1. Fig. 5 is an enlarged face view of one of the abutments. Fig. 6 is a plan view of the same. Fig. 7 is an elevation of one end of the said abutment. Fig. 8 is a like view of the other end of the abutment. Fig. 9 is a transverse section of the improvement on the line 9 9 of Fig. 1. Fig. 10 is a reduced rear end elevation of the improvement. Fig. 11 is a reduced front end elevation of the same. Fig. 12 is a plan view of one of the piston-heads, and Fig. 13 is an inner face view of the cylinder-cover.

The improved rotary engine is provided with a cylinder A, having a cover A', and containing a piston B, secured on a shaft C, journaled in suitable bearings in the integral end of the cylinder A, the outer end of the

shaft carrying a pulley D for transmitting the rotary motion of the shaft to the other machinery. In the integral end or head of the cylinder A is arranged an inlet E, connected by a pipe E' with a boiler or other suitable source of motive-agent supply, and opposite the inlet E is formed in the cylinder an outlet E², connected with the exhaust-pipe E³, leading to the outer air. The piston B is provided with a number of piston-heads B', B², and B³, engaged at their peripheral surfaces by abutments F, fitted to slide in suitable guideways arranged in the cylinder A, as plainly shown in Fig. 4, the abutments being preferably arranged in pairs, of which each pair has its two abutments located diametrically opposite each other, and the said two abutments are connected with each other by a spring F', so as to move in unison alternately inwardly and outwardly, but always with their inner ends in contact with the peripheral surface of the piston and its heads B', B², and B³.

Each spring F' extends in a diametrical groove A², formed in the inner face of the cylinder-head A', and the latter is provided with an offset A³, fitting into the outer end of the cylinder and formed with recesses A⁴, registering with the said grooves A², and each forming a guideway for the one side F² of the abutment F, the other side F³ of the said abutment being split and fitted to slide in a radial groove or guideway A⁵, formed on the inner end of the cylinder A. (See Fig. 1.) Each abutment is hollowed out, as at F⁴, for the reception of the coil end of the spring F', as plainly shown in Figs. 1, 4, 5, 6, 7, and 8.

As illustrated in Fig. 4, eight abutments F are employed to the three piston-heads of the piston B. In the piston are formed two chests B⁴ and B⁵ for the live and exhaust steam, respectively, the chest B⁴ opening at its inner end into an annular recess c, registering with a port a, formed in the integral end of the cylinder A and adapted to register with one of the recesses G' or G², formed in a valve G, mounted to turn in the cylinder end and adapted to have its recesses register with either the inlet E or the outlet E². The recesses G² and G' are also adapted to register with a port b, leading to an annular port d, connected with the chest B⁵, so that the ex-

haust from the latter can pass by way of ports $d b$ and either of the recesses G' or G^2 to the outlet E^2 and the exhaust-pipe E^3 .

The valve G is provided at its outer end with a handle G^3 , adapted to be taken hold of by the operator to turn the said valve, so as to bring either of the recesses G' or G^2 in register with the inlet E or the exhaust E^2 , to direct the live steam into either of the chests B^4 or B^5 and the exhaust from either chest B^5 or B^4 to the outlet E^2 .

On the handle G^3 is arranged a locking-lever G^4 , adapted to engage one of a series of notches formed in a segment G^5 , attached or formed on the cylinder to hold the valve in the desired position. The chest B^4 extends into each of the piston-heads B^1 , B^2 , and B^3 , and is formed at each of these heads with two ports e and f , opening to the peripheral surface of the head, but a suitable distance apart, as indicated in dotted lines in Fig. 4, (see also Fig. 12,) and the other chest B^5 is similarly arranged and is formed at each head with two ports g and h , leading to the peripheral surface of the head, but on the opposite side to that on which the ports e and f are located. Packings H are arranged in the crown of each piston-head, and each packing is provided with notched offsets H^1 and H^2 , extending over the ports e and g , respectively, the notches being preferably formed with oblique sides to direct the steam properly into the working chambers formed between the piston-heads in the cylinder A . Each of the ports f is provided with a relief ball-valve I , adapted to open inwardly on pressure from the working chamber, and a similar relief ball-valve I' is arranged in each port h in the chest B^5 , as plainly shown in Fig. 4.

The operation is as follows: When the several parts are in the position as illustrated in Figs. 1, 4, and 9, then the motive agent from the inlet E passes through the recess G' , ports a and c , into the steam-chest B^4 , contained in the piston B , to then pass simultaneously through the several ports e into the working chambers between the piston-head and its corresponding abutment F , so that a pressure is exerted against the several piston-heads to rotate the piston in the direction of the arrow a' . The exhaust-steam in advance of the piston-head passes through the ports $g h$ into the exhaust-chest B^5 , from which the exhaust-steam can pass through the registering ports $d b$ into the recess G^2 and from the latter into the outlet E^2 and exhaust-pipe E^3 . Now when it is desired to reverse the engine the operator simply turns the valve G so as to connect the inlet E with the recess G' . Steam will now pass from the inlet E through the recess G^2 into the port b and from the latter through the port d into the chest B^5 , from

which the steam can pass through the ports $g h$ into the working chambers, but on the opposite side of the piston-heads, so as to cause the piston to rotate in the inverse direction of the arrow a' . The exhaust now takes place through the ports $e f$, chest E^4 , and registering port $c a$, opening into the recess G' , connected with the outlet E^2 . Now it will be seen that by the arrangement described the live steam finally acts on the piston-heads so as to impart a rotary motion to the piston, and an exhaust takes place continually in small puffs through the several ports $g h$, leading to the exhaust-chest used at the time.

By reference to Fig. 4 it will be seen that steam is cut off shortly after its admission to a working chamber, so as to work expansively in the said working chamber.

As shown in dotted lines in Fig. 1, the outlet E^2 has in one of its walls a valve E^4 for connecting the interior of the cylinder with the exhaust to drain any water of condensation from the cylinder. The valve E^4 is provided with a valve-stem E^5 , extending to the outside of the cover A' , so as to permit of conveniently opening and closing the said valve whenever desired.

It will be seen that the engine is very simple and durable in construction, is not liable to get out of order, and utilizes the steam in small quantities expansively but continually with pressure on the piston-heads, so as to insure a steady and continuous rotary motion of the piston and the main shaft C .

The ports f and h and valves I and I' serve to relieve the working chamber of any back pressure when two abutments extend a like distance in the working chamber, as the steam-pressure between them is balanced equally on each side of the shaft, causing as much back pressure as forward pressure. Now as the piston rotates one of the abutments will pass over the corresponding port f or h and the pressure from the working chamber will open the valve I or I' and the steam can pass into the exhaust.

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

A rotary engine, comprising a cylinder, a piston mounted to rotate in the cylinder, a series of abutments mounted to slide radially in the cylinder and at all times bearing on the piston and spring-rods connecting diametrically opposite abutments, the said rods having coiled ends engaging in hollowed-out portions of the abutments, substantially as specified.

FRED ERNEST BRAINERD.

Witnesses:

EDWARD S. PATTEN,
STUART BRAINERD.