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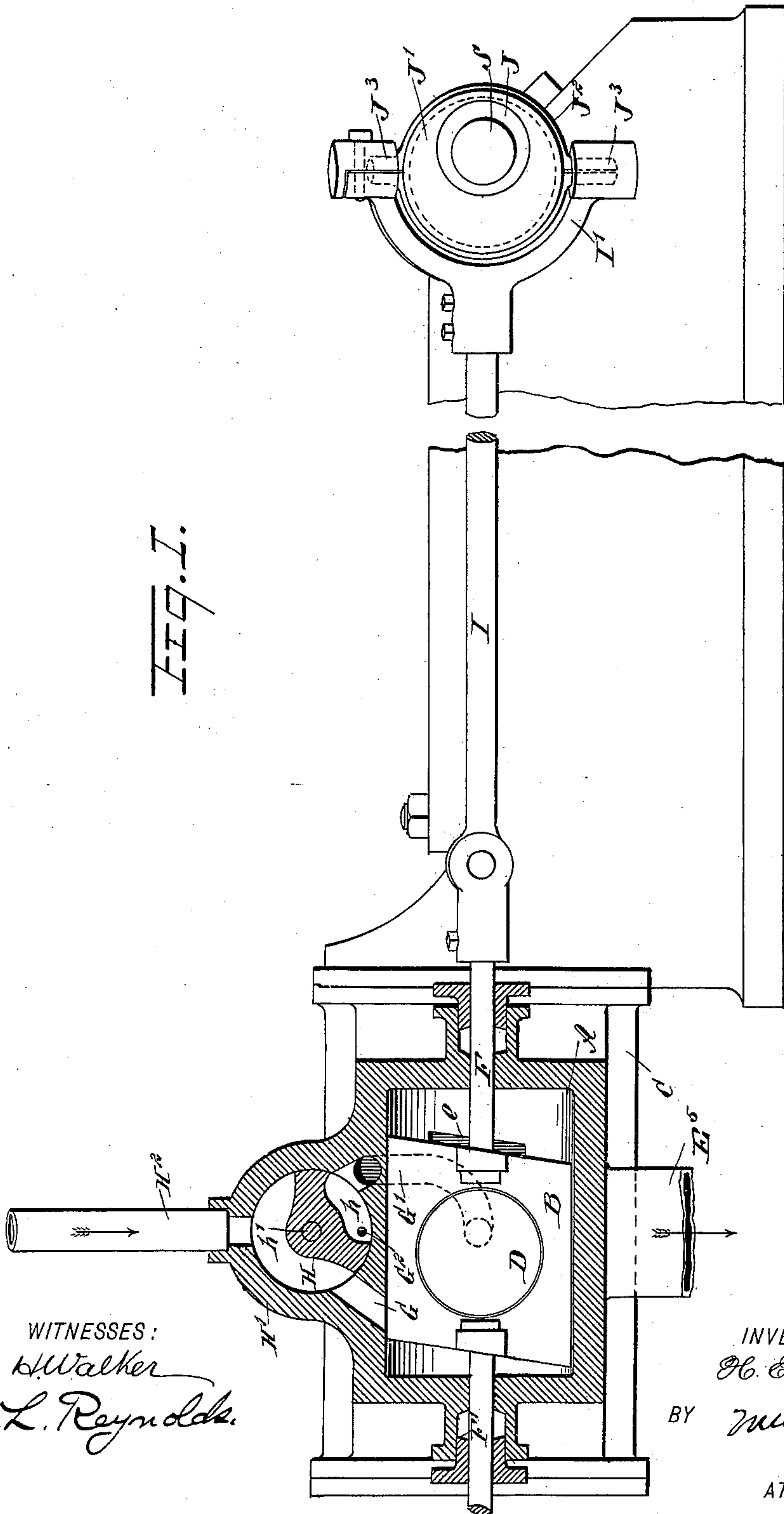
Patented Jan. 31, 1899.

H. E. BROWN.  
STEAM ENGINE REVERSING VALVE.

(Application filed July 2, 1898.)

(No Model.)

4 Sheets—Sheet 1.



WITNESSES:  
*H. Walker*  
*H. L. Reynolds.*

INVENTOR  
*H. E. Brown.*  
BY *Mumford*  
ATTORNEYS.

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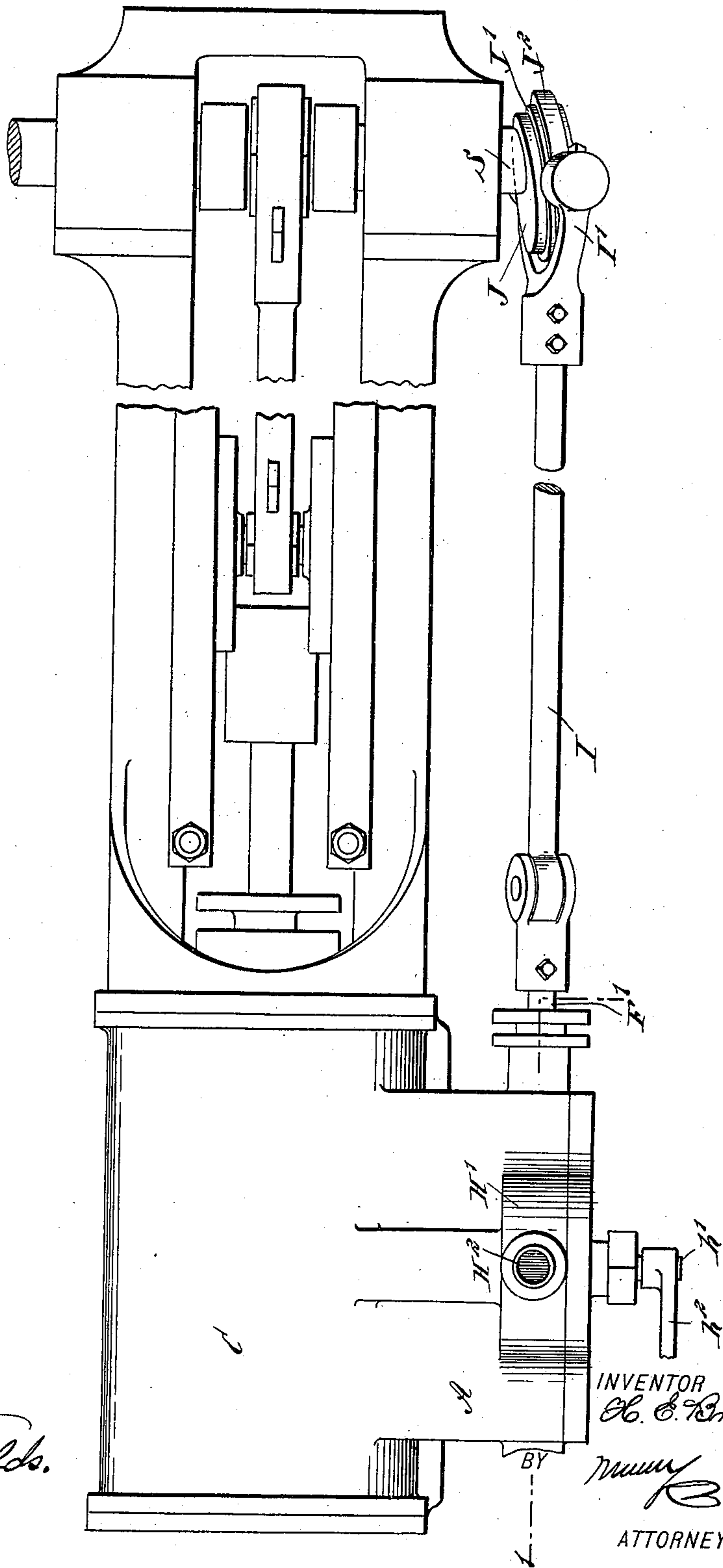
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Fig 2



WITNESSES:  
*H. Walker*  
*H. L. Reynolds.*

INVENTOR  
*H. E. Brown.*  
BY *Mumy*  
ATTORNEYS.

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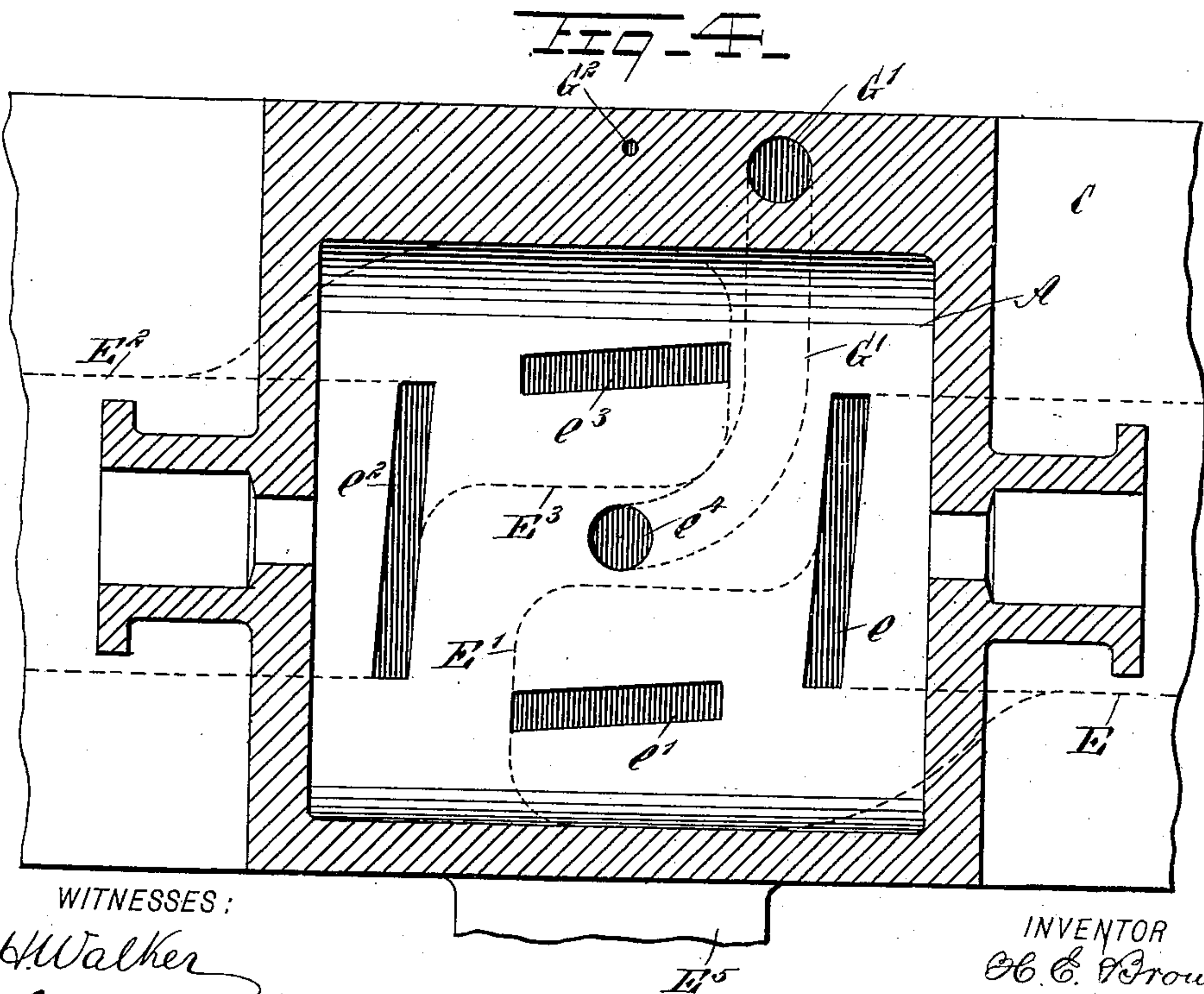
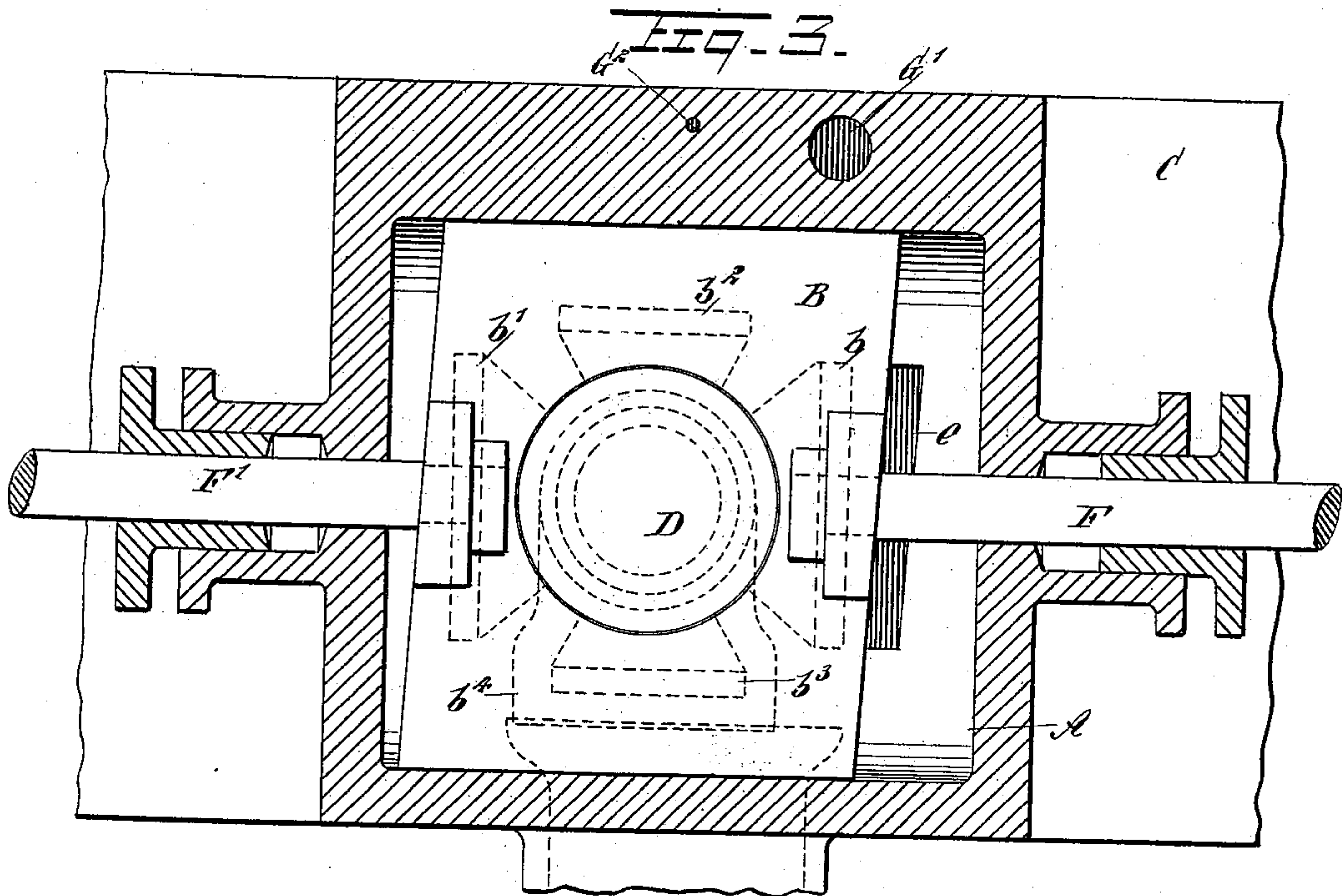
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H. Walker  
H. L. Reynolds.

INVENTOR

H. E. Brown.

BY

M. B.

ATTORNEYS.



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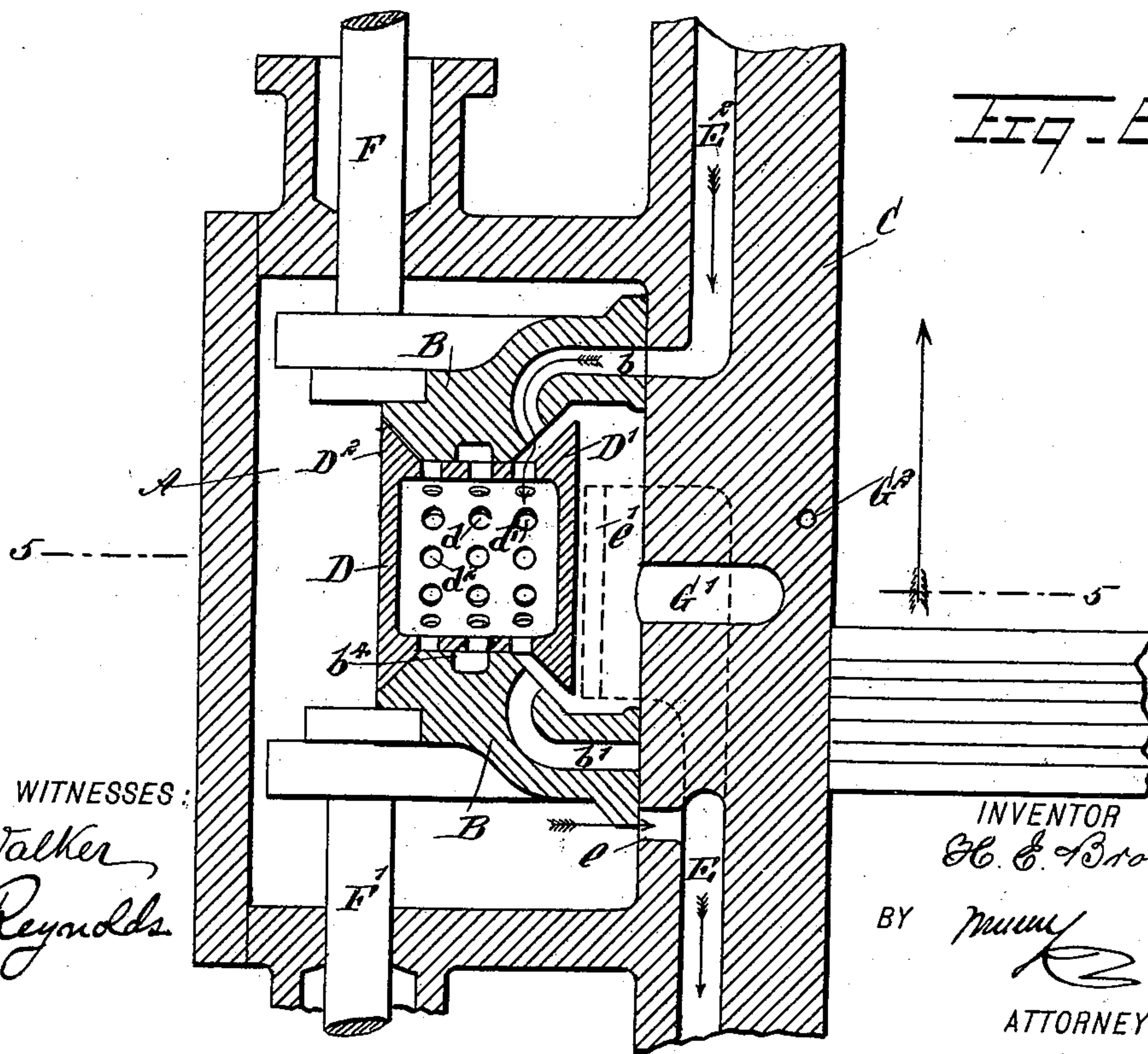
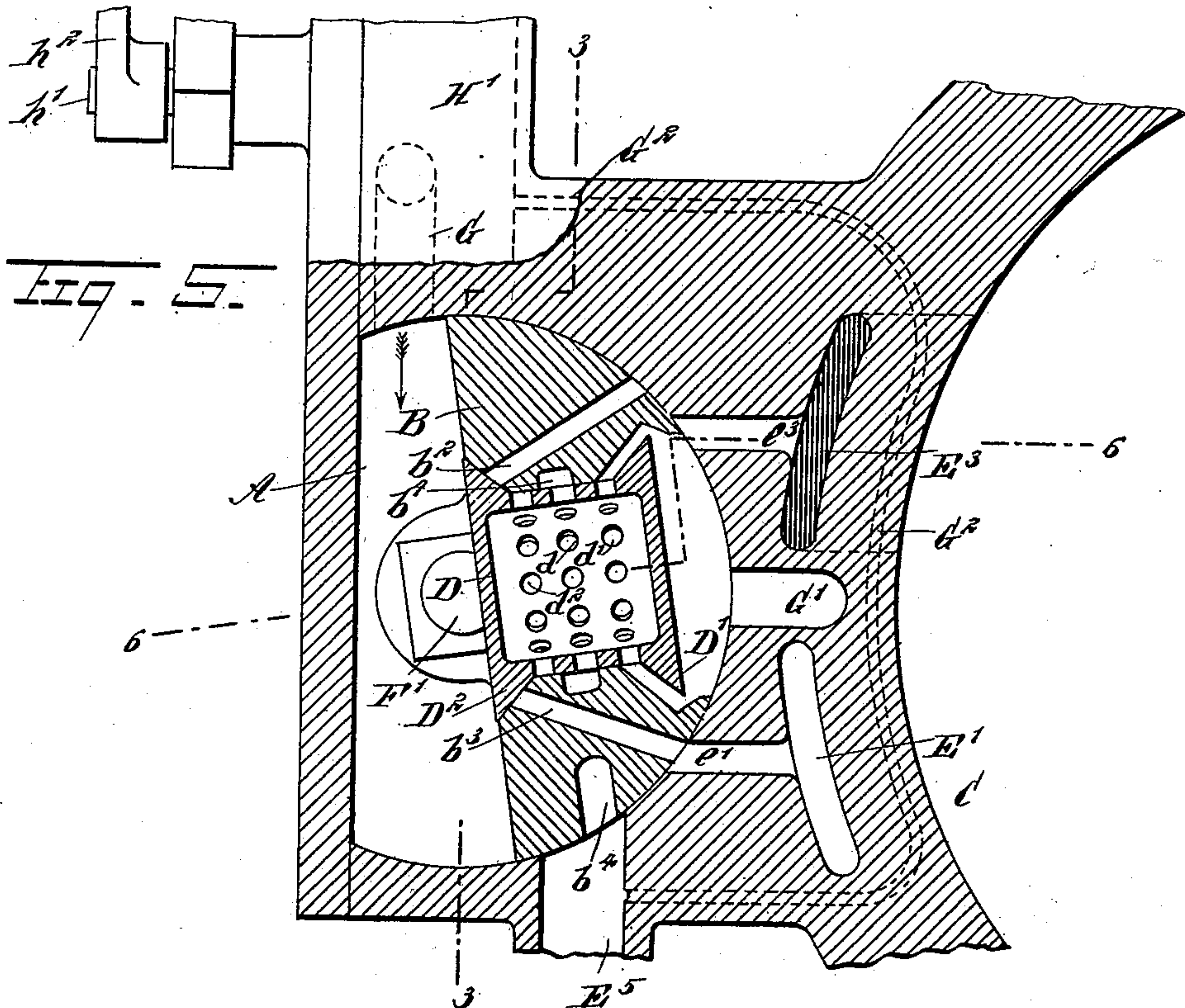
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4 Sheets—Sheet 4.



WITNESSES:

H. Walker  
H. L. Reynolds

INVENTOR

H. E. Brown.

BY

Mum

ATTORNEYS.



# UNITED STATES PATENT OFFICE.

HARRY EDGAR BROWN, OF NEW MATAMORAS, OHIO.

## STEAM-ENGINE REVERSING-VALVE.

SPECIFICATION forming part of Letters Patent No. 618,776, dated January 31, 1899.

Application filed July 2, 1898. Serial No. 685,055. (No model.)

*To all whom it may concern:*

Be it known that I, HARRY EDGAR BROWN, of New Matamoras, in the county of Washington and State of Ohio, have invented a new and Improved Steam-Engine Reversing-Valve, of which the following is a full, clear, and exact description.

My invention relates to improvements in the valve used for operating steam-engines and in the gear for actuating the same.

My invention comprises the novel features which will be hereinafter described and claimed.

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 side elevation of an engine with my gear attached, the steam-chest being in section on the line 1 1 in Fig. 2. Fig. 2 is a top plan view of the same. Fig. 3 is a sectional side elevation on the line 3 3 in Fig. 5. Fig. 4 is a sectional side elevation on the line 3 3 in Fig. 5, the valve being removed. Fig. 5 is a cross-section on the line 5 5 in Fig. 6, and Fig. 6 is a horizontal section on the line 6 6 in Fig. 5.

In applying my invention to a steam-engine the steam-chest A is formed with a cavity of circular outline or forming a portion of a cylinder. Within the body of the steam-chest and the engine-cylinder are formed steam-passages E and E<sup>2</sup>, leading to the opposite ends of the cylinder C. These passages are connected with the cavity in the steam-chest by means of two sets of ports. Two of these ports are connected with each steam-passage. The ports *e* and *e'* are connected with the passage E, leading to one end of the cylinder. The port *e'* lies substantially longitudinally of the cylinder, while the port *e* is substantially at right angles to the cylinder. The port *e'* lies at some distance at one side of the center line of the steam-chest and is connected with the steam-passage E by an extension E' thereof. The other steam-passage E<sup>2</sup>, leading to the opposite end of the cylinder, is similarly connected with steam-ports *e*<sup>2</sup> and *e*<sup>3</sup> and has an extension E<sup>3</sup>, leading to the port *e*<sup>3</sup>. Two of these ports are to be used when the engine is running in one direction and the other two

when the engine is running in the opposite direction. The ports *e* and *e*<sup>2</sup> are complementary and the ports *e'* and *e*<sup>3</sup> are also complementary.

Above the steam-chest is formed a valve-chamber H', within which is placed a valve H, mounted upon a shaft *h'*, which extends outside the chamber and is provided with an operating-handle *h*<sup>2</sup>. The valve H is a reversing-valve, being shifted to change the direction of travel of the engine. The valve-chamber H' is connected by a steam-passage G' with the center of the steam-chest chamber, opening into the same by a port *e*<sup>4</sup>, centrally located between the other ports. The reversing-valve chamber H' is also connected with the steam-chest by a direct passage G, which opens into the upper side of the steam-chest chamber. An exhaust-passage E<sup>5</sup> leads from the lower side of the steam-chest chamber to a suitable exhaust-pipe. The valve B, which occupies the steam-chest, is outwardly shaped as a portion of a cylinder of such a diameter as to closely fit the steam-chest chamber and is fixedly connected at one or both ends to valve-stems F and F', which extend outward through suitable stuffing-boxes. The valve B is provided with a central passage extending through the same and perpendicular to the outer face thereof, and within this passage is placed a controlling-valve D, which is circular in outline and consists of a hollow cylinder having conical heads D' and D<sup>2</sup>. The central cylindrical portion of the valve is also provided with three sets of apertures, one set, *d*, being centrally located about the periphery of the cylinder and the other sets, *d'* and *d''*, being located just within the base of the conical heads. The distance between the conical heads is somewhat greater than the distance between the two sides of the valve upon which the conical heads rest. The portion of the valve immediately surrounding the passage which contains the controlling-valve D is coned, so as to form a seat upon which the conical heads of the controlling-valve may rest. The body of the controlling-valve being longer than the distance between the seats upon the main valve B leaves a space between one of the heads and its seat, by means of which



connection may be made through one of the sets of apertures, either  $d'$  or  $d^2$ , to the space outside the main valve B.

Within the body of the main valve B and surrounding the central portion of the controlling-valve is an exhaust-passage  $b^4$ , which upon one side of the valve extends to the outer surface, where it is adapted to make connection with the exhaust-passage  $E^5$ , formed in the steam-chest. The body of the valve B is also provided with two exhaust-ports  $b^2$  and  $b^3$ , extending from the rounded side thereof through to the opposite side of the valve and terminating at this end in the valve-seat, so that they are covered by the conical head of the controlling-valve. The ports  $b^2$  and  $b^3$  connect with the ports  $e'$  and  $e^3$  in the steam-chest and extend longitudinally of the valve. The body of the valve also contains ports  $b$  and  $b'$ , substantially at right angles to the ports  $b^2$  and  $b^3$  and connecting with the ports  $e$  and  $e^2$  in the steam-chest.

The reversing-valve H is hollowed on its under side, forming a port  $h$ . The body of the valve-chamber is provided with a passage  $G^2$ , connecting with the port  $h$  and extending around to a connection with the exhaust E, the passage  $G^2$  acting as a relief for the steam entrapped in the steam-chest when the valve is reversed. The means for operating the valve B consists of an eccentric placed at an angle to the engine-shaft and connected to the valve-stem F, so that the stem and the valve may be rocked upon their axes.

For convenience in adjusting the throw of the eccentric it may be formed in two parts, consisting of an inner eccentric J, which is secured to the engine-shaft S, and an outer eccentric  $J'$ , surrounding the inner eccentric and adapted to be secured thereon at any point desired. The outer eccentric is provided with a strap  $J^2$ , which has journals  $J^3$  formed thereon diametrically opposite each other. These journals are engaged by a yoke I', secured to one end of the rod I, the other end of which is fixedly secured to the valve-stem F. The junction between the rod I and stem F is by a pivot constructed so as to permit the rod I to swing, and yet so as to communicate oscillating motion to the valve-stem F. The eccentric being placed upon the shaft S at an angle communicates two motions to the valve-stem and valve—first, a reciprocating motion due to its eccentricity, and, second, an oscillating motion due to its angular position upon the shaft.

With the reversing-valve in the position shown in Fig. 1 steam is admitted to the outer side of the valve. The pressure of the steam will automatically throw the controlling-valve to the position shown in Figs. 5 and 6. With the steam upon the rear side of the valve the ports  $e$  and  $e^2$  will be the operative ports and the ports  $e'$  and  $e^3$  will be inoperative, which will cause the engine to run in one direction. With this adjustment of the controlling and

reversing valve the steam will be exhausted through the ports  $b$  and  $b'$  into the space between the inner conical head  $D'$  of the controlling-valve, through the openings  $d'$  into the interior of the controlling-valve, and through the openings  $d$  in the same valve into the exhaust-passage  $b^4$ , and from this passage into the exhaust-passage  $E^5$  in the valve-chest.

If the reversing-valve H be shifted in position so as to cover the port G and uncover the steam-passage  $G'$ , the steam will be admitted to the under side of the valve B. This will automatically throw the reversing-valve to the opposite position—that is, with the conical head  $D'$  seated upon the inner seat of the main valve B. This will close the ports  $b$  and  $b'$  and place the apertures  $d^2$  in the reversing-valve in communication with the outer side of the main valve and steam-chest. It will also place the ports  $b^2$  and  $b^3$  in communication with that portion of the steam-chest on the outer side of the valve. In this adjustment the ports  $e'$  and  $e^3$  will be operative ports and the ports  $e$  and  $e^2$  will be inoperative, which will cause the engine to run in a direction opposite to that of the previous adjustment. With this adjustment the opening and closing of the steam-ports are caused by the oscillating movement of the valve, while in the opposite adjustment the opening and closing of the ports are caused by the reciprocating movement of the valve. It will thus be seen that the valve is automatic in this respect and that the controlling-valve is automatically shifted by the change in the reversing-valve, which causes the steam to be delivered to opposite sides of the main valve. It is thus possible to cause the reversal of the engine to be accomplished by the operation of the throttle-valve. This enables a number of parts to be done away with and simplifies the valve-gear.

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

1. A steam-engine valve, provided with a passage connecting its top and bottom faces, and having an exhaust-port within its body and connecting with the central portion of said passage, a hollow controlling-valve fitting said passage and having heads adapted to seat upon the main valve at the ends of said passage, said heads being separated sufficiently to allow of a limited reciprocation of the controlling-valve in its containing-passage, and the controlling-valve body having three series of apertures connecting with the interior, two of the series being located just inside the heads, and the third at the center, the latter connecting at all times with the exhaust-port, substantially as described.

2. A steam-engine, composed of a main and an exhaust-controlling valve, the main valve having a passage extending through it and adapted to receive the controlling-valve, and also having an exhaust-port within its body



connecting with said passage, a hollow controlling-valve mounted to have a limited reciprocation within said passage and to act as a valve to close the same and having ports  
 5 connecting its interior with the exhaust-passage at all times, and other ports adapted to connect its interior with either side of the main valve, substantially as described.

3. A steam-engine, composed of a main and  
 10 an exhaust-controlling valve, the main valve having a passage extending through it and adapted to receive the controlling-valve, and also having an exhaust-port within its body connecting with said passage, a hollow controlling-valve mounted to have a limited reciprocation within said passage and to act as  
 15 a valve to close the same, and having ports connecting its interior with the exhaust-passage at all times, and other ports adapted to connect its interior with either side of the main valve, the ends of the passage in the main valve being coned to form seats, and the controlling-valve having heads coned to fit said seats, substantially as described.

25 4. A steam-engine valve-gear, comprising a main and an exhaust-controlling valve, the main valve having a passage extending through it and adapted to receive the controlling-valve, and also having an exhaust-  
 30 port within its body connecting with said passage, a hollow controlling-valve mounted to have a limited reciprocation within said passage and to act as a valve to close the same, and having ports connecting its interior with the exhaust-passage at all times, and other ports adapted to connect its interior with either side of the main valve, and a reversing-valve adapted to admit steam to either side of the main valve, substantially  
 35 as described.

40 5. In a steam-engine valve-gear, the combination of a cylinder, and a steam-chest having steam-passages therein leading from the cylinder and each connecting with the  
 45 valve-chamber by two ports, and also having two steam-supply passages connecting the steam-pipe with the valve-chamber, and a shifting-valve controlling the latter passages, with a valve composed of two parts, a main  
 50 valve having exhaust-passages therein, and a controlling-valve mounted to have a limited reciprocation in the main valve, and adapted to be shifted by the steam to correspond with

the position of the shifting-valve, said controlling-valve being adapted to change the  
 55 exhaust connections from one set of ports to the other, substantially as described.

6. In a steam-engine valve-gear, the combination of a cylinder, and a steam-chest  
 60 having steam-passages therein leading from the cylinder and each connecting with the valve-chamber by two ports substantially at right angles to each other, and also having two steam-supply passages connecting the  
 65 steam-pipe with the valve-chamber, and a shifting-valve controlling the latter passages, with a valve composed of two parts, the main valve having a rounded face and exhaust-passages therein, a controlling-valve mounted  
 70 to have a limited reciprocation in the main valve and adapted to be shifted by the steam to correspond with the position of the shifting-valve, said controlling-valve being adapted to change the exhaust connections from  
 75 one set of ports to the other, and an operative mechanism by which the valve is given a reciprocating and a rocking motion, substantially as described.

7. In a steam-engine valve-gear, the combination of a cylinder, and a steam-chest  
 80 having steam-passages therein leading from the cylinder and each connecting with the valve-chamber by two ports substantially at right angles to each other, and also having two steam-supply passages connecting the  
 85 steam-pipe with the valve-chamber, and a shifting-valve controlling the latter passages, with a valve composed of two parts, a main valve having a rounded face and exhaust-passages therein, a controlling-valve mounted  
 90 to have a limited reciprocation in the main valve and adapted to be shifted by the steam to correspond with the position of the shifting-valve, said controlling-valve being adapted to change the exhaust connections from  
 95 one set of ports to the other, a valve-rod fixedly connected with the main valve, an eccentric and strap placed at an angle on the engine-shaft, and a yoke pivoted to the eccentric-strap and connected to the valve-rod,  
 100 substantially as described.

HARRY EDGAR BROWN.

Witnesses:

OTHA MCKDONOLD FOLGER,  
 ELMER HISSOM.