

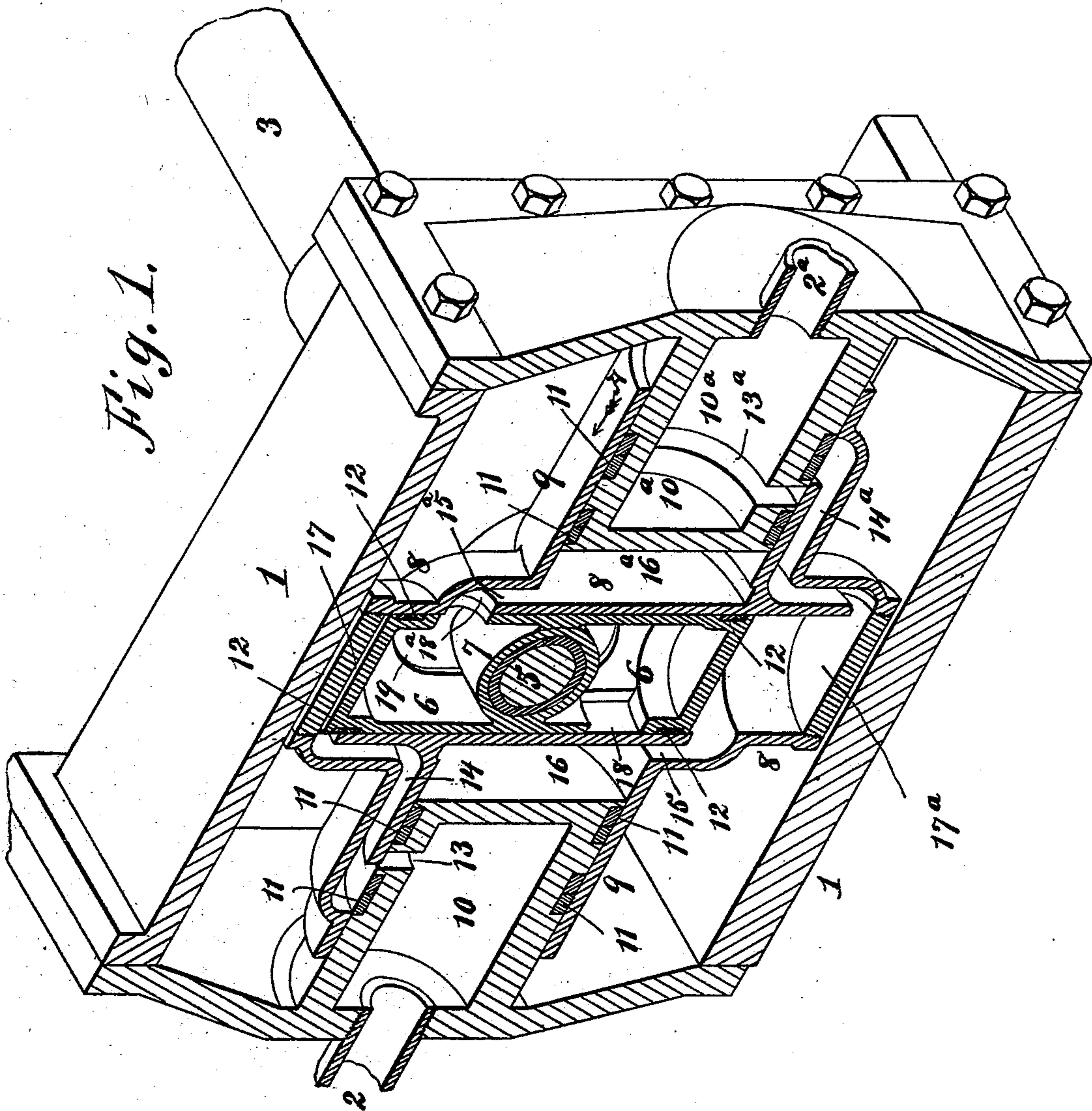
(No Model.)

2 Sheets—Sheet 1.

LA MOTTE C. ATWOOD & N. W. PERKINS, Jr.  
ENGINE.

No. 514,054.

Patented Feb. 6, 1894.



Attest:  
Albert M. Ebersole  
Benj. A. Knight.

Inventors:  
Nathan W. Perkins Jr.  
La Motte C. Atwood  
By Wright & Bro Attys.



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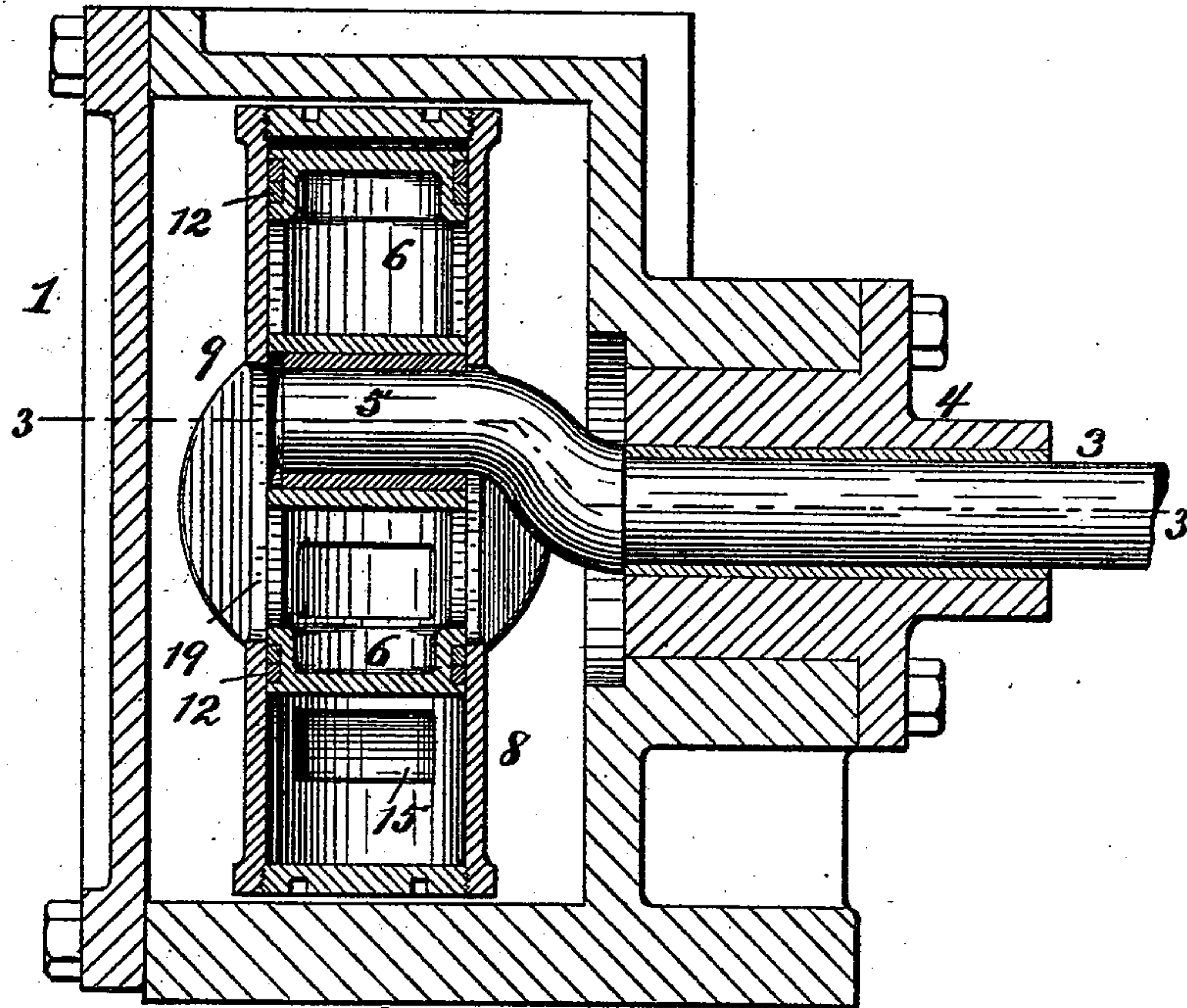
2 Sheets—Sheet 2.

LA MOTTE C. ATWOOD & N. W. PERKINS, Jr.  
ENGINE.

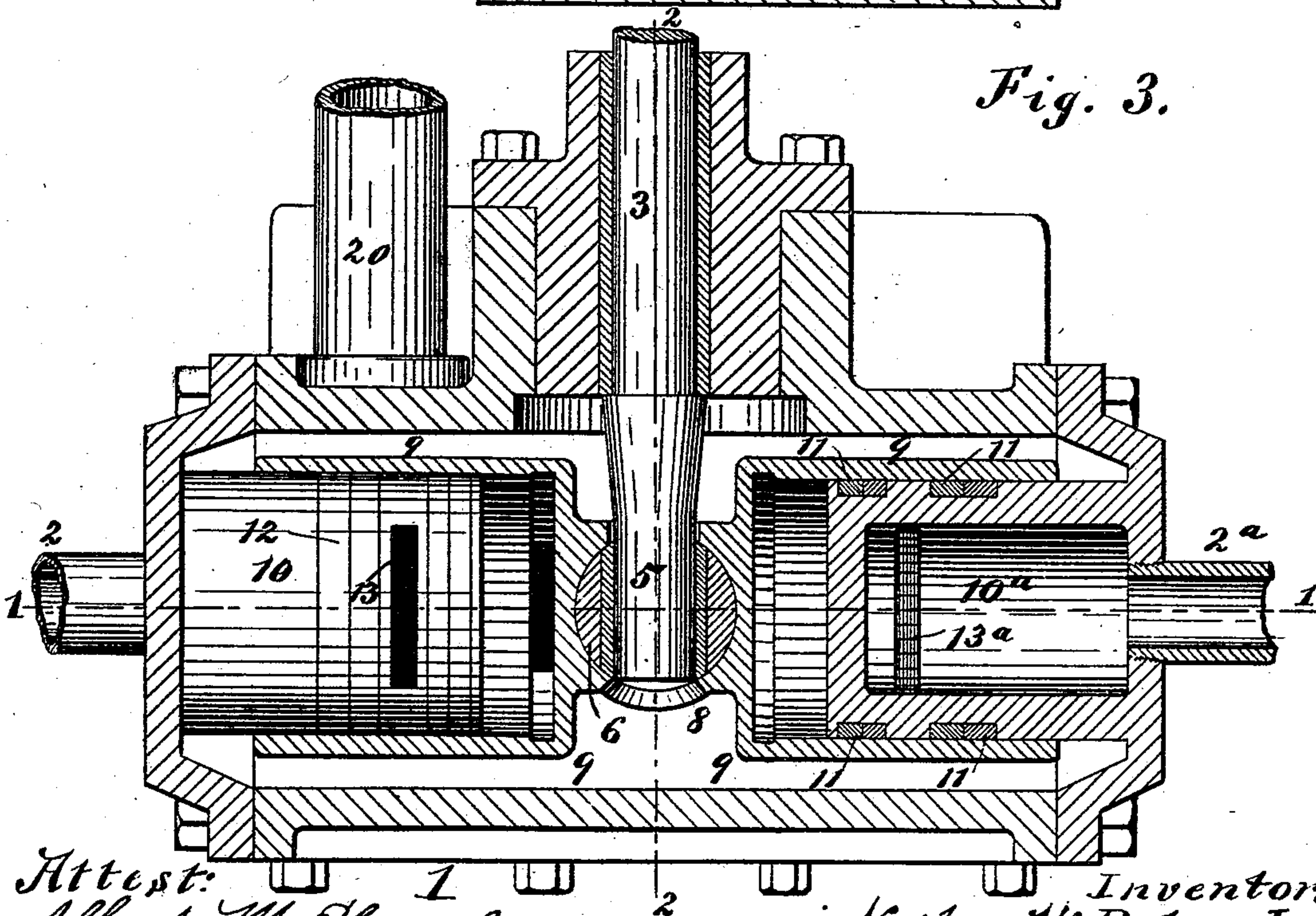
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*Fig. 2.*



*Fig. 3.*



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# UNITED STATES PATENT OFFICE.

LA MOTTE C. ATWOOD AND NATHAN W. PERKINS, JR., OF ST. LOUIS, MISSOURI, ASSIGNORS TO THE ATWOOD ELECTRIC COMPANY, OF SAME PLACE.

## ENGINE.

SPECIFICATION forming part of Letters Patent No. 514,054, dated February 6, 1894.

Application filed April 14, 1893. Serial No. 470,276. (No model.)

*To all whom it may concern:*

Be it known we, LA MOTTE C. ATWOOD and NATHAN W. PERKINS, Jr., both of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

Our invention relates to an engine in which there is a piston and a cylinder acting alternately on the crank of a shaft, to produce a rotary movement of the shaft; the piston acting to move the crank shaft a quarter revolution, the cylinder then acting to move the crank the next quarter of a revolution, the piston then acting to move the crank another quarter of its revolution, and the cylinder then acting to move the crank the next and last quarter of its revolution.

The object of our invention is to construct an engine of this character, in such a manner as to make it simple and durable, as well as effective, and our invention consists in features of novelty hereinafter fully described and pointed out in the claims.

Figure 1 is an isometric perspective view, taken in section, on line 1—1, Fig. 3, and illustrative of our invention. Fig. 2 is a section taken on line 2—2, Fig. 3. Fig. 3 is a section, taken on line 3—3, Fig. 2.

Referring to the drawings, 1 represents a housing, provided with steam or air supply pipes, 2, 2<sup>a</sup>.

3 is the shaft to which the motion is imparted, and which extends through a suitable box 4, at one side of the housing. The shaft 3 has a crank 5 located within the housing.

6 is a piston, preferably hollow, with closed ends, having a box or bearing 7, fitted on the crank 5, of the shaft 3. This piston 6 fits in a vertical barrel 8 of a movable horizontal cylinder 9, which fits over fixed hollow pistons 10, 10<sup>a</sup>, extending inwardly from the ends of the housing.

11 represents packing rings between the cylinder 9 and the pistons 10, 10<sup>a</sup>, and 12 represents packing rings between the piston 6 and the barrel 8. The barrel 8 and pistons 10, 10<sup>a</sup> have closed ends, and the cylinder 9 open ends.

13, 13<sup>a</sup> represent ports in the pistons 10, 10<sup>a</sup> which communicate through ports 14, 14<sup>a</sup>, in the cylinder 9, with the chambers at the opposite ends of the piston 6.

15, 15<sup>a</sup> represents ports forming communications between the interior of the hollow piston 6, and the chambers 16, 16<sup>a</sup> located between the pistons 10 and barrel 8.

The operation is as follows: Supposing steam or air to enter the hollow piston 10, through pipe 2, it will pass through the ports 13 and 14 to the space 17 between the upper head of the barrel 8 and the piston 6, causing the descent of the piston 6 and moving the crank 5 a quarter of its rotation, and at the same time carrying the cylinder 9 and barrel 8 until the latter is close to the end of the piston 10<sup>a</sup>. As the crank 5 completes this quarter of its movement, the chamber 17 is opened to the chamber 16<sup>a</sup>, through the port 15<sup>a</sup>, and the air or steam, exerting its pressure between the barrel 8 and the end of the piston 10<sup>a</sup>, will cause the cylinder 9 to be moved in the direction of the arrow A, Fig. 1, and cause the crank 5 of the shaft 3 to be moved another quarter of its revolution, which carries the piston 6 to its lower position. The ports 13<sup>a</sup> and 14<sup>a</sup> are now opened to admit steam or air into the chamber 17<sup>a</sup> beneath the piston 6. This causes the upward movement of the piston 6, and causes the crank 5 to turn the third quarter of its revolution, and moves the cylinder 9 still farther in the direction of the arrow A. As the crank 5 completes this third part of its revolution, the port 15 is opened to the chamber 16, and the cylinder 9 is moved in the opposite direction to that indicated by the arrow A, causing the crank 5 to complete the last or fourth part of its revolution, and bringing the parts again into the position shown in Fig. 1, and then the operation is repeated. The air or steam exhausts from the chambers 16 and 16<sup>a</sup> through the ports 15 and 15<sup>a</sup>, and passages 18 and 18<sup>a</sup>, in the piston 6 and barrel 8 and from there through a passage 19 into the interior of the housing, from where it escapes through an exhaust pipe 20. (See Fig. 3.)

With this construction it will be seen that no valves are employed, other than those formed by the piston and cylinder themselves



moving with relation to their ports. The engine is an exceedingly simple and durable one, and is not likely to get out of order.

We claim as our invention—

- 5 1. In an engine, the combination of a housing having fixed inwardly projecting hollow pistons provided with ports, a movable cylinder fitting over said pistons and provided with ports, a barrel carried by said cylinder
- 10 and between which and said cylinder ports are located, a movable piston located within said barrel, and a crank shaft upon which said movable piston is mounted; substantially as set forth.
- 15 2. In an engine, the combination of a housing having fixed inwardly projecting hollow pistons provided with ports, a movable cylinder fitting over said pistons and provided with ports, a barrel carried by said cylinder
- 20 and between which and said cylinder ports are located, a movable piston located within said barrel, and a crank shaft upon which said movable piston is mounted; said barrel and movable piston having exhaust passages
- 25 and said movable piston being made hollow, substantially as shown and described.

3. In an engine, the combination of a movable cylinder having open ends and carrying a central barrel, a movable piston located within said barrel, fixed pistons fitting within the hollow, open ends of said cylinder and air or steam pipes communicating with said fixed pistons; said cylinder and pistons being provided with ports; substantially as and for the purpose set forth.

4. In an engine, the combination of a movable cylinder having open ends and carrying a central hollow barrel with closed ends, a movable piston with closed ends located within said barrel, fixed hollow pistons with closed ends fitting within said cylinder and air or steam pipes communicating with said fixed pistons; said cylinder and pistons being provided with ports; substantially as and for the purpose set forth.

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NATHAN W. PERKINS, JR.

In presence of—  
A. M. EBERSOLE,  
BENJN. A. KNIGHT.