

(No Model.)

J. S. MARSHALL.  
VALVE FOR STEAM ENGINES.

No. 381,152.

Patented Apr. 17, 1888.

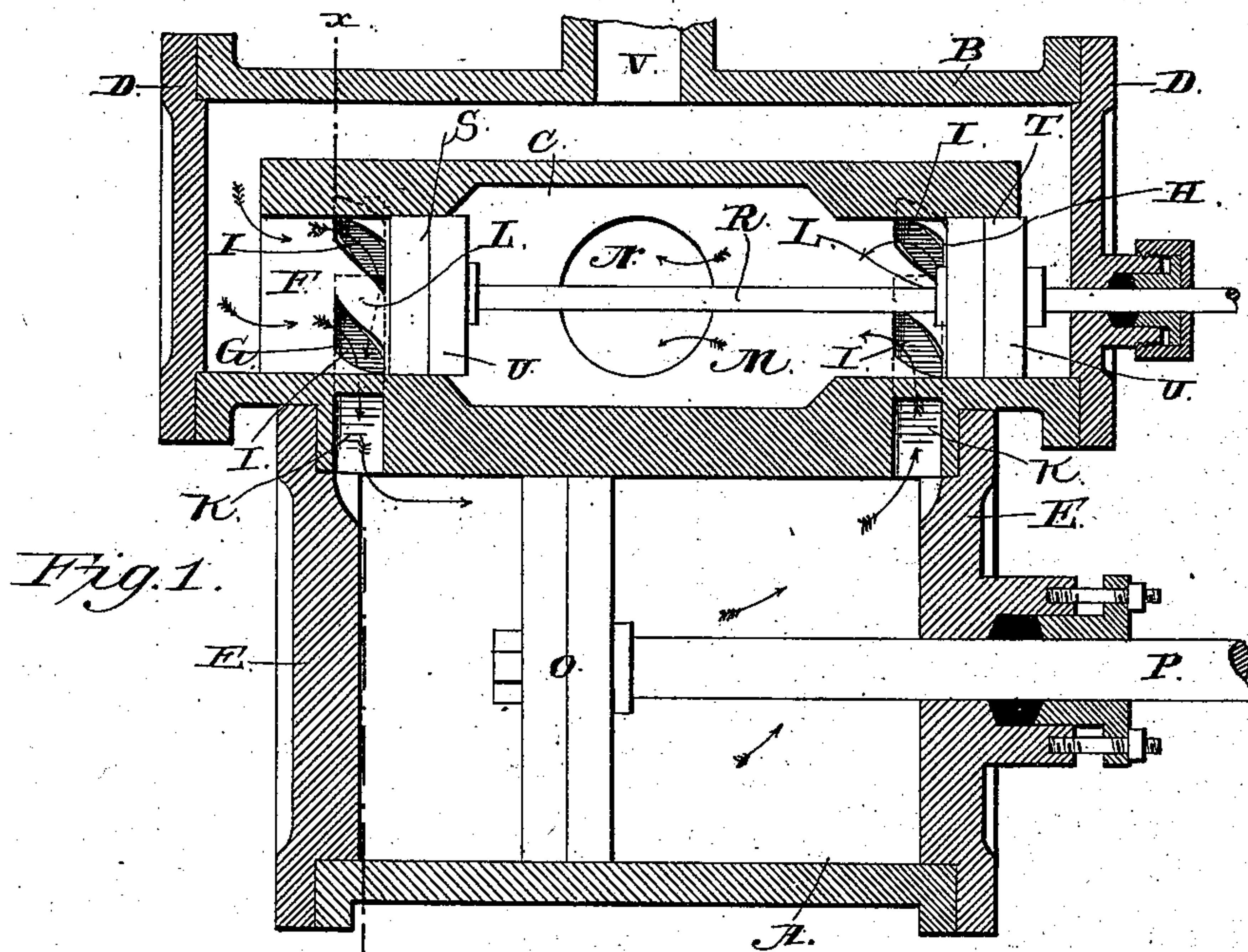


Fig. 1.

Fig. 2.

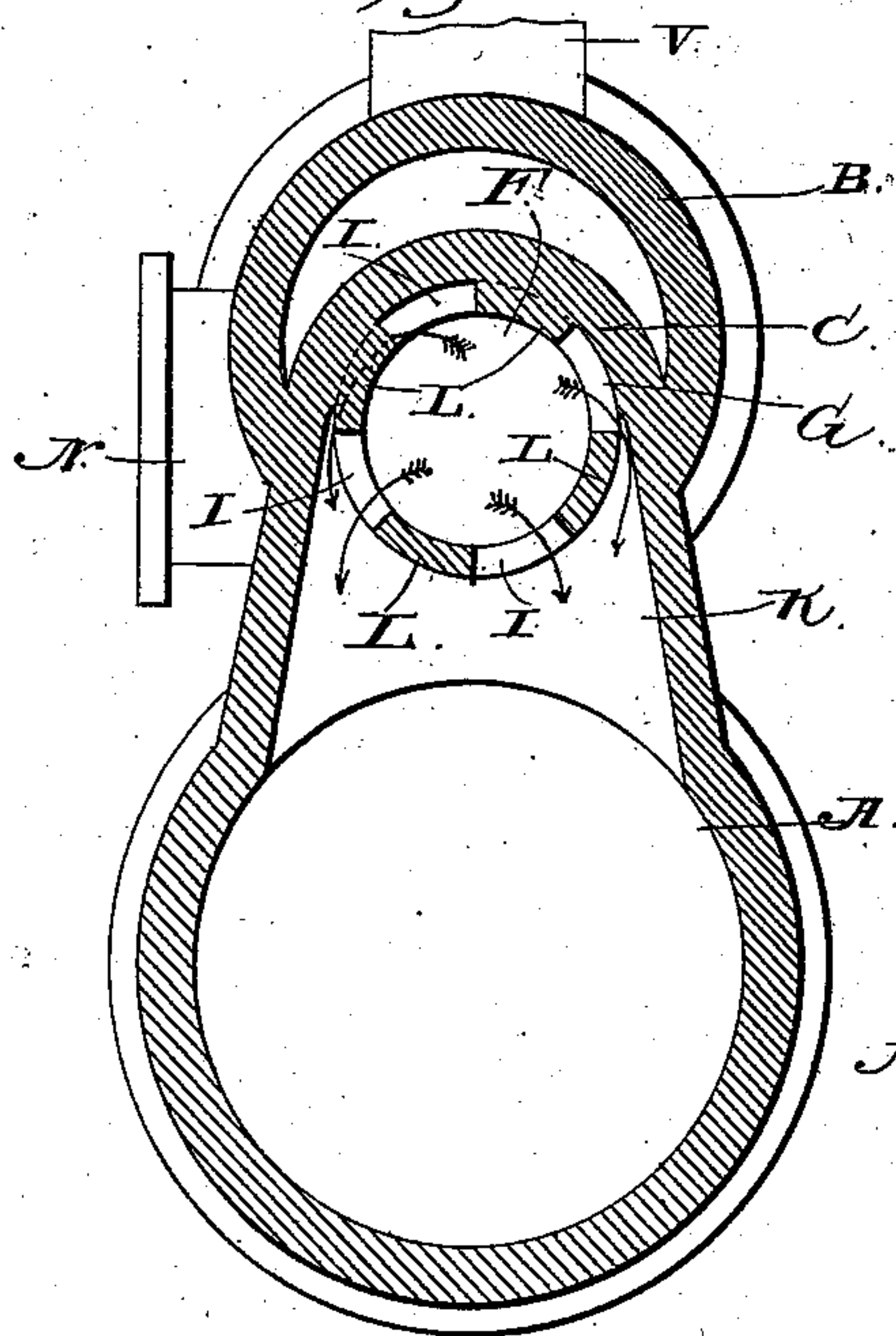
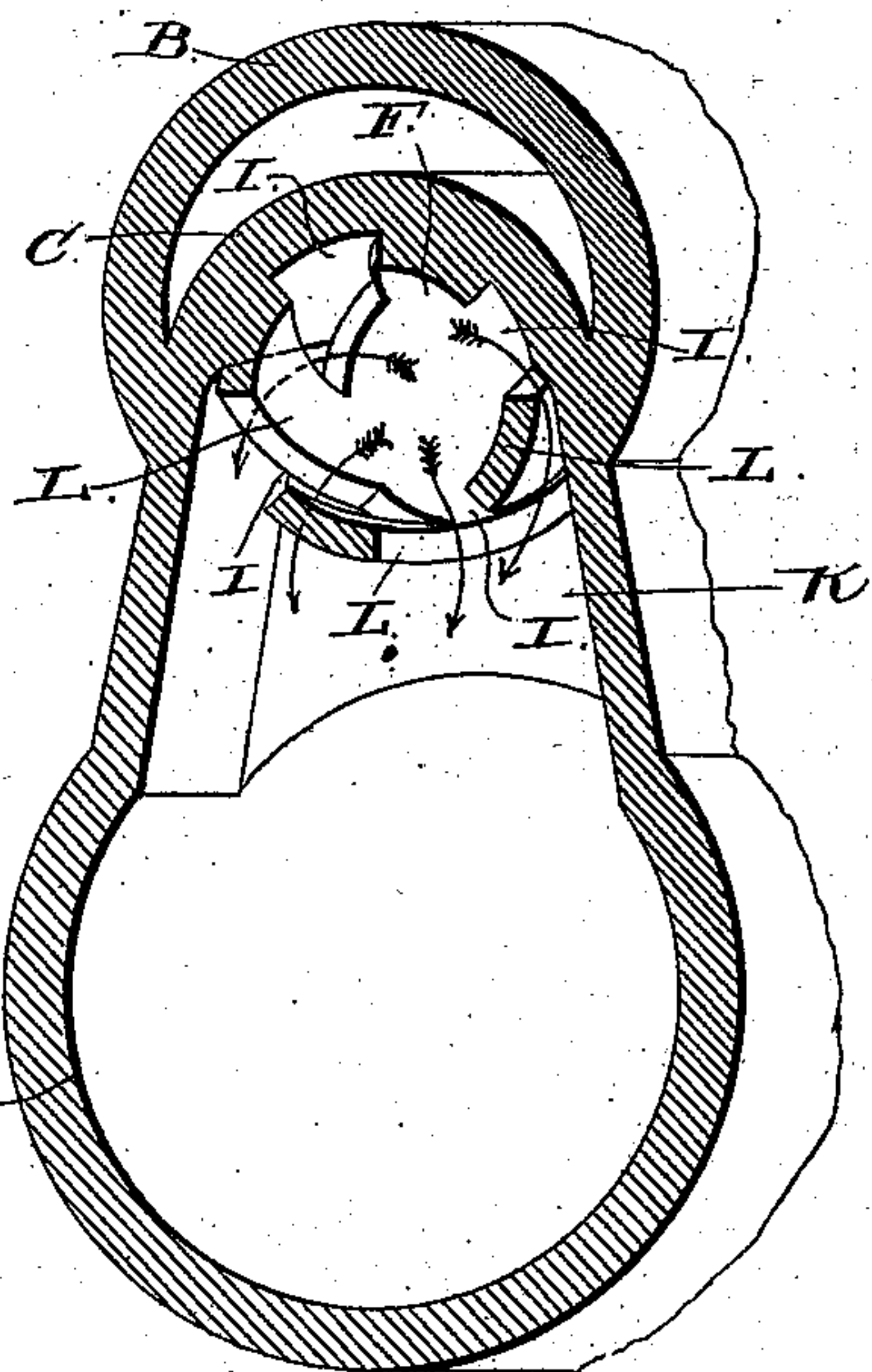


Fig. 3.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## VALVE FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 381,152, dated April 17, 1888.

Application filed October 26, 1887. Serial No. 253,466. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN S. MARSHALL, a citizen of the United States, residing at Imlay City, in the county of Lapeer and State of Michigan, have invented a new and useful Improvement in Valves for Steam-Engines, of which the following is a specification.

My invention relates to an improvement in valves for steam-engines; and it consists in the peculiar construction and combination of devices that will be more fully set forth hereinafter, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional view of the operating parts of a steam-engine embodying my improvements. Fig. 2 is a vertical sectional view of the same taken on the line *x x* of Fig. 1. Fig. 3 is a perspective view taken on the same section-line *x x*.

A represents the steam-cylinder. B represents a cylindrical steam-chest on one side thereof and somewhat longer than the steam-cylinder, and C represents an interior valve-cylinder which is arranged on one side of the cylindrical steam-chest B. The said steam-cylinder, cylindrical valve-chest, and valve-cylinder C are cast integrally and are formed of the same piece of metal.

The ends of the steam-chest B project somewhat beyond the ends of the steam-cylinder A, and the valve-cylinder C is arranged in the side of the chest B, adjacent to the steam-cylinder A. The said valve-cylinder C is of less diameter than the cylindrical chest B, and is also somewhat shorter than the latter, so that a space is formed between the sides and ends of the cylinders B C. On the ends of the cylindrical steam-chest B are fitted heads D by means of ground joints, and on the ends of the steam-cylinder A are fitted heads E by means of ground joints.

In the center of the valve-cylinder C and extending longitudinally through the same is a cylindrical bore, F. In opposite ends of the valve-cylinder C are formed steam-ports G H, each of which comprises a series of four spirally-arranged openings, I, which openings extend entirely around the circumference of the bore and communicate with each other and with recesses K, that are made in the under side of the valve-cylinder and communicate

with the ends of the steam-cylinder. By thus arranging the spiral openings I bridge-pieces L are formed between the same, which bridge-pieces are integral with the cylinder C. The central portion of the bore F intermediate the steam-ports is enlarged to form an exhaust-chamber, M, and an opening, N, is made through the sides of the cylindrical steam-chest and valve-cylinder C, through which the exhaust-steam passes.

O represents the piston, which is of the usual construction, is arranged in the cylinder A, and is provided with a piston-rod, P, that extends through one of the heads of the cylinder and through a packing-box formed on the said head.

R represents a valve-rod that extends through one of the heads D of the cylindrical steam-chest and enters the valve-cylinder C, as shown. Secured to the said rod are valves S T, which are cylindrical in shape, are fitted snugly in the bore F by means of expansion packing-rings U, of the ordinary construction, and are adapted to alternately open and close the ports G H, as will be readily understood. By reason of the spirally-arranged openings I and bridge-pieces L between the said openings the inner surface of the cylindrical bore F is preserved unbroken, so that compression is at all times maintained on the packing-rings U while the valves are in position in the valve-cylinder, and the said packing-rings are prevented from expanding and catching in the ports as the valves pass over the same, as will be readily understood. Furthermore, the recesses K, which communicate with the openings I and with ends of the steam-cylinder A, are very short, the ports being arranged directly over the ends of the cylinder, and thereby the area of the said recesses K is reduced to a minimum, and consequently only a very small quantity of steam remains dead in the said recesses at each stroke of the piston. Inasmuch as the said recesses K are arranged directly at the ends of the steam-cylinder only a very slight space is left between the cylinder-heads and the piston at the ends of the strokes of the latter for dead steam.

The operation of my invention is as follows: Live steam is admitted to the cylindrical steam-chest through a central opening, V, therein and is caused to bear against the outer ends of



the valves S T with equal pressure, thereby balancing the said valves and enabling the same to be moved lengthwise in the valve-chest very easily. When the valves are in the position shown in Fig. 1, the valve T is arranged at the front end of the valve-chest on the outer side of the ports H, and the valve S is arranged near the rear end of the valve-chest on the inner side of the port G. Steam therefore passes through the port G into the rear end of the cylinder A and forces the piston forward, and the dead steam in the said cylinder in front of the piston passes through the port H into the exhaust-chamber M and through the opening N. When the piston reaches the forward limit of its stroke, the valves are moved rearward by suitable gearing or mechanism, which is not here shown, as it forms no part of my present improvement, (and may be of the form ordinarily employed in steam-engines for this purpose,) thereby causing the positions of the valves S and T to be the reverse of that shown in Fig. 1, so that the valve S will be on the outside of the port G and the valve T will be on the inner side of the port H. When thus arranged, steam will be admitted through the port H into the front end of the steam-cylinder to force the piston rearward therein, and the steam in the rear end of the said cylinder escapes upward through the port G into the exhaust-chamber M and out through the opening N.

A steam-engine thus constructed will be extremely cheap and simple. It is very readily made and is easily put in running order. By casting the cylinder A, the cylindrical steam-chest B, and the valve-cylinder C in one integral piece, as before described, no packing is

required between the steam-cylinder and the steam-chest and no interior fitting or truing of the steam-cylinder and of the steam-chest is necessary other than boring the cylinder A and the valve-cylinder.

Having thus described my invention, I claim—

1. In a steam-engine, the combination of the steam-cylinder A, having the vertical recesses K adjoining its heads and extending transversely from wall to wall, the steam-chest extending at each end beyond said cylinder and taking steam centrally on top at V, the valve-cylinder provided with the inclined spiral ports G H, opening directly into the recesses K, and all in the same vertical plane open at its ends to take steam from the steam-chest, and having the exhaust-opening at its central port, and the valves S T provided with expansion packing-rings of ordinary construction, substantially as specified.

2. In a steam engine, in combination with the steam-cylinder, the steam-chest extending at each end beyond the said cylinder, and the valve-cylinder within the steam-chest adjoining the steam-cylinder and having ports opening directly thereinto, the said steam-cylinder, steam-chest, and valve-cylinder being cast integral with each other, and the cylinder-heads and steam-chest heads fitted to their seats by ground-joints, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

JOHN S. MARSHALL.

Witnesses:

JOHN H. SIGGERS,  
E. G. SIGGERS.