

H. H. Erarts,
Rotary Steam Valve.
No 23,807. Patented Apr. 26, 1859.

Fig: 1.

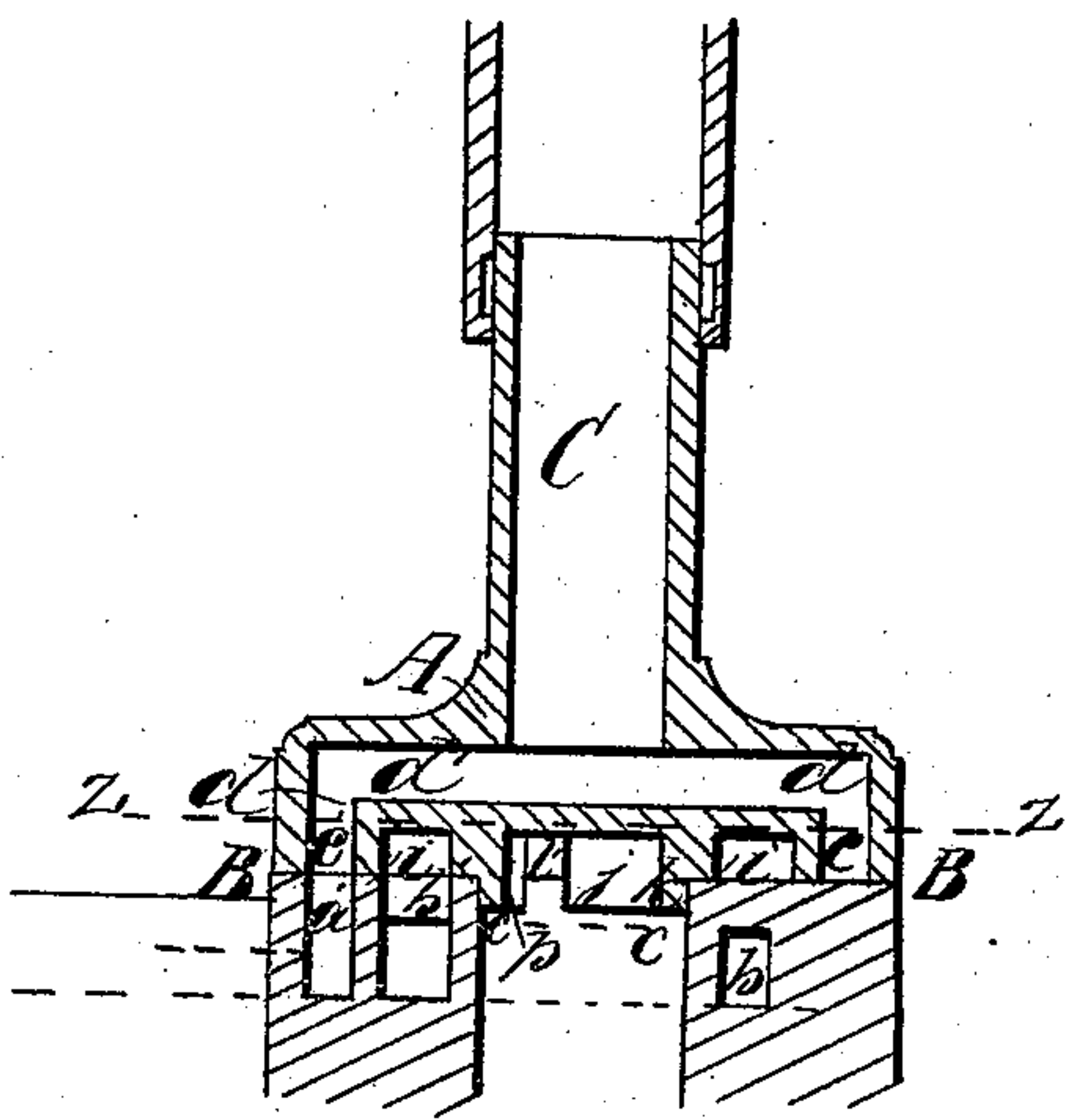


Fig: 3.

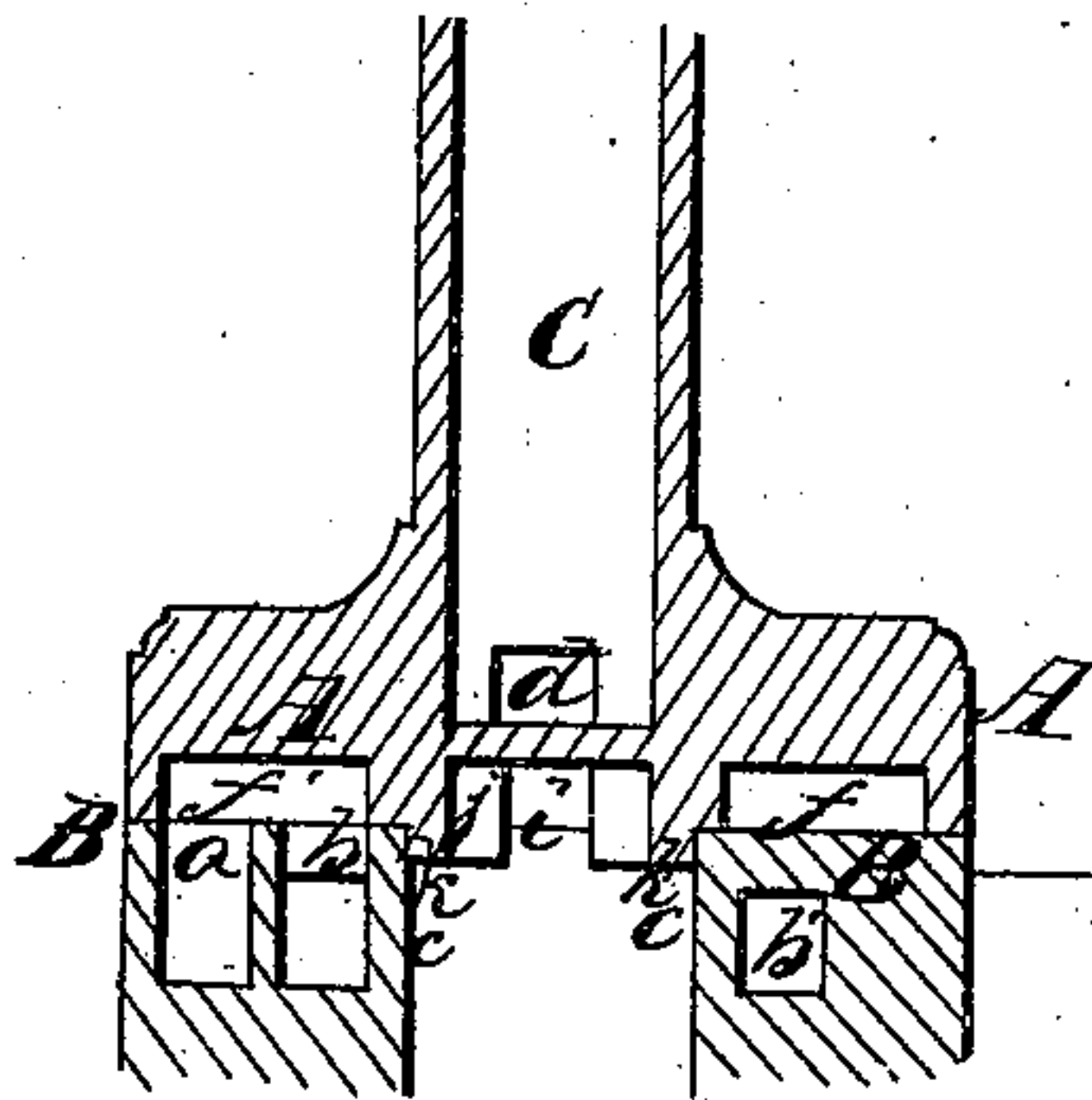


Fig: 2.

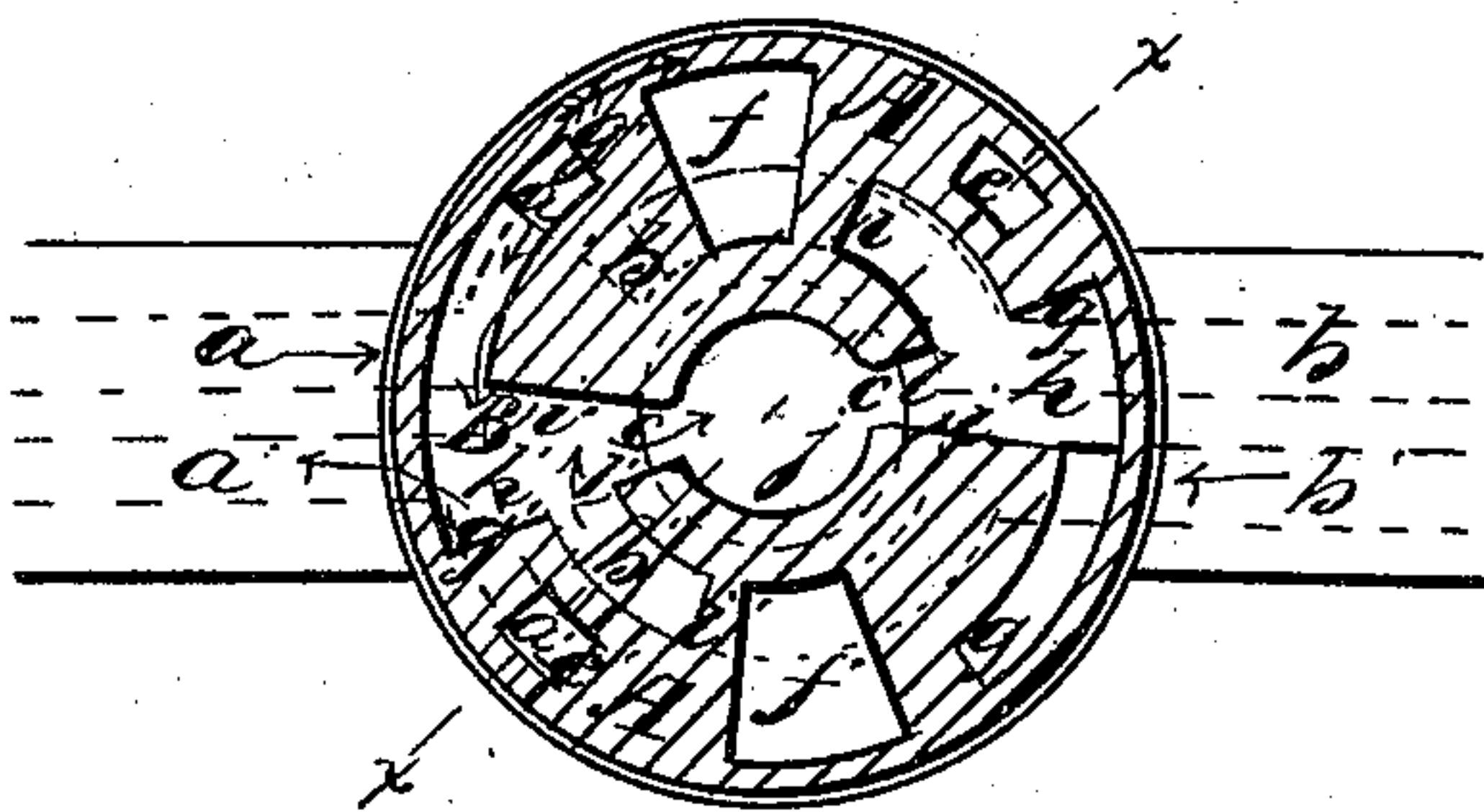
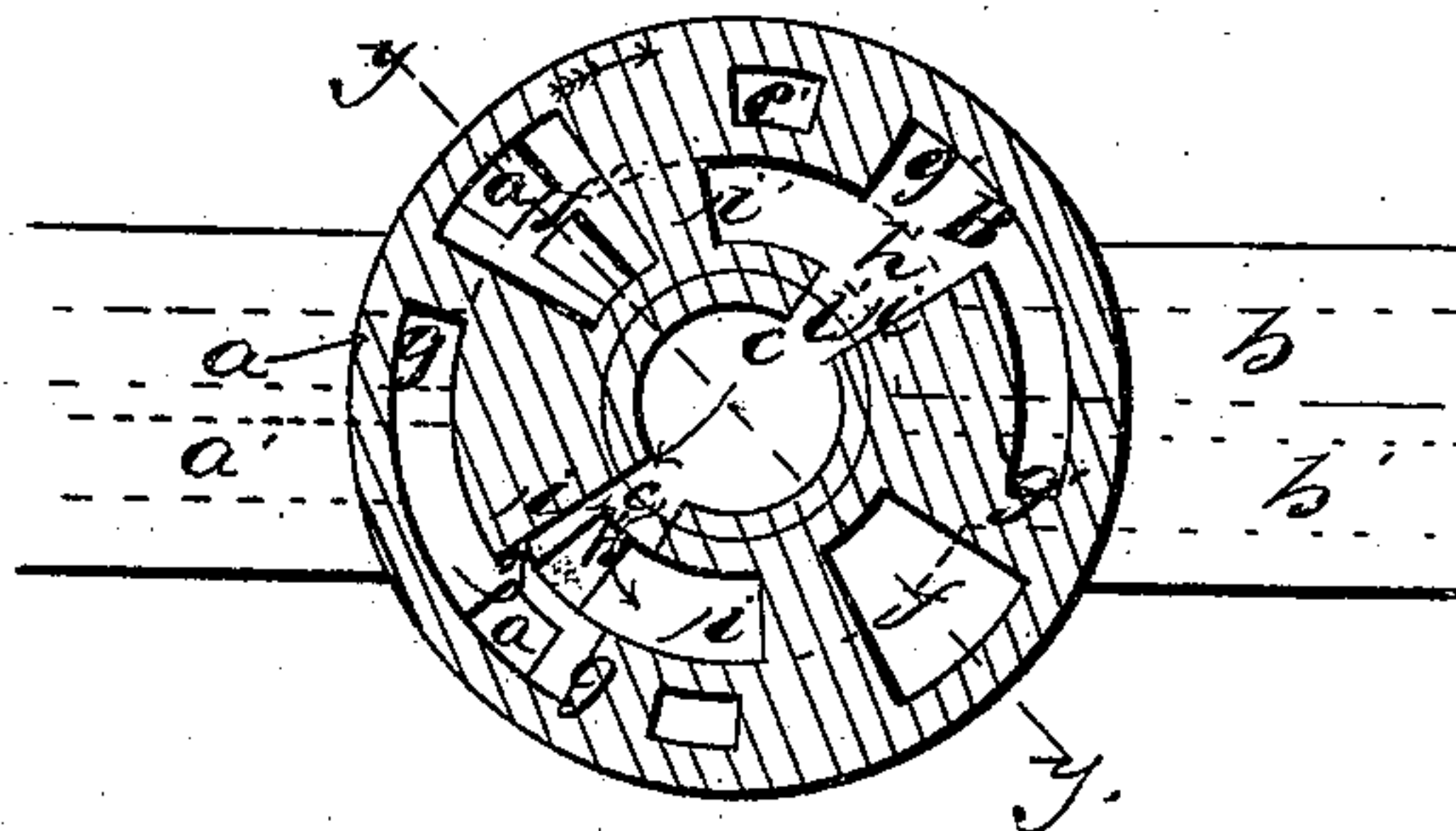


Fig: 4.



Witnesses:
Carlyle Whipple
John M. Cook

Inventor:
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UNITED STATES PATENT OFFICE.

HARRY H. EVARTS, OF CHICAGO, ILLINOIS, ASSIGNOR TO HIMSELF AND PHINEAS E. MERRIHEW, OF SAME PLACE.

STEAM-VALVE.

Specification of Letters Patent No. 23,807, dated April 26, 1859.

To all whom it may concern:

Be it known that I, HARRY H. EVARTS, of Chicago, in the county of Cook and State of Illinois, have invented a new and Improved Rotary Induction, Education, and Expansion Valve for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1, is a central section of the valve and its seat in the plane indicated by the line x, x , in Fig. 2. Fig. 2, is a section of the valve parallel with its face, in the plane indicated by the line z, z , in Fig. 1, also partly exhibiting a face view of the valve seat. Fig. 3, is a central section of the valve and seat in the plane indicated by the line y, y , in Fig. 4. Fig. 4, exhibits in black outline a plan of the valve seat, and in red outline a section of the valve in the same plane as Fig. 2, but exhibits the valve in a different position on its seat. Figs. 3 and 4 also exhibit, in the section of the valve, the form of its face.

Similar letters of reference indicate corresponding parts in the several figures.

My improved rotary induction and education valve is intended for a steam engine with two cylinders whose pistons connect with two cranks arranged at right angles to each other upon the same shaft, or in an equivalent manner, the one a cylinder which receives the steam from the boiler and from which steam is cut off at or before half stroke, and the other a larger cylinder into which, at the commencement of the stroke of its piston, the steam is admitted from the steam side of the piston of the smaller one, which is then at half stroke, so that the larger piston is acted upon throughout its whole stroke, and the smaller one through half or more of its stroke by the expansive force of the steam which was admitted to the smaller cylinder from the boiler during the earlier portion of its stroke, the steam exhausting from each cylinder either into the atmosphere or into a condenser.

My invention consists in a certain arrangement of ports, cavities and passages in a single rotary-valve, in combination with a suitable arrangement of ports in its seat, whereby the induction and education of the

steam to and from both ends of both cylinders are effected.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A, is the valve, and B, its seat, of circular form. These may have their faces flat, as represented, or conical. In the seat B, there are four ports, two, a, a^1 , and two, b, b^1 , the first two, a, a^1 , which are arranged in the same circles concentric with the axis of rotation of the valve, and with their centers at 90° , apart, communicating with the two ends of the smaller cylinder, and the other two, b, b^1 , which are similarly arranged between the same radial lines as a, a^1 , and between the latter and the axis of rotation of the valve, communicating with the two ends of the larger cylinder. In the center of the said seat there is a large circular opening c, c , communicating with the exhaust pipe through which the whole of the steam from the engine is to be exhausted.

The revolving valve A, is in the form of a box, constituting at the same time the steam chest of the engine, and it has permanently attached to its center a short pipe C, through which all the steam is admitted to the smaller cylinder of the engine, said pipe being intended to be connected by a box joint with the stationary steam pipe coming from the boiler, and from this pipe C, there branch off radially in opposite directions toward the sides of the box, two passages d, d^1 , (see Figs. 1 and 3,) which terminate in ports e, e^1 , in the face of the valve, said ports e, e^1 , being so arranged as to register with the ports a, a^1 , of the seat and of such length in the circular direction that each in its revolution over each of the latter ports will remain in communication therewith, during so much of the stroke of the smaller piston, less than half stroke, as it is intended that steam shall be admitted from the boiler. In the particular valve represented these ports are of a length to admit steam during but one third of the stroke of the smaller piston and as the ports a, a^1 , are of similar length and the valve is intended to make but one revolution for two revolutions of the engine, the ports a, a^1 , and e, e^1 , have a length equal to one twenty-fourth part of a circle. The valve has also two cavities f, f^1 , having their ends radial to the center of the valve, and

these cavities are of such a width in a direction radial to the center of the valve that each will cover the ports a , b , or those a^1 , b^1 , at the same time, to form a means of communication between the larger and smaller cylinders. These cavities commence at a distance from the ports e , e^1 , taken in a direction opposite to the direction of the revolution of the valve (which latter direction is indicated in Figs. 2 and 4, by red arrows) equal to the length of the ports a , a^1 , and b , b^1 , and the length of the said cavities is equal to twice the length of the ports a , a^1 , and b , b^1 , taken in corresponding circles or one-twelfth the circle of the valve. There are also two other cavities g h i l , and g^1 h^1 i^1 l^1 , which unite with a central circular cavity j , which is partially surrounded by two pieces k , k , which project from the face of the valve to fit within the central circular opening c , c , of the seat. These projecting pieces constitute guides to aid in keeping the valve concentric with its seat. The cavities g h i l , and g^1 h^1 i^1 l^1 , register with the ports a , a^1 , and with those b , b^1 , of the seat. The parts g , g^1 , of the said cavities which register with a , a^1 , being of a length equal to five twenty-fourth parts of the circle of the valve and the parts i , i^1 , which register with b , b^1 , being of corresponding length, the parts g , g^1 , extending to within a twenty-fourth part of a circle of one side of the cavities f , f^1 , and the parts i , i^1 , to within a corresponding distance of the opposite side of the said cavities. The parts h , h , whose width is equal to two twenty-fourths of the circle, unite the said parts g , g^1 , and i , i^1 , midway between the cavities f , f^1 , and the parts l , l^1 , forming continuations of the parts h , h^1 , into the central circular cavity j .

The operation of the valve is as follows. The valve in its revolution in the direction of the red arrows shown upon it in Figs. 2 and 4, just commences to open the port e , or e^1 , to the port a , or a^1 , of the seat to admit steam to the smaller cylinder of the engine, as the piston of that cylinder has arrived at the end of its stroke in one direction. I will suppose for example that the port e^1 , is opening to the port a^1 , and admitting steam through that port to the smaller cylinder, as represented in Fig. 1, where these ports are wide open to each other, the piston of the smaller engine having completed one sixth of its stroke. The corresponding end of the larger cylinder, that is to say that end which receives the steam from the port a^1 , of the smaller cylinder, is still exhausting through the port b^1 , and the cavity g^1 h^1 i^1 l^1 , into the exhaust passage c , c , and the opposite end of the small cylinder is exhausting through the port a , into the same

cavity of the valve. The large cylinder is receiving no steam and has made two thirds of its stroke. As the rotation of the valve with the engine continues, the port e^1 , passes over the port a^1 , and closes it by the time one third of the stroke of the smaller piston has been completed, but no further change in the communications of the several ports and passages takes place till the smaller piston has made half its stroke and the larger one has completed its stroke, when the port b^1 , belonging to the latter cylinder, is closed to the exhaust, and commences being brought into communication with the port a^1 of the smaller cylinder from which the steam has just been previously cut off, and the port b , of the said cylinder is opened to the exhaust pipe through the cavity g^1 h^1 i^1 l^1 . The communication between the ports a^1 b^1 , continues till the stroke of the smaller piston is completed, when said communication is closed by the cavity f^1 , completing its passage over them, and the induction of steam to and eduction of steam from its opposite end are commenced by the arrival of the port e^1 , of the valve over the port a , and the arrival of the cavity g h i l , of the valve over the port a^1 , the piston of the larger cylinder being left to be acted upon throughout the remaining half of its stroke by the expansion of the steam remaining shut up within it and the exhaust of steam through its port b , continuing to the end of the stroke. The port e , cavity f , and cavity g h i l operate in connection with each set of cylinder ports as the port e^1 , cavity f^1 , and cavity g^1 h^1 i^1 l^1 .

It will be obvious to the engineer that by differently spacing the ports and passages in the valve, still retaining the same form of and proportion between the spaces that a single valve may be constructed to perform all the functions of the double valve represented, and will be the equivalent thereof, but such valve would require to rotate once for every revolution of the engine instead of once for every two revolutions as is the case with the double valve.

What I claim as my invention and desire to secure by Letters Patent, is—

The arrangement of the ports, cavities and passages in the valve, substantially as herein described, in combination with a corresponding arrangement of the ports in the seat, whereby a single valve is made to perform its functions for the two cylinders of the engine, as herein set forth.

HARRY H. EVARTS.

Witnesses:

CARLYLE WHIPPLE,
JOHN M. COOKE.