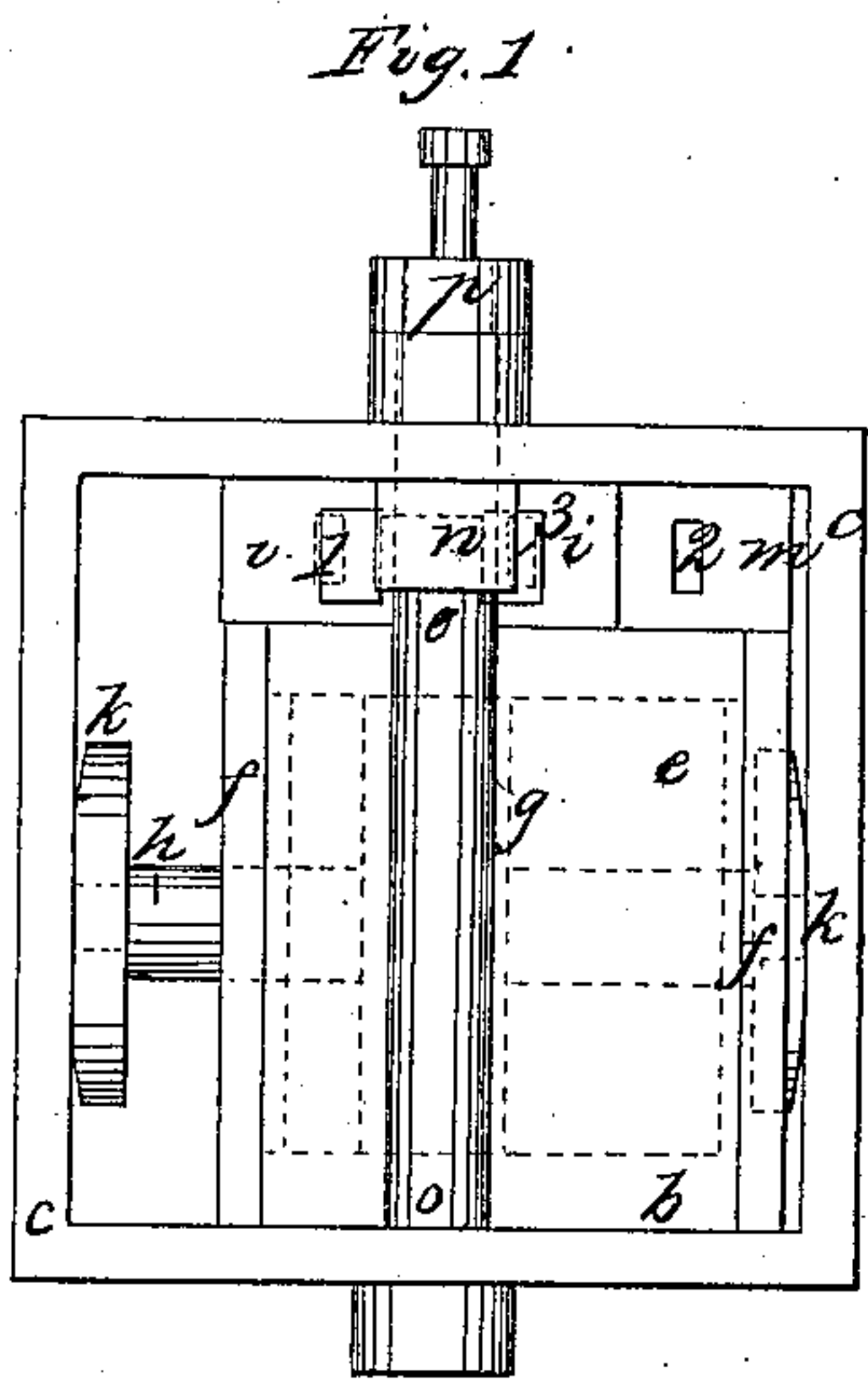
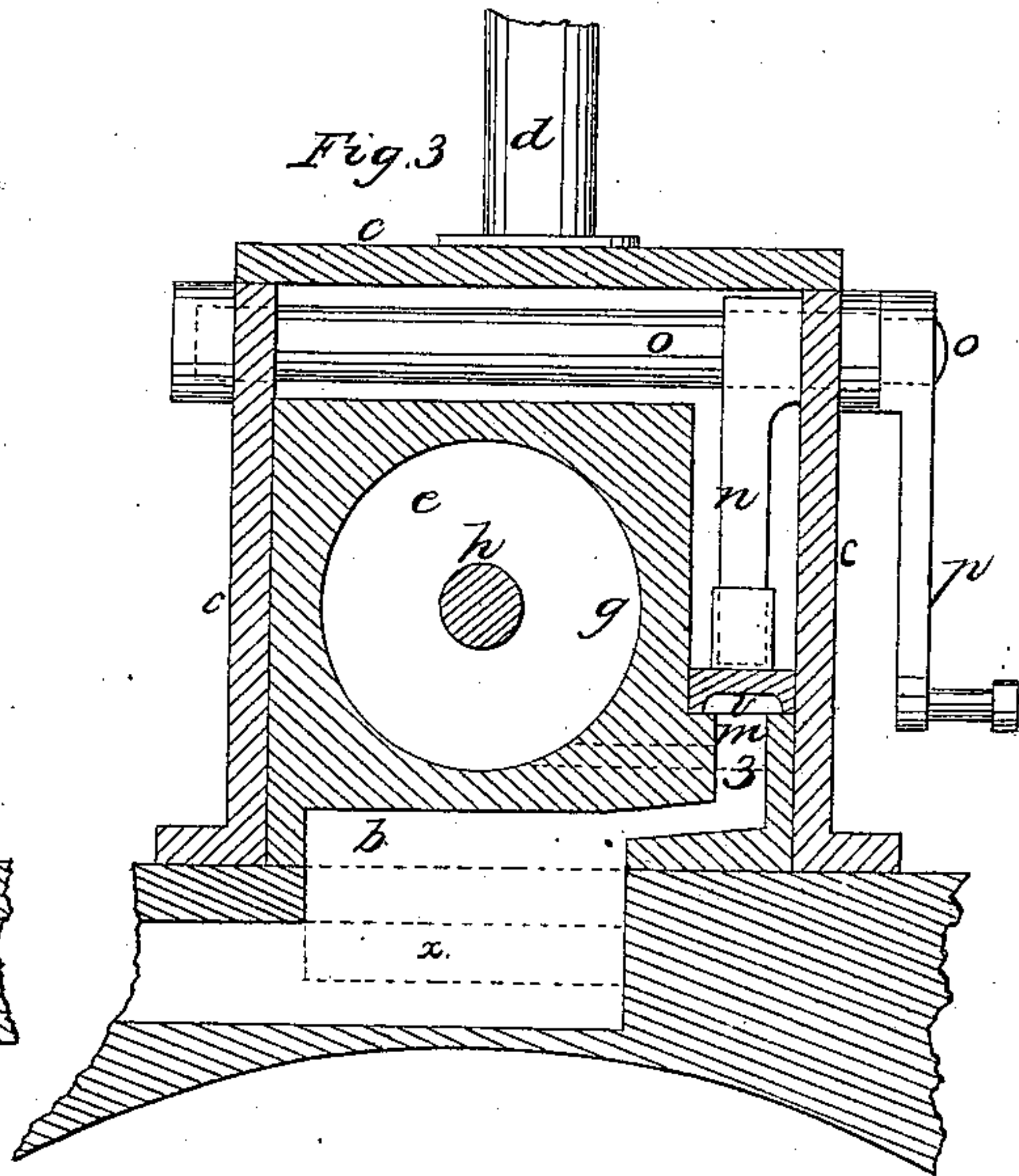
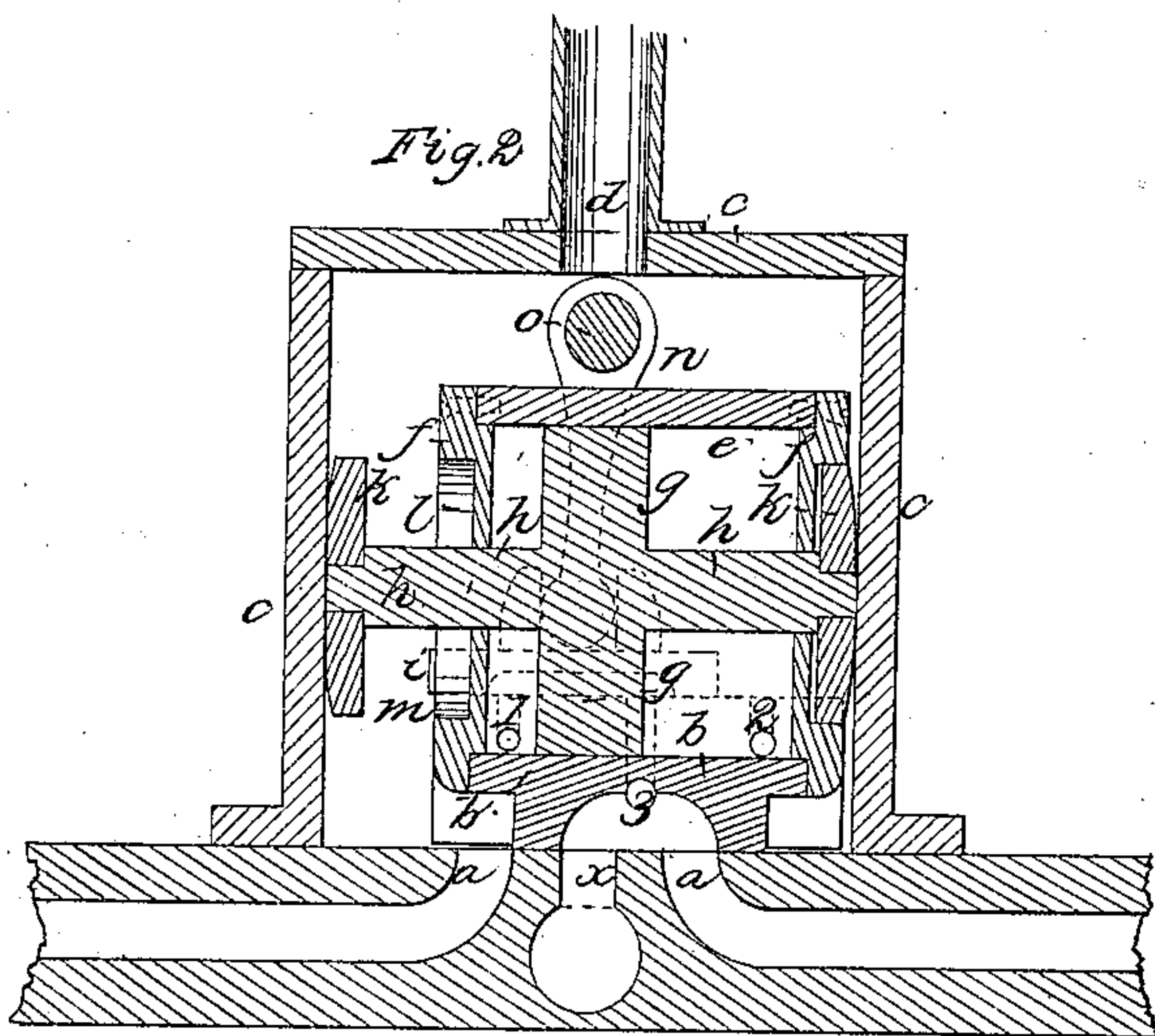


J. & C. B. Hardick,

Steam Slide Valve.

N^o 36,407.

Patented Sep. 9, 1862.



Witnesses:

Lemuel W. Snell

Thos. W. Harold

Inventors.

John Hardick

Charles B. Hardick

UNITED STATES PATENT OFFICE.

JOHN HARDICK AND CHAS. B. HARDICK, OF BROOKLYN, NEW YORK.

VALVE FOR STEAM-ENGINES.

Specification of Letters Patent No. 36,407, dated September 9, 1862.

To all whom it may concern:

Be it known that we, JOHN HARDICK and CHARLES B. HARDICK, of Brooklyn, in the county of Kings and State of New York, have invented, made, and applied to use a certain new and useful Improvement in Valves for Direct-Acting Steam-Engines; and we do hereby declare that the following is a full, clear, and exact description of the said invention, reference being had to the annexed drawing, making part of this specification, wherein—

Figure 1, is a plan of our improved valve with the cover of the steam chest removed. Fig. 2, is a vertical longitudinal section and Fig. 3, is a cross section of our valve, chest, and part of the steam cylinder.

Similar marks of reference denote the same parts.

Steam engines have heretofore been made direct acting upon the pump or other mechanism to be moved, so as not to require the intervention of cranks and connecting rods. Our invention is especially applicable with this character of engine. The valves of such engines have been acted upon by a rod and tappets taken by an arm on the piston rod, and a second steam valve with a piston has been employed to give motion to and control the action of the main steam valve. In these instances the main valve has been liable to stoppage in consequence of the steam piston not traveling quite far enough to give the full movement—or if stopped in a particular position, the valve would so remain and exclude steam from the main cylinder until moved by hand.

Our invention obviates all the aforesaid difficulties and consists in a stationary piston in a cylinder formed upon or attached to the main valve and receiving steam from a suitable secondary valve by means whereof the steam causes the main valve to move and admit steam on the opposite side of the engine piston. We also prevent concussion to the main valve as moved in the aforesaid manner, by a cushion of steam confined in an annular space by a head or disk.

In the drawing a, a' , are the steam ports of any usual steam cylinder.

x , is the exhaust port.

b , is the steam valve of any ordinary construction adapted to the said ports a, a' , and x .

c , is the steam chest and d , the opening or pipe for steam from the boiler.

The valve b , is formed with or connected to a cylinder e , that is provided with heads f, f . Inside this cylinder e , is the piston g that is placed at the middle of the rod h , the ends of which pass through the respective heads f, f , and take against the inside of the steam chest c , so that the said piston g , remains stationary and if steam is admitted into the cylinder on one side, the cylinder and valve move toward the steam chest on the side of the piston at which the steam is admitted.

To prevent concussion by the valve coming in contact with the inside of the steam chest we provide the disks k, k , that are stationary on the piston rod h , and in the heads f, f , annular cylindrical recesses l, l , are formed, the steam being constantly in these recesses forms a cushion when confined by the disks l, l , as the movement of the valve causes one of the recesses to inclose this disk and confine the steam so that the accumulation of pressure arrests the momentum of the valve.

In order to give motion to the main steam valve b , we employ the secondary valve i , moving on the seat m , formed as a part of the main valve b . This valve i , is moved by the arm n , from the rock shaft o , that receives its motion from the arms p , and a rod or other suitable connection to the cross head of the engine, or an arm projecting from the piston rod or other suitable device. This secondary valve is formed of a size and shape adapted to the ports 1, 2, and 3, in the seat m . The port 3, opens into the exhaust way of the main valve b , and the ports 1, and 2, open into the respective ends of the cylinder e .

The operation is as follows: The valve i , is by the rock shaft o , moved in the same direction as the main steam engine piston and as soon as the end thereof uncovers one of the ports 1, or 2, steam immediately rushes into that end of the cylinder e , and acting between the stationary piston g , and head f , moves the main valve b , in the opposite direction, fully uncovering the port 1, or 2, and opening the exhaust (through 3,) at the other side of the piston g ,—this movement immediately reversing the position of the main valve b , opens the steam port a , or a' , behind the piston to move it in the other direction, and opens the exhaust to the other side of the piston; and in this position the valve b , remains until the

engine is near the end of another stroke when the auxiliary valve *i* lets steam in on the other side of the stationary piston *g*, and reverses the position of the valve *b*, as before. The disks *l*, *l*, in all instances preventing concussion of the valve against the steam chest by the cushioning as aforesaid.

Our improved stationary piston, cylinder and steam valve are very easily constructed and are not injuriously affected by expansion the valve cannot be stopped at any center or dead point and the engine will start when the steam is let on no matter what position the piston may be in.

The auxiliary valve is easily moved so that but little strain comes on the rock shaft and parts moving it—and it will be apparent that the position in which this auxiliary valve is applied to the main valve may be varied if necessary so long as the steam

is admitted to the cylinder *e*, in the required manner.

What we claim and desire to secure by Letters Patent is—

1. The stationary piston *g*, in combination with the cylinder *e*, formed with or attached to the valve *b*, substantially as and for the purposes specified. 25

2. We also claim the disks *l*, *l*, and annular recesses *l*, *l*, in combination with the said valve *b*, and cylinder *e*, to cushion the valve and prevent concussion as set forth. 30

In witness whereof we have hereunto set our signatures this twenty ninth day of July 1862. 35

JOHN HARDICK.
CHARLES B. HARDICK.

Witnesses:

LEMUEL W. SERRELL,
CHAS. H. SMITH.