

(No Model.)

E. S. WINCHESTER.

2 Sheets—Sheet 1.

STEAM ENGINE.

No. 246,264.

Patented Aug. 23, 1881.

Fig. 1.

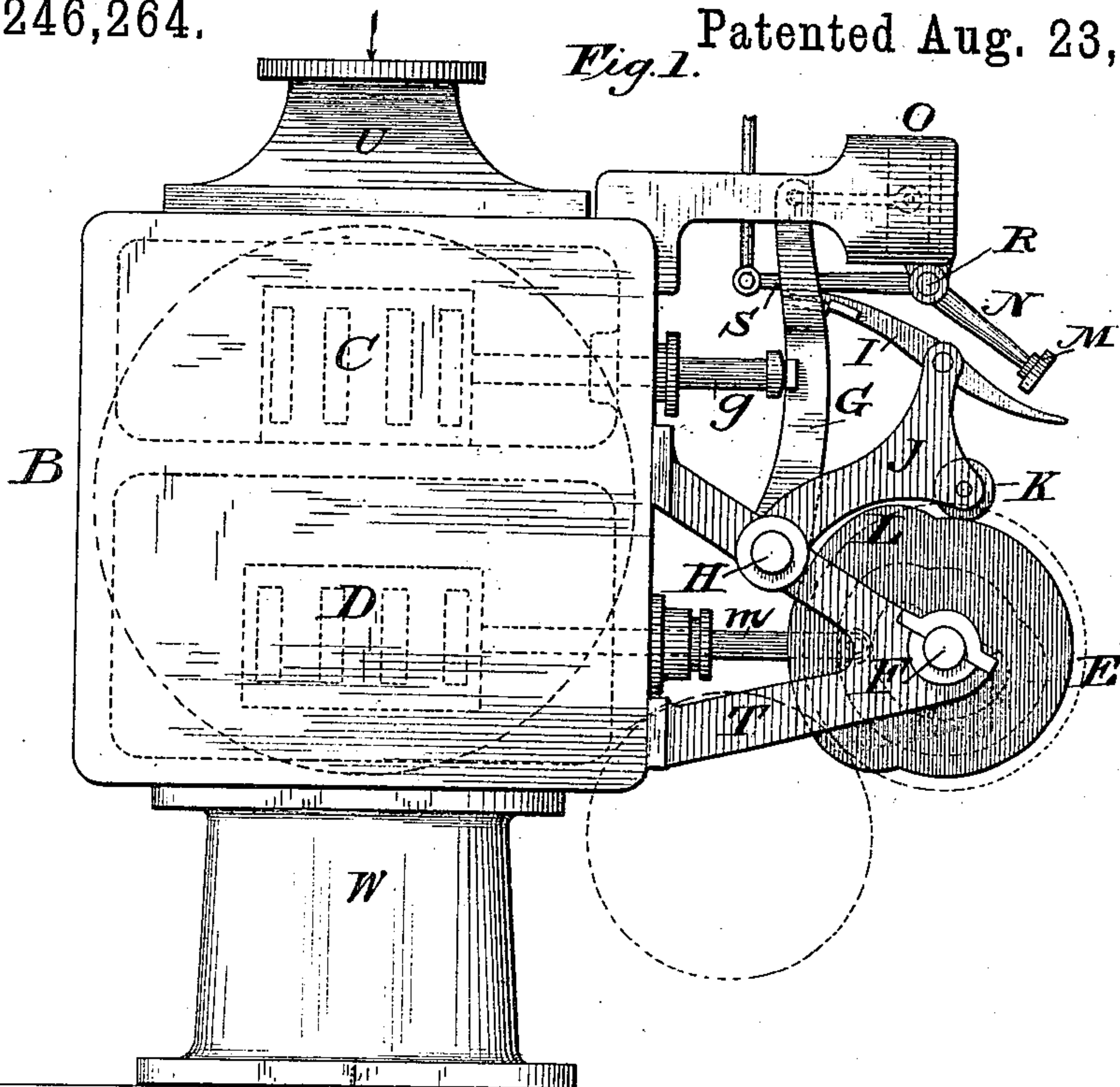
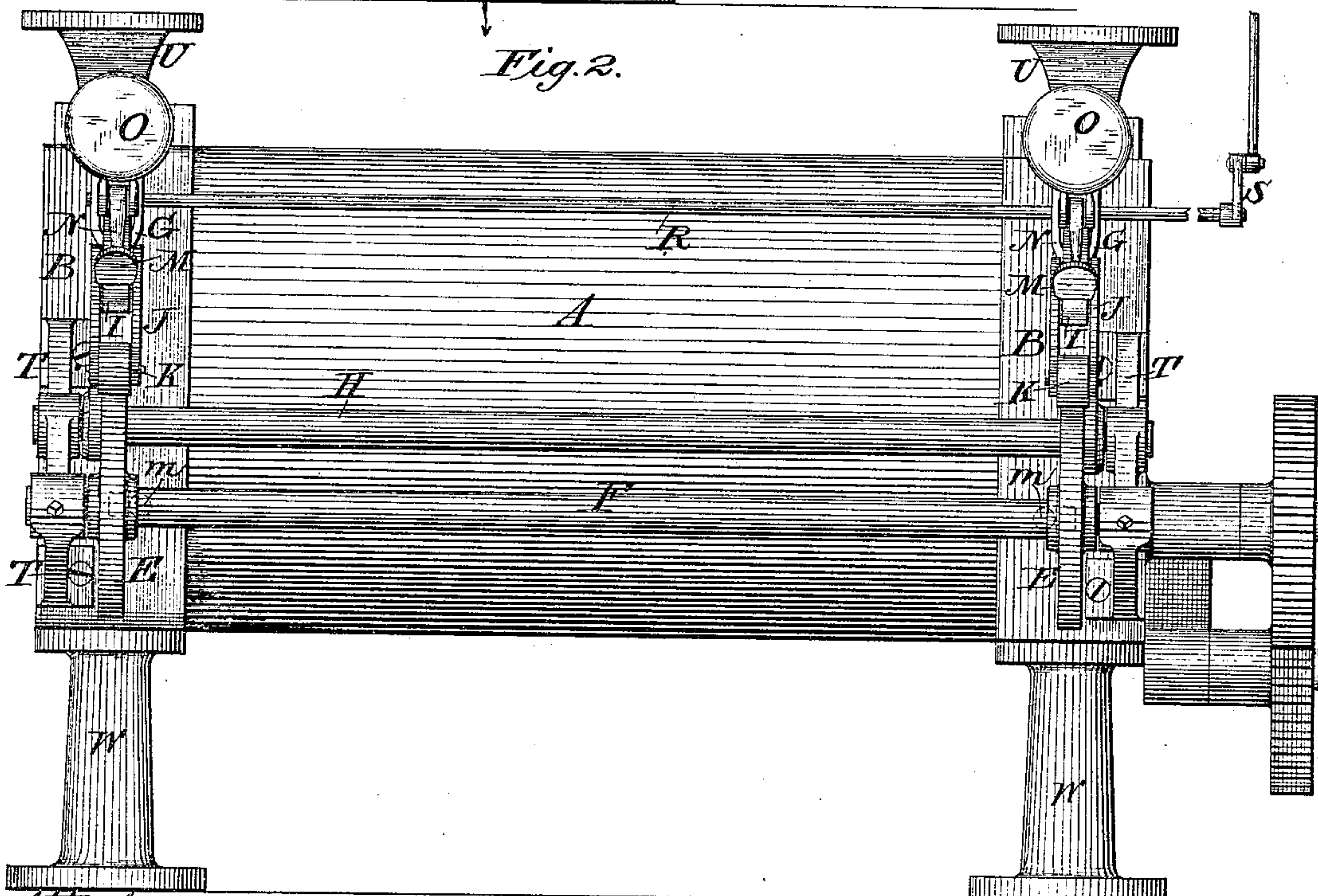


Fig. 2.



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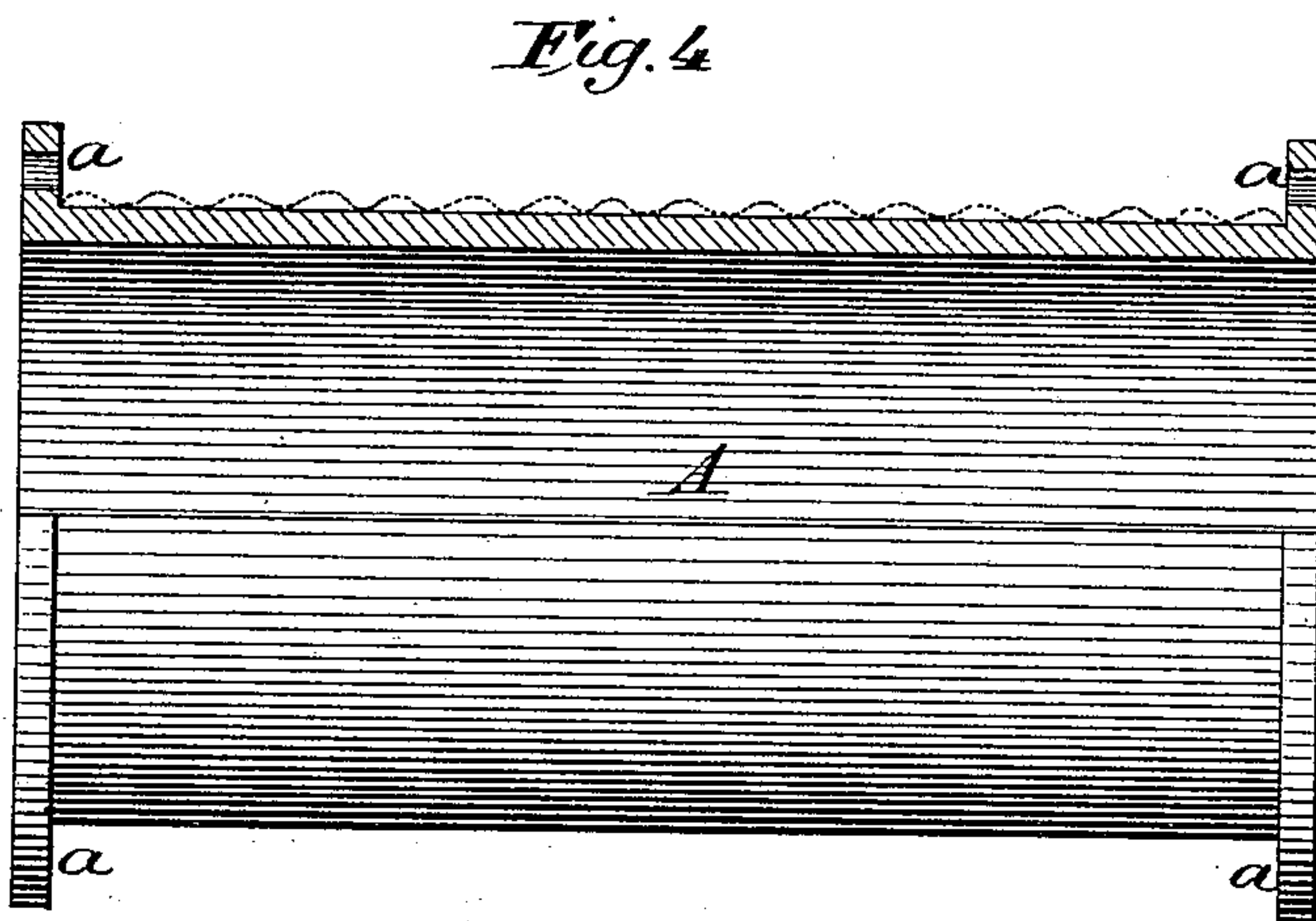
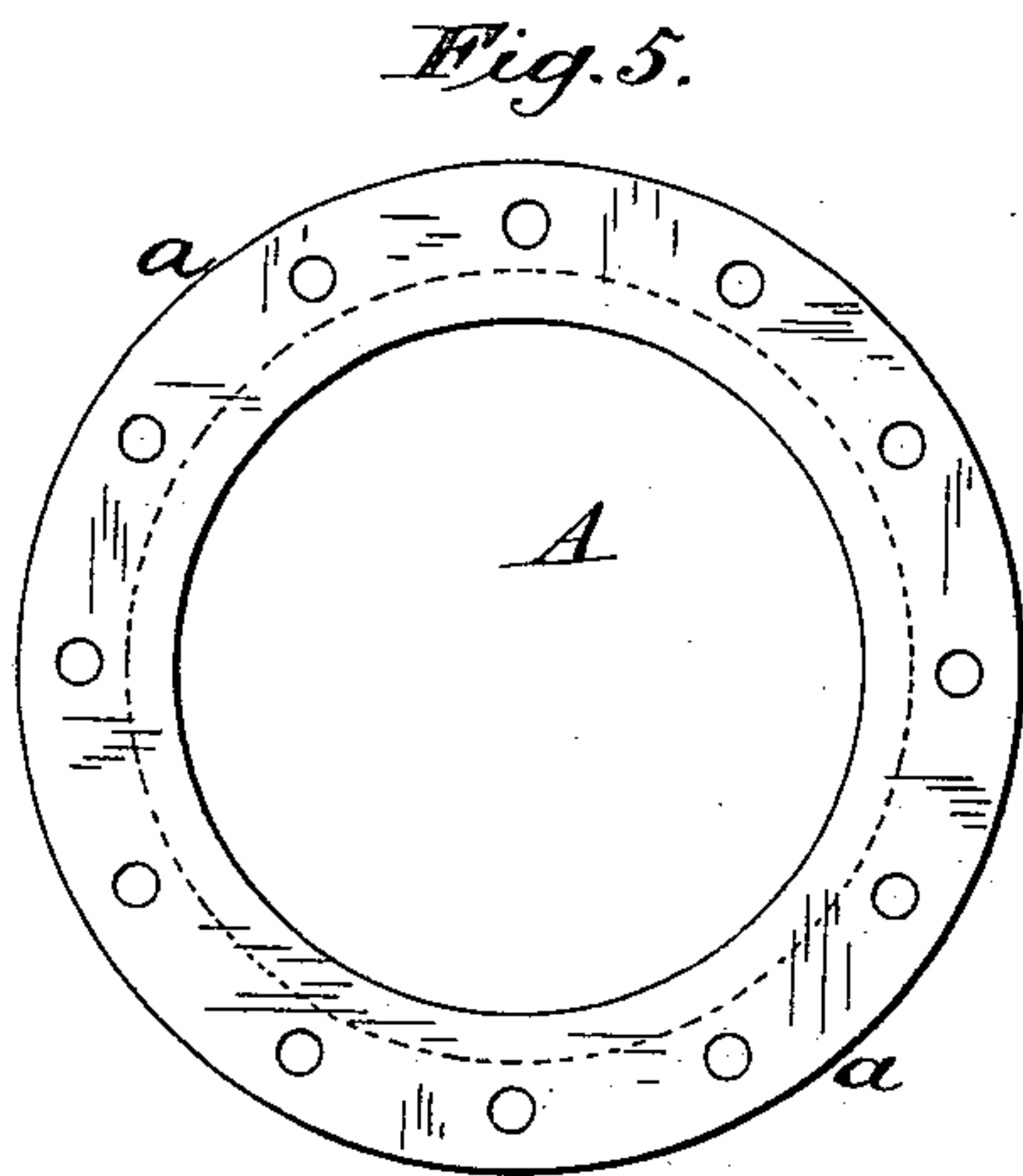
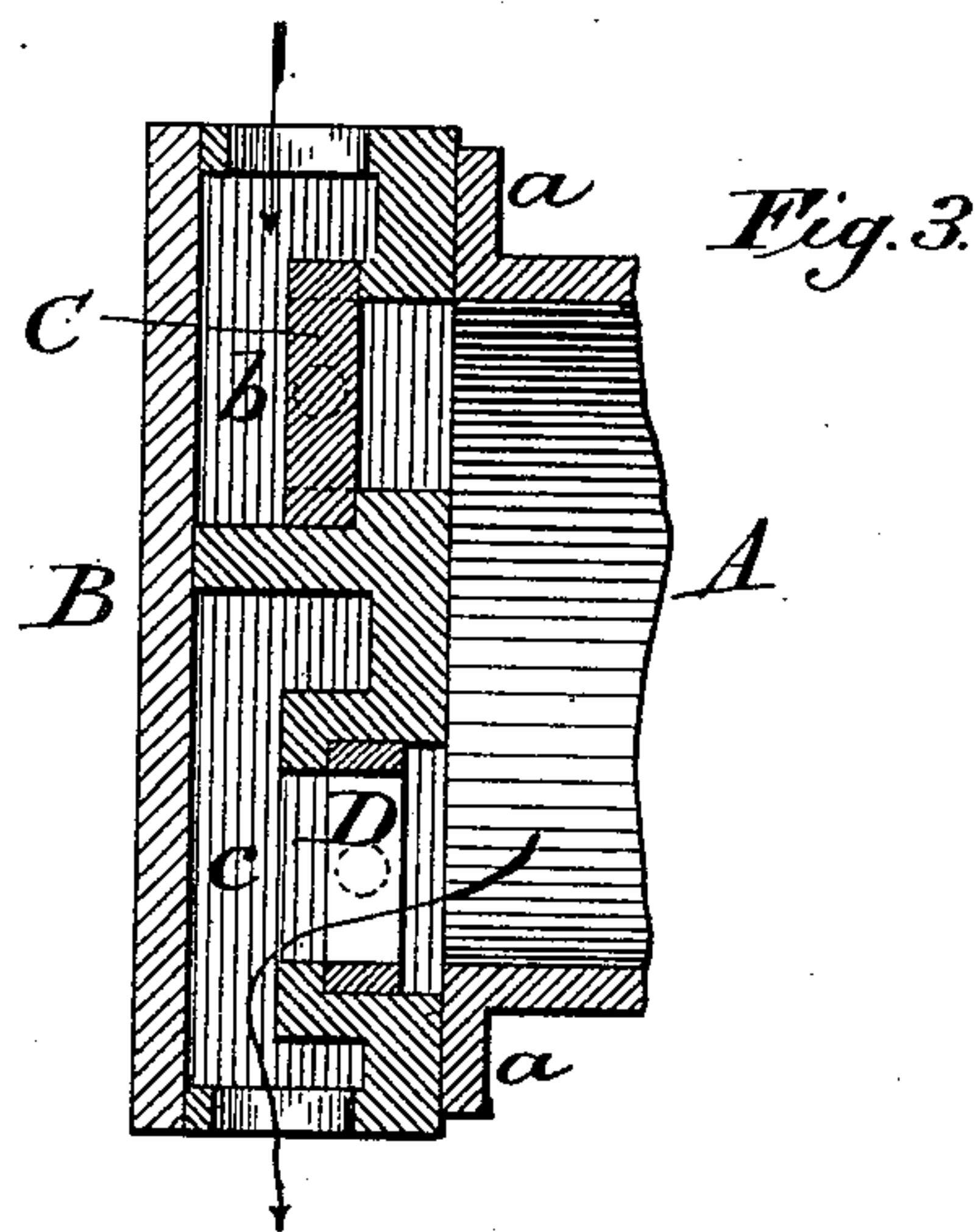
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UNITED STATES PATENT OFFICE.

EDWARD S. WINCHESTER, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO
C. E. MOORE AND M. L. WYMAN, BOTH OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 246,264, dated August 23, 1881.

Application filed February 4, 1881. (No model.)

To all whom it may concern:

Be it known that I, E. S. WINCHESTER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Steam-Engines, of which the following is a specification.

My invention relates to reciprocating-piston engines, and its object is to simplify and cheapen their construction, give easier access to the working parts, render them more economical in the consumption of steam, and admit of their being readily repaired, as well as to equalize the wear of the piston on the cylinder.

With these ends in view the invention consists in arranging a horizontal cylinder in such manner that it may be revolved around its axis or turned end for end to equalize the wear; in transversely-sliding valves of peculiar arrangement mounted in the cylinder-heads in close proximity to the interior of the cylinder.

I am aware that it is old to provide the cylinder-heads of steam-engines with puppet-valves and other valves, and this I do not claim, my invention being restricted to an engine wherein the valves are of a flat form and arranged to slide transversely in the cylinder in immediate proximity to the cylinder, in order to reduce the area of the steam-ports and prevent the waste of steam.

The invention also consists in a valve-gear in which the operating devices swing from a common center in the manner hereinafter described, and in various other details which will be hereinafter more fully explained.

Figure 1 represents an end elevation of the cylinder and valve-gear of my improved engine, the cylinder being horizontal; Fig. 2, a side elevation of the same; Fig. 3, a side elevation of one end of the cylinder and its head, illustrating the form of the steam-ports. Fig. 4 is a side elevation of my cylinder, with one-half represented in section. Fig. 5 is an end view of the same.

Referring to the drawings, A represents the cylinder, and B B' the cylinder-heads, as shown in Figs. 4 and 5.

The cylinder is made of a true cylindrical form, of uniform thickness throughout its entire length, and without openings therein or projections thereon except at the ends, each of which has a narrow flange, *a*, turned upward,

as shown. By thus constructing the cylinder it is found that, unlike those that are made of unequal thickness, and which have steam-passages, valve-seats, and other projections cast upon them, it will retain its cylindrical form when expanded by the heat of the steam admitted within it. It also possesses other advantages, which will be hereinafter fully stated.

The cylinder-heads, which are made preferably of rectangular form, as shown, have the steam inlet and outlet ports formed in them, as clearly represented in Figs. 1 and 3, each head having an inlet-port, *b*, and a separate and independent outlet-port, *c*. The cylinder-heads are bolted or otherwise secured firmly to the ends of the cylinder, as shown. Each head is provided with two slide-valves, C and D, located in the inlet and outlet steam-passages, respectively, as shown. These valves, which may be of the ordinary gridiron type, or of any other approved form of slide-valves, are arranged to slide upon valve-seats formed in the heads as near as possible to their inner faces.

An important feature of my construction consists in thus seating valves in the cylinder-head, and in arranging them in the closest possible proximity to the inner faces of the cylinder-heads, in order to reduce to the smallest possible amount the area of the steam-ports between the inner face of the valve and the cylinder. It is plain that all steam required to fill the ports between the valve and the cylinder is a complete loss, or nearly so, and consequently the smaller the ports the greater the economy with which the engine loses steam.

In engines of the ordinary construction, having the ports arranged upon the sides of the cylinder, or having rotary valves at the ends of the cylinder, a great waste of steam occurs. By my method of construction, however, consisting in using flat valves, locating them in the heads of the cylinder, and arranging them near the inner faces of the cylinder-heads, I attain a degree of economy hitherto unequalled. It will be seen that the use of the valves of flat form in the particular position indicated is peculiarly advantageous, for the reason that, unlike other valves, they may be adjusted very close to the cylinder.

The lower or exhaust valve, D, is provided

with a stem or spindle extending outward through a stuffing-box, and is opened and closed with a positive action by means of a cam-groove, E, formed in the cam-wheel L and acting upon the end of the valve-stem or a roller thereon, as shown in Figs. 1 and 2.

The cam-wheel L is mounted on a shaft, F, which extends along the side of the cylinder, and carries all four cams required for operating the valves, as hereinafter described. There are two of the grooved wheels L, one for each of the exhaust-valves, as shown in Fig. 2.

The inlet-valves C are duplicates of each other. They are each provided with a stem, g, extending outward through a stuffing-box at one side of the cylinder-head. They are moved outward and closed by the pressure of the steam, which acts with greater effect upon the inner than upon the outer end, owing to the fact that the latter is reduced in area by the valve-stem passing to the outside. Whenever the valve is released it is instantly thrown outward and closed by the pressure of the steam.

For the purpose of moving the valve C inward to open the stem and admit the steam to the cylinder, I make use of a lever, G, in connection with each valve-stem. The lever G is mounted at its lower end loosely upon a fixed shaft, H, and is forced inward so as to act upon the valve-stem by means of a latch, I, attached to a lever, J, which is mounted upon the same shaft as lever G. Lever J is provided with a roller, K, bearing upon the periphery of the cam L, secured upon the revolving shaft F. The revolution of the cam L lifts the lever J and causes the latch I to push the lever G inward, and the latter, in turn striking upon the valve-stem G, moves the valve C inward, thereby opening the steam-admission ports. The latch I has its inner end shouldered or notched, so as to fall over and engage upon a corresponding shoulder on the lever G, so that it may be disengaged at will by depressing its outer end, the effect of which is to cause the inner end to rise from the shoulder on lever G, releasing the latter, and permit the valve C to close.

As a means of disengaging the latch I, and thereby determining the point at which the steam shall be cut off, I make use of a regulator-bar, M, mounted on arms N, which is secured to a rocking shaft, R, provided with an arm, S, which will be connected at the opposite end with the governor or regulator of the engine. This governor or regulator may be of any approved form or construction, and may be connected with the arm S through any suitable intermediate device.

To the upper end of the lever G, I connect the piston or plunger of an ordinary dash-pot, O, which serves to check the closing action of the valve and prevent the same from being arrested violently.

The action of the inlet-valve gear is as follows: The valve having been closed by the action of the steam, as represented in Fig. 1, the

cam L raises lever J, and the latch I upon the latter engages with the lever G and forces the same inward, the lever acting upon the valve-stem and opening the valve until the rear end of the latch I encounters the regulator-bar M, whereupon the outer end of the latch is depressed by said bar, causing its inner end to disengage from the lever G and permit the closing of the valve. The lower or exhaust valve, as before stated, is opened and closed positively at proper interval by means of the cam-groove E.

The shafts F and H may be sustained, as shown, by arms T, bolted to the cylinder-head, or in any other suitable manner.

The steam is admitted to the ports in the cylinder-head through the steam-inlet pipes U, bolted to said head, and the exhaust-steam is discharged through tubular standards W, which serve to sustain the cylinder-heads and the cylinder.

It will be noted that owing to the form and attachment of the cylinder it may be turned end for end or revolve around its axis at will, in order to cause an equalization of the wear of its inner surface, and that this may be done without disarranging the other parts or disconnecting them from each other.

By my improved method of construction, as hereinbefore described, I produce an engine which is exceedingly cheap and simple in construction, economical in the consumption of steam, and which can be readily repaired without the employment of special tools and machinery for the purpose.

It will, of course, be understood that in order to have the cylinder retain its true cylindrical form it is only necessary that it shall be of uniform thickness in cross-section, and therefore in its longitudinal section it may vary in thickness, as indicated by the dotted line in Fig. 4.

I am aware that a description has been published of an engine having a single slide-valve mounted in the cylinder-head at right angles to the axis of the cylinder, the single valve being employed to control the admission and discharge of the steam, the valve being of somewhat complicated character and necessitating the use of extended steam-passages on the sides of the cylinder. By making use of separate valves and valve-chambers to control the admission and discharge of the steam, I am enabled to make use of a cut-off or expansion-gear to reduce the waste of the steam-space and to avoid the use of steam ports or passages on the sides of the cylinder, thus leaving the cylinder in proper form to be rotated about its axis, as hereinbefore described.

Having thus described my invention, what I claim is—

1. In a steam-engine, a horizontal cylinder constructed and arranged substantially as shown, and adapted to be revolved about its axis for the purpose of equalizing the wear of the piston upon its inner surface.

2. In combination with the cylinder of the

steam-engine, a cylinder-head containing separate induction and eduction chambers and separate induction and eduction valves mounted in the respective chambers, and arranged to reciprocate at right angles to the cylinder.

3. The cylinder-head provided with the two independent chambers, the inlet and outlet ports *b* and *c*, and the two valves C and D, sliding transversely to the axis of the cylinder.

10 4. The combination of the cylinder-head, separate steam induction and eduction ports formed in said head, and the two slide-valves provided with ports passing through them from front to back, arranged to reciprocate within
15 the cylinder-head, as shown and described.

5. The combination of the steam-admission valve C, opened by the action of the steam, as described, vibrating levers G and J, latch I,
20 and a tripping device, M, substantially as described.

6. In an automatic valve-gear, the combination of a valve-operating lever and a latch-carrying lever mounted upon a common center.

7. In combination with the valve-operating lever G, lever J, and latch I, the regulator-bar 25 M, mounted upon a rocking shaft, R, and connected with a governor or regulator.

8. In a steam-engine, the combination of a cylinder, two steam-controlling valves mounted in the cylinder-head and moving at right 30 angles to the axis of the cylinder, and a shaft provided with two cams operating directly upon the stems of the respective valves, as described and shown.

9. In combination with the two inlet-valves 35 and the two outlet-valves, the single shaft F, provided with the four cams E and L, the former acting directly upon the valves D, and the latter acting through intermediate device upon valves C.

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Witnesses:

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