

(No Model.)

3 Sheets—Sheet 1.

E. REYNOLDS.
STAMP MILL.

No. 604,502.

Patented May 24, 1898.

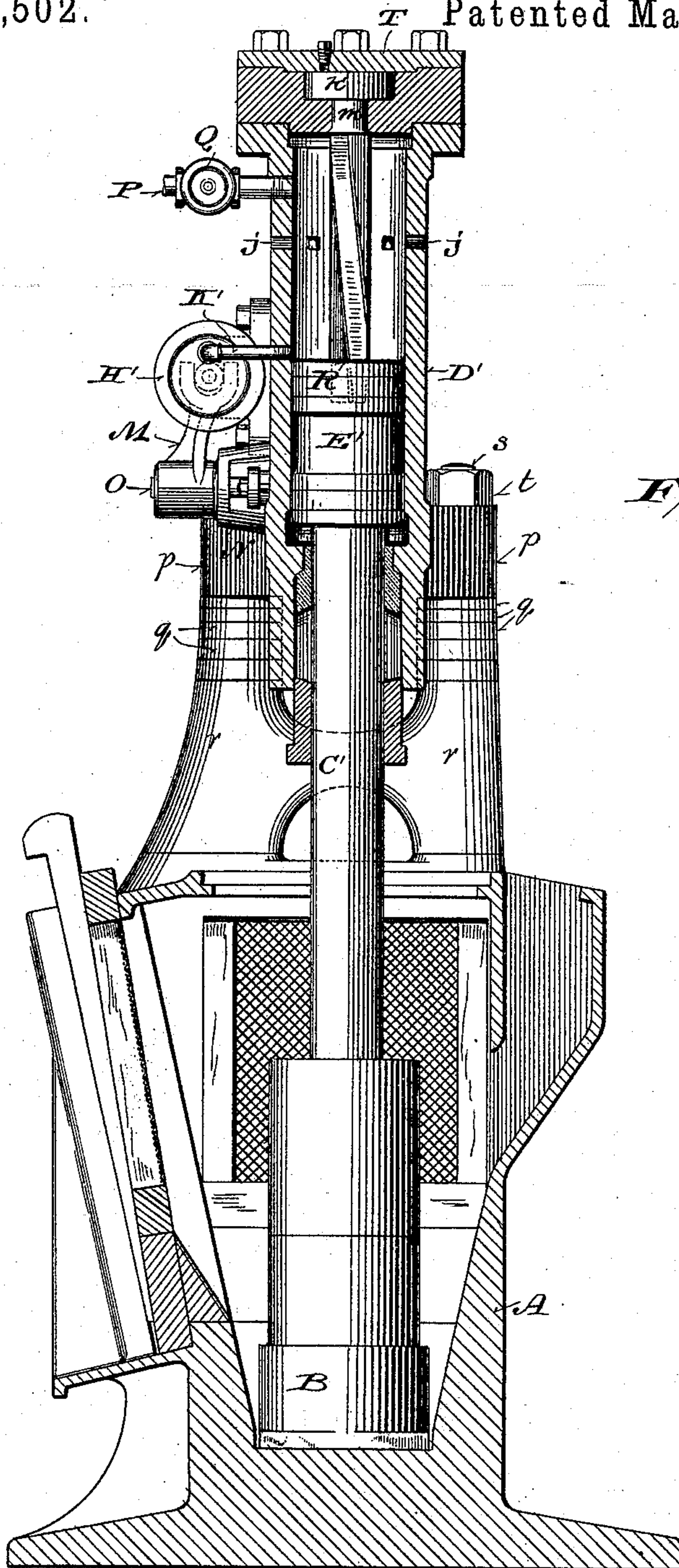


Fig. 1.

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Inventor:
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Fig. 2.

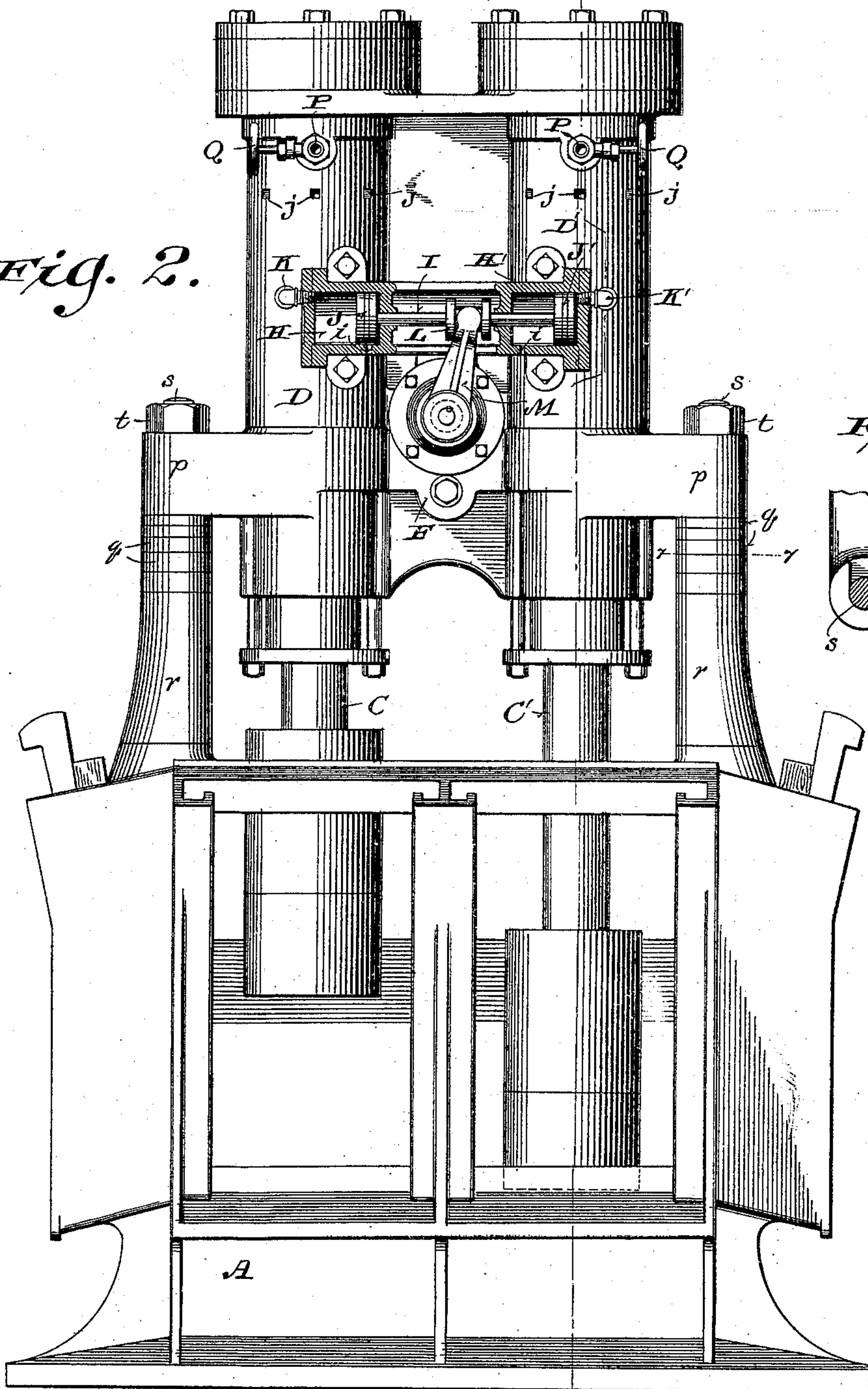
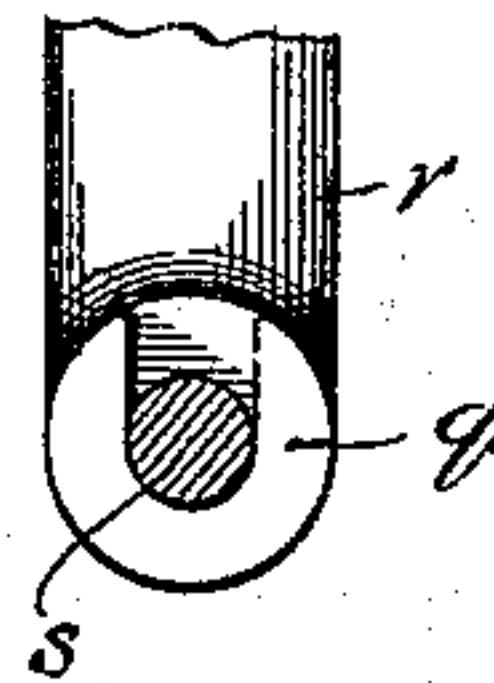


Fig. 7.



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Fig. 4.

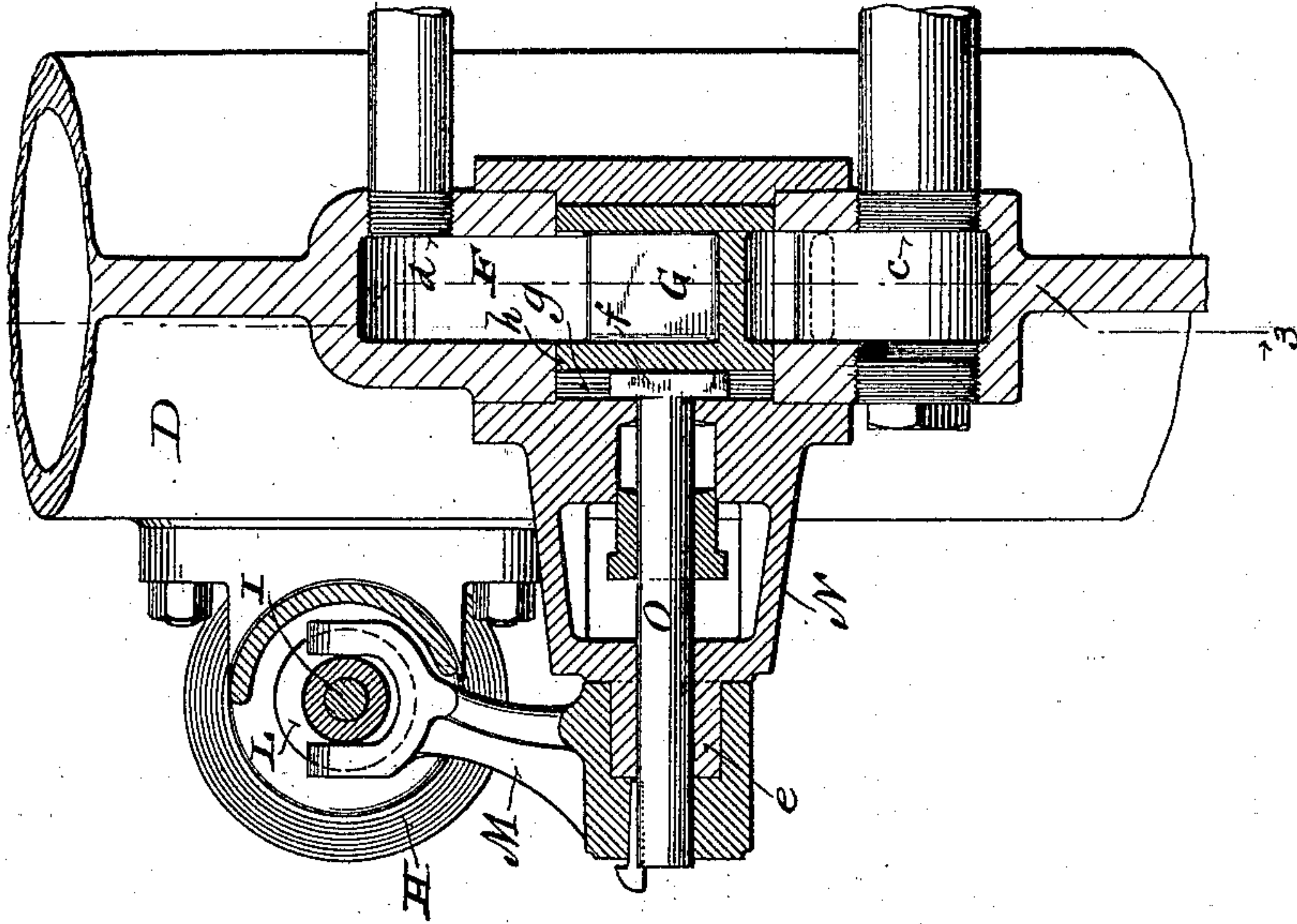


Fig. 5.

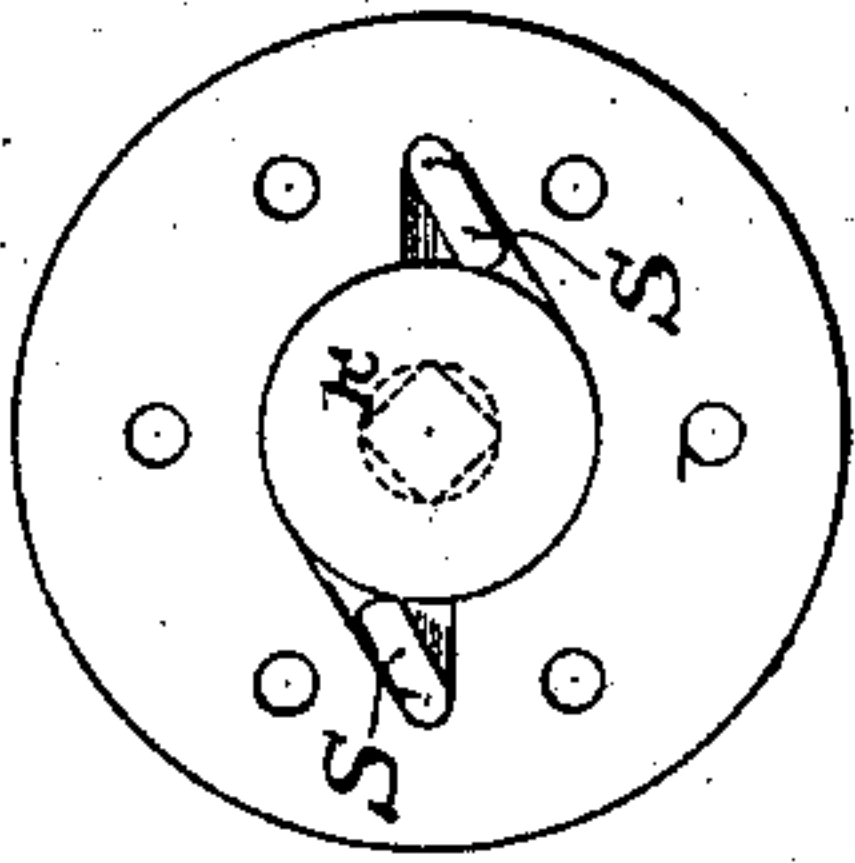


Fig. 6.

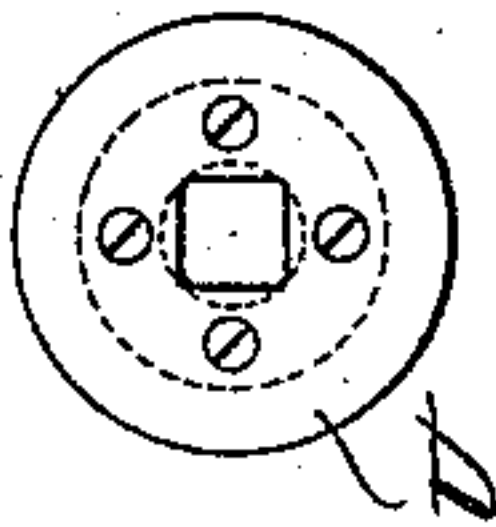
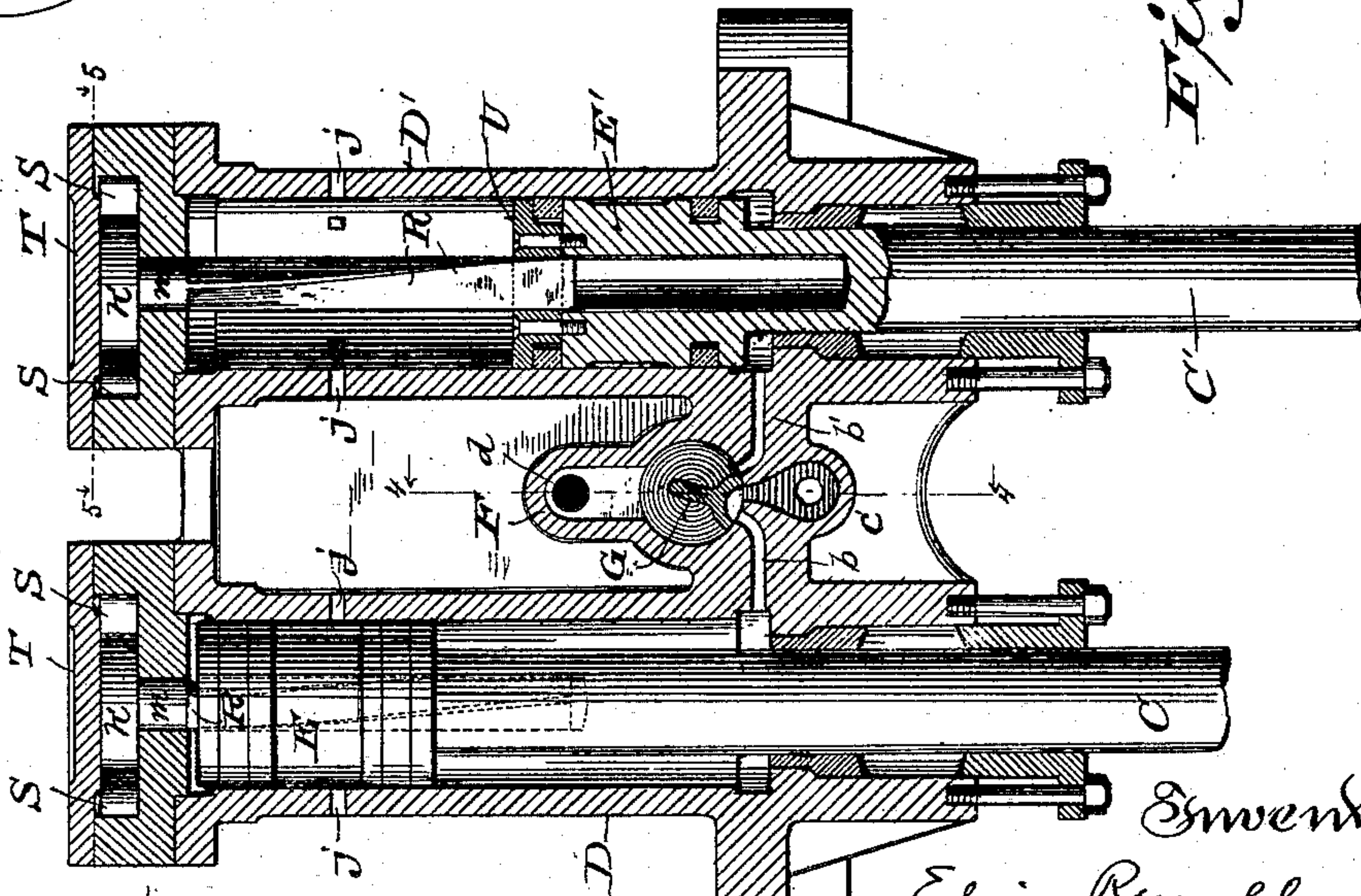


Fig. 3.



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UNITED STATES PATENT OFFICE.

EDWIN REYNOLDS, OF MILWAUKEE, WISCONSIN.

STAMP-MILL.

SPECIFICATION forming part of Letters Patent No. 604,502, dated May 24, 1898.

Application filed March 13, 1897. Serial No. 627,291. (No model.)

To all whom it may concern:

Be it known that I, EDWIN REYNOLDS, a citizen of the United States, and a resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Stamp-Mills; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention has for its object to provide ore stamp-mills organized to have the stamp-connected pistons thereof raised in their cylinders by steam and driven on their descent by reaction of air-cushions formed in said cylinders by the rise of said pistons. The invention also contemplates automatic rotation of each reciprocative stamp-connected piston and the employment of a single automatically-operating steam-supply valve in connection with a pair of the aforesaid cylinders. Hence said invention consists in certain peculiarities of construction and combination of parts hereinafter set forth with reference to the accompanying drawings and subsequently claimed.

Figure 1 of the drawings represents a side elevation of my improved ore stamp-mill, partly in section, the view being indicated by line 1 1 in the next succeeding figure; Fig. 2, a front elevation of the mill, partly in section; Fig. 3, a detail sectional view illustrating a pair of cylinders, the pistons therein, and the automatically-operating steam-valve controlling the admission and exhaust of steam with respect to said cylinders, the view being indicated by line 3 3 in the fourth figure; Fig. 4, a sectional view indicated by line 4 4 in the preceding figure and illustrating the aforesaid valve, its chamber, and operating mechanism; Fig. 5, a plan view of an uncovered cylinder-head, showing a disk-and-pawl mechanism embodied in said mill; Fig. 6, a plan view of a reciprocative and intermittently-rotative piston, and Fig. 7 a detail horizontal section indicated by line 7 7 in the second figure.

Referring by letter to the drawings, the mortars A and dies B therein are such as are ordinarily used for ore stamp-batteries; but it is to be understood that the improved stamp mechanism hereinafter specified may be operated with any mortars and dies when properly arranged with relation thereto. The

stamps are coupled to rods C C', that have play in glands at the lower ends of cylinders D D' and depend from pistons E E', contained in said cylinders, the latter being vertically adjustable, as hereinafter explained.

The cylinders D D' are preferably cast in one piece with an intermediate steam-chest F, provided with a chamber for a rocker-valve G, communication between the chest and steam-spaces at the lower ends of said cylinders being had through passages b b', controlled by the valve, the latter being of the ordinary D type and provided with circular end flanges that have free oscillation in the chambered portion of said steam-chest, said valve being organized, arranged, and operated to provide for admission of steam to one cylinder while the other is open to exhaust, it being understood that this action is alternate with respect to said cylinders.

In Fig. 3 the pistons E E' and valve G are shown in their relative positions at the instant of automatic reversal of said valve. This movement of the valve has opened the aforesaid passage b to the exhaust-port c of the steam-chest, so as to permit descent of piston E, and at the same time the other passage b' has been opened to live steam that enters said chest through a port d, this live steam operating against piston E' to elevate the same.

The automatic operation of valve G is due to the admission of steam into auxiliary cylinders H H', that are preferably cast in one piece and bolted to the cylinders above specified, as shown in Fig. 2, the inner heads of the auxiliary cylinders being parts of the casting to which the outer heads of these latter cylinders are detachably connected.

The inner heads of the auxiliary cylinders H H' have central apertures engaged by a sliding rod I, having pistons J J' in connection with its ends, and pipes K K' connect the outer ends of these auxiliary cylinders with the main cylinders in order that pressure may be exerted against the pistons J J' to reciprocate the rod I in connection therewith. A spool-shaped tappet L is made fast to rod I intermediate of cylinders H H', and engaged with this tappet is the bifurcated end of a lever M, that is loose on a hub e, constituting part of a bonnet N, made fast to the

front of steam-chest F, this bonnet being provided with a gland that packs a stem O, extended through the outer hub end of said bonnet and securely keyed to the aforesaid lever. The stem O connects with the valve G, and incidental to reciprocation of piston-rod I said valve is oscillated to accomplish the result above specified. As a matter of detail it is preferable to provide the inner end of stem O with a vertically-elongated head *f* and have this head engage a corresponding groove *g*, cut across the adjacent face of the outer circular flange *h* of valve G, this groove being in line with the center of said valve to thereby permit the latter to automatically find its seat regardless of the position of said stem, whereby compensation is had for wear on the part of the aforesaid valve and seat.

Each of the auxiliary cylinders H H' is provided near its inner end with a vent-port *i*, and this port being closed as the corresponding piston is on stroke toward said head the air then confined causes both pistons on said rod to come to a state of rest without jar or noise.

The cylinder-connecting pipes K K' are alternately opened to steam upon ascending strokes of the main pistons E E' in order to provide for the automatic movement of valve G, as above specified, and it will be understood that when one of the auxiliary cylinders H H' is taking steam the other will be exhausting into the corresponding main cylinder, the exhaust-steam having its escape from said main cylinder through the then open valve-controlled passage.

When either of the main pistons E E' approaches the end of its upward stroke, it cuts off the ports *j* in the corresponding cylinder, and the air confined above these ports is compressed by continued ascent of said piston until the forces are in equilibrium. Hence it will be seen that the expansive force of compressed air in addition to the force of gravity is exerted to accelerate the descent of the aforesaid piston and increase the striking force of the corresponding stamp.

Where varying speeds and steam-pressures may be used, it is necessary to vary the elastic effect of the compressed air. Therefore each of the cylinders D D' is shown provided with a pipe P near its upper end, this pipe being controlled by a valve having a hand-wheel Q, and by slight adjustment of this valve it is possible to make the air-cushion react agreeably to other varying conditions.

As shown in Figs. 1 and 3, the upper head of each main cylinder is bored out to provide a seat for a circular disk *k* on the upper end of a polygonal spiral-twist bar R, having an annular neck *m* in loose engagement with a corresponding aperture in said cylinder-head. Extending in opposite directions from the aforesaid seat are recesses containing spring-controlled pawls S, that impinge against the periphery of disk *k*, each pawl being to one

side of the center of said disk. Therefore they operate to prevent turning of the corresponding bar R in one direction, but permit its rotation in the opposite direction. A cover-plate T is secured on the upper disk of each cylinder D D' in opposition to the rod-head and pawls above specified.

Each spiral bar R depends into a main cylinder to fit within a correspondingly polygonal aperture in a block U, made fast to the upper end of the piston in said cylinder, as best illustrated in Fig. 3, and the organization and arrangement of the related parts are such that upward movement of said piston imparts rotation to said bar. However, on descent of the piston the pawls S operate against the disk *k* to hold the bar R stationary. Consequently there will be rotation on the part of said piston and stamp in connection therewith to change the face of said stamp with reference to the material in the corresponding mortar.

The cylinders D D' are herein shown provided with apertured lugs *p*, each of which rests on a stack of radially-slotted washers *q*, piled on a standard *r* and engaged with stationary rods *s*, that constitute lug-guides. A set-nut *t*, run on each of the rods *s* above the corresponding cylinder-lug, serves to clamp the latter tight against the stack of washers upon which it rests. As the stamps and dies become worn, washers are withdrawn to permit compensating vertical adjustment of the cylinders and various other parts explained in connection therewith.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a stamp-mill, a pair of main cylinders containing reciprocative stamp-pistons and provided with ports communicating with free atmosphere, these ports being opened and closed by the pistons, a pair of auxiliary cylinders having pipe connection with the main cylinders, pistons in the auxiliary cylinders connected by a sliding rod, a lever in connection with the rod, a steam-chest intermediate of said main cylinders, and an oscillative valve in the steam-chest provided with a stem having rigid connection with said lever, the valve being operative to control passages that establish communication between said steam-chest and steam-spaces at the lower ends of the aforesaid main cylinders.

2. In a stamp-mill, a pair of main cylinders containing reciprocative stamp-pistons, a pair of auxiliary cylinders communicating with the main cylinders, pistons in the auxiliary cylinders connected by a sliding rod, a lever in connection with the rod, a steam-chest intermediate of said main cylinders, and an oscillative valve in the steam-chest provided with a stem having rigid connection with said lever, the valve being operative to control passages that establish communication between said chest and main cylinders.

3. In a stamp-mill, a pair of main cylinders

containing reciprocative stamp-pistons having automatic intermittent rotary movement, a pair of auxiliary cylinders communicating with the main cylinders, pistons in the auxiliary cylinders connected by a sliding rod, a lever in connection with the rod, a steam-chest intermediate of said main cylinders, and an oscillative valve in the steam-chest provided with a stem having rigid connection with said lever, the valve being operative to control passages that establish communication between said chest and main cylinders.

4. In a stamp-mill, a pair of main cylinders containing reciprocative stamp-pistons having automatic intermittent rotary movement in one direction only, a pair of auxiliary cylinders communicating with the main cylinders,

der, pistons in the auxiliary cylinders connected by a sliding rod, a lever in connection with the rod, a steam-chest intermediate of said main cylinders, and an oscillative valve in the steam-chest provided with a stem having rigid connection with said lever, the valve being operative to control passages that establish communication between said chest and main cylinders.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

EDWIN REYNOLDS.

Witnesses:

N. T. HARRINGTON,
W. E. DODDS.