3 Sheets—Sheet 1.

J. GATES.
Steam-Pump.

No. 218,514. Patented Aug. 12, 1879.

Fig. 1.

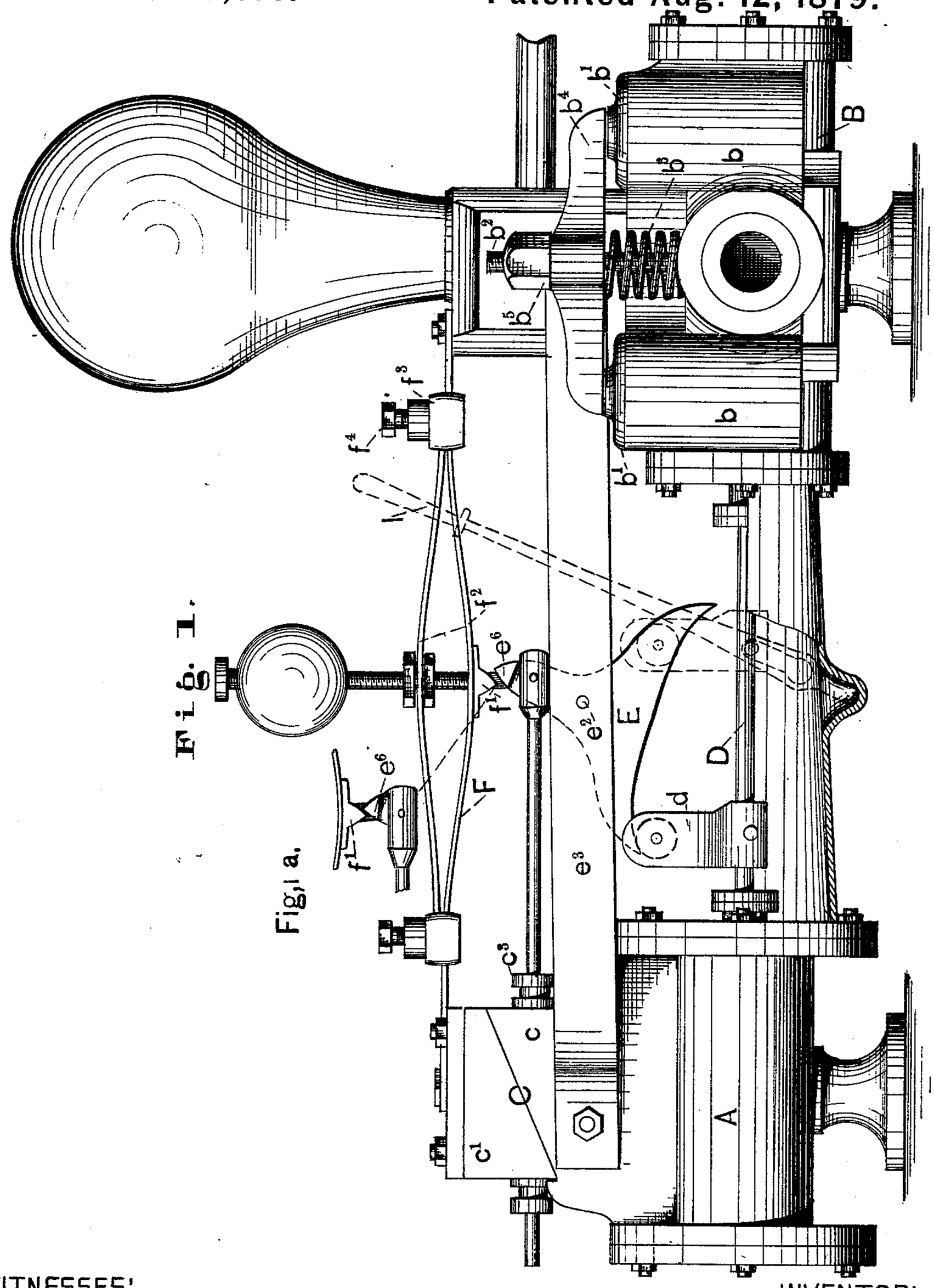

Fig. 1a.

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ATTYS.

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Steam-Pump.

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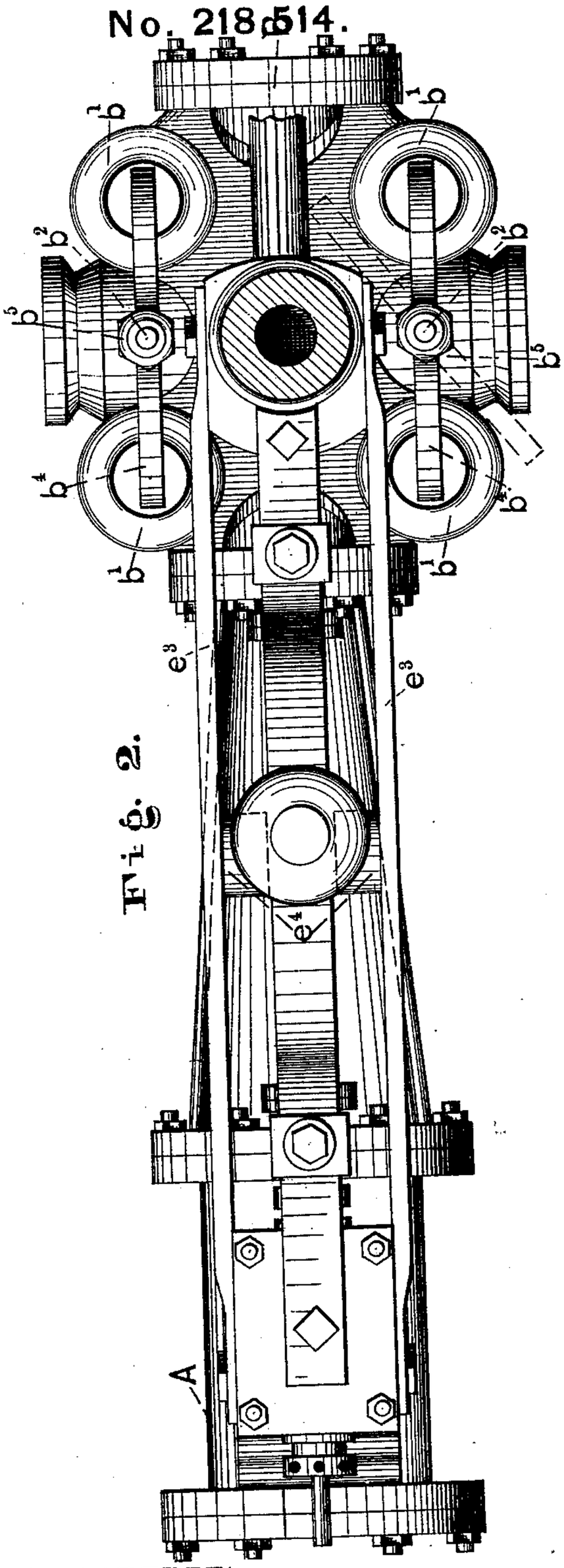

Fig. 2.

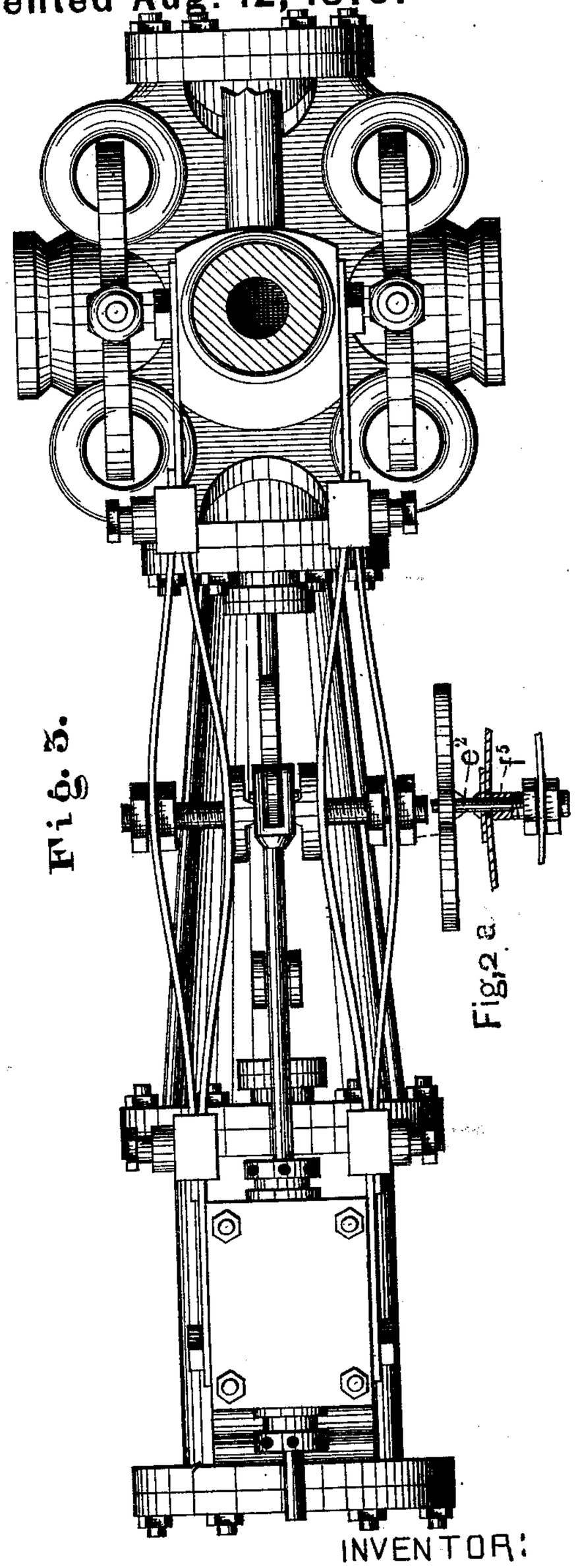

Fig. 3.

Fig. 2 a.

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Fig. 4.

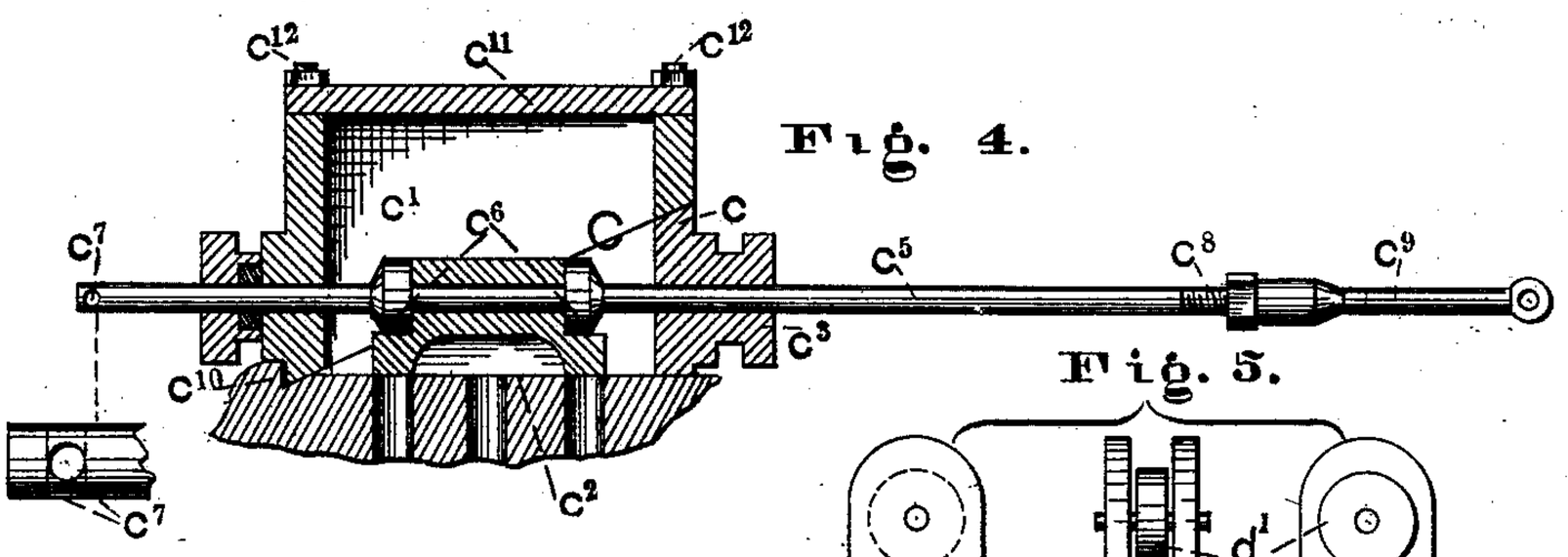


Fig. 5.

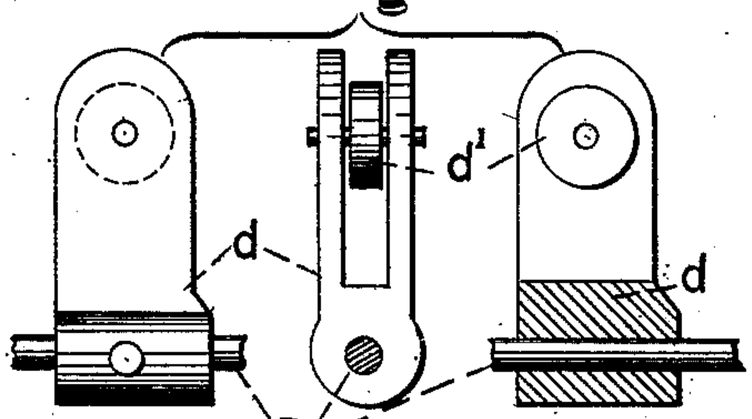


Fig. 6.

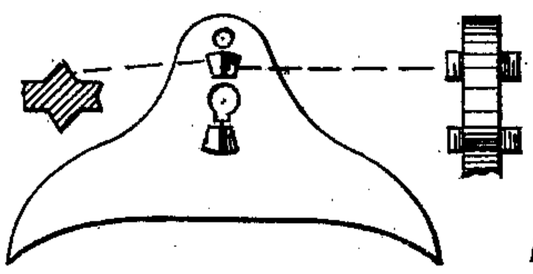


Fig. 7.

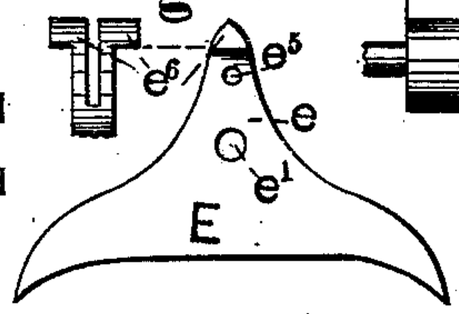


Fig. 8.

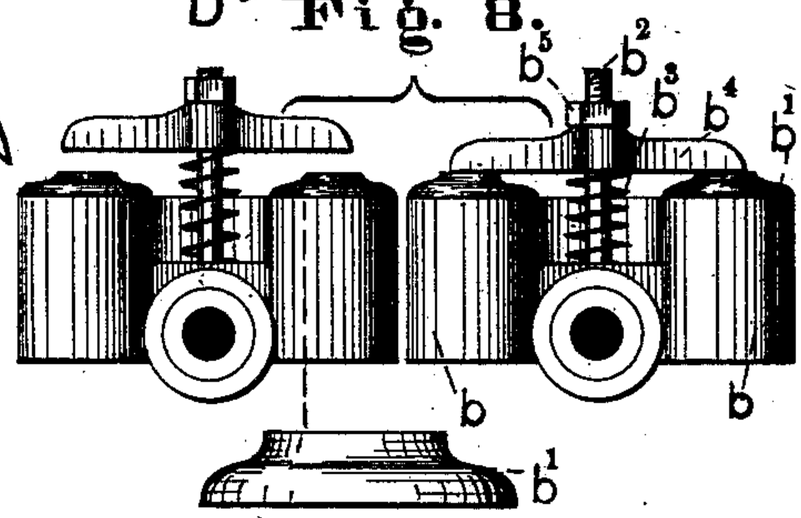


Fig. 9.

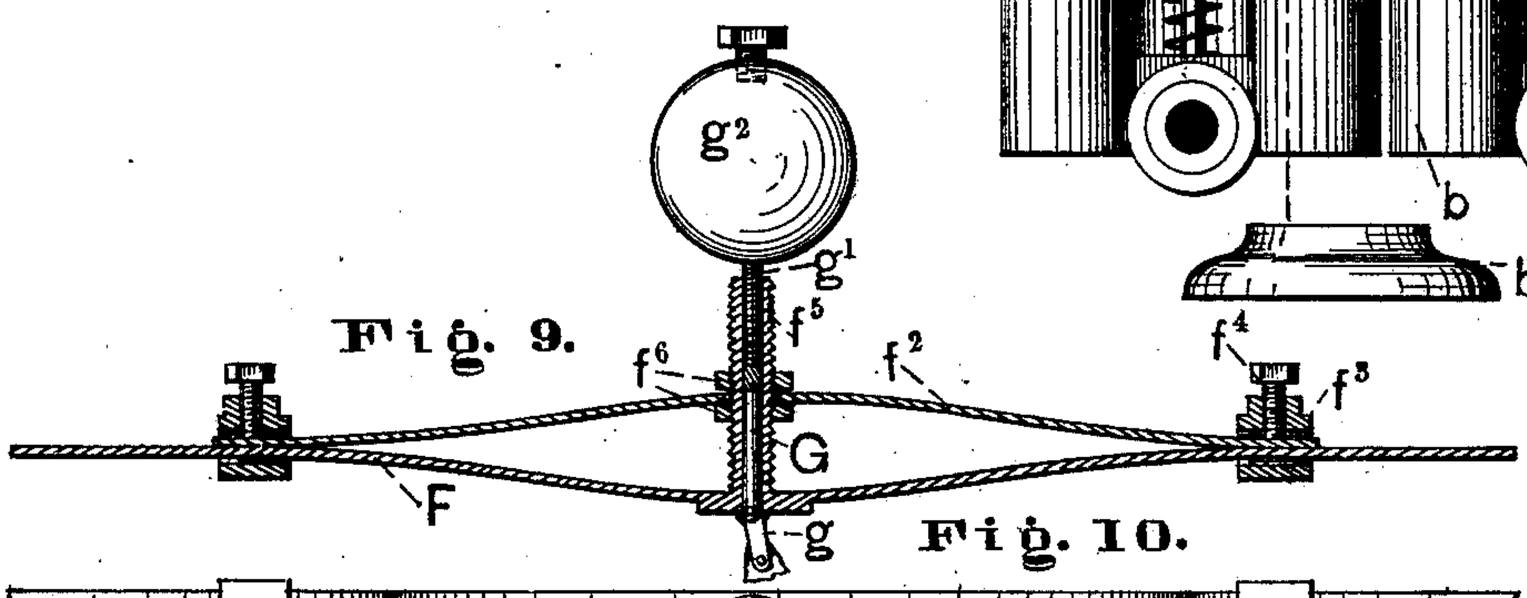


Fig. 10.

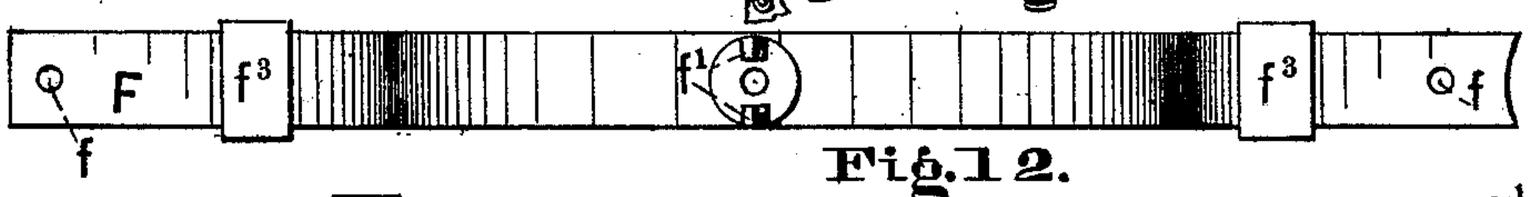
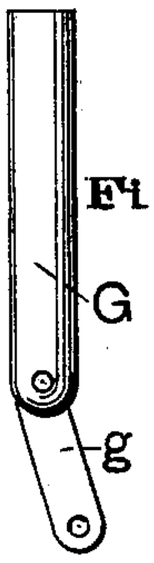


Fig. 12.

Fig. 11.



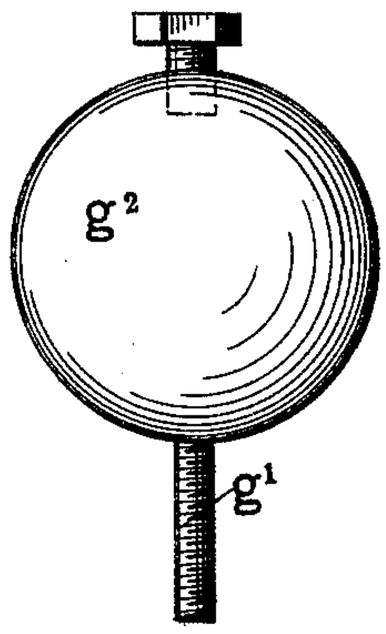
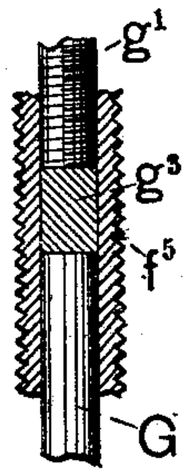


Fig. 13.



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UNITED STATES PATENT OFFICE.

JOHN GATES, OF PORTLAND, OREGON.

IMPROVEMENT IN STEAM-PUMPS.

Specification forming part of Letters Patent No. **218,514**, dated August 12, 1879; application filed September 27, 1878.

To all whom it may concern:

Be it known that I, JOHN GATES, of Portland, of the county of Multnomah and State of Oregon, have invented new and useful Improvements in Steam-Pumps; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

This invention relates to that class of direct-acting steam-pumps in which the valves are shifted by certain intermediate tappet or trip mechanism actuated by the main piston-rod; and it consists, mainly, first, in the peculiar means employed for securing the valve-chamber covers of the pump-cylinder in place; second, in the peculiar construction of the valve-chest; third, in certain spring mechanism for throwing the valve-stem to shift the valves; and, fourth, in certain special mechanism for determining the distance that the valve is thrown.

It further consists in certain details of construction, all of which will be fully described hereinafter.

In the drawings, Figure 1 represents a side elevation of my improved pump; Fig. 2, a plan view of the same, with the air-chamber removed to show the parts beneath; Fig. 3, a similar plan view, with a modified construction of the spring mechanism; Fig. 4, an enlarged view of the valve-stem and chest; Fig. 5, enlarged views of the actuating-arm of the piston-rod; Figs. 6 and 7, views of two different forms of tappet or trip mechanism; Fig. 8, detail views of the valve-chambers and the mechanism for holding the covers of the same in place; Fig. 9, a detail view of the mechanism employed to determine the distance that the valve is thrown; Fig. 10, a plan view of the spring F reversed; Fig. 11, a detached view of the plunger enlarged; Fig. 12, a detached view of the weight g^2 enlarged; and Fig. 13, a detached view of the hollow stud, the adjusting-screw, the intermediate spring, and the plunger enlarged.

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

A represents the steam-cylinder of a direct-acting steam-pump, which may be constructed generally in any proper manner, no novelty whatever being claimed in connection with this part.

B represents a double-acting-pump cylinder, having two suction and two discharge pipes, so arranged as to give large and easy openings from the valve-chambers to the barrel of the pump.

b b represent the valve-chambers, and b^1 b^1 the covers, by means of which they are properly closed.

b^2 represents a stud or standard rising from the cylinder between the valve-chambers, which is provided at its upper end with a thread, as shown.

b^3 represents a spiral spring, encircling the stud at the lower end; and b^4, a yoke having a central opening, by means of which it is held upon the stud above the spring, as shown.

b^5 represents a nut, located on the upper end of the stud, by means of which the yoke is properly held in place, and also is moved in downward direction, when desired, for the purpose of securely clamping the cover-plate.

The relative arrangement of the parts is such, it will be understood, that when the yoke is screwed downward upon the stud for the purpose of clamping the cover-plate in place, the spiral spring upon the stud below the yoke will be compressed to a certain extent. The arrangement is such, also, that the yoke may be moved in an upward direction sufficiently far to release the cover-plates without necessitating the removal of the nut from the stud.

When it is desired to remove the cover-plates for any purpose, the nut b^5 is first unscrewed or revolved upon the stud in an upward direction the proper distance to permit the yoke to be lifted by the action of the spring b^3 away from contact with the cover-plates. The yoke is then swung upon the stud in such manner as to move its arms away from the plane of the cover-plates, as shown in dotted lines, Fig. 2, so that the latter may be readily lifted from their seats. When it is desired to secure the parts again, this is accomplished by replacing the cover-plates, turning the yoke back to its normal position, and screwing the nut down until the proper engagement has taken place.

The advantages of this special construction are substantially as follows: A single nut and

screw are employed to secure a pair of cover-plates. The operation of fastening and unfastening may be easily and rapidly performed. The fastening parts are not removed at all from the cylinder, and hence they cannot be lost or misplaced.

C represents the valve-chest, divided in a longitudinal direction, on a diagonal line, into two main parts, c c^1.

c^2 represents the valve seat in the base portion, and c^3 a valve-stem stuffing-box, which projects from one end.

c^5 represents the valve stem, provided at any proper points between its ends with the fixed collars c^6, at one end with the holes c^7, and at the other with the screw-thread c^8.

c^9 represents a connecting-rod, uniting the valve-stem proper to the tappet mechanism, which is provided with a threaded recess for receiving the end c^8 of the valve-stem.

c^{10} represents a ledge or flange, by means of which the part c^1, when in position, is prevented from sliding downward upon the part c.

c^{11} represents the cover-plate for the valve-chest, and c^{12} bolts, by means of which the removable parts are firmly secured to the base portion.

The manner of uniting the parts is substantially as follows: The valve is first secured to the valve-stem between the fixed collars in any proper manner. The threaded end of the stem is then inserted through the stuffing-box of the base portion c, and the upper part, c^1, slipped upon the opposite end of the stem and moved to its proper place, the spring of the stem permitting it (the part c^1) to pass over the flange c^{10}. The cover is then placed in position, and the parts are secured by means of the bolts. The threaded end of the stem is then properly united to the connecting-rod.

By means of the diagonal division of the valve-chest into two parts the valve-seat may be easily dressed in a planer. By means of this construction, also, it is possible to affix the valve solidly to the stem before the same is put in place. By means of the special construction of the valve-stem, also, it may be adjusted, if desired, without arresting its movement, by simply turning the same in the proper direction, the adjustment being obtained by its longitudinal movement in the threaded socket of the connecting-rod.

D represents the main piston-rod common to both cylinders, which is provided with a recessed arm or tappet, d, having a friction-roller, d^1, Fig. 5, located in the recess.

E represents the rocker-arm, consisting of a crescent-shaped block having a central vertical projection, e, with opening e^1, by means of which it is hung or pivoted upon the transverse shaft e^2, supported by the side plate e^3. The lower edge of this rocker-arm, it will be observed, lies in the recess of the tappet d, and the lower face of the same bears upon the friction-roller d^1.

e^4 e^4 represent bearing-blocks upon the side plates, by means of which the central position of the rocker-arm is preserved.

e^5 represents an opening formed at the proper point in the projection e, by means of which or other suitable means the inner end of the connecting-rod or stub of the valve-stem is secured to the tappet.

e^6 represents the termination of the vertical projection e of the rocker-arm, which is given a prismatic form, for purposes hereinafter explained.

The operation of these parts will be readily understood. Motion having been given to the engine, the rocker will be moved by the tappet d of the piston-rod, near the end of the movement of the latter, in such manner as to rock the same upon its shaft, and thus give its upper extremity a reciprocating movement, as will be more fully described hereinafter. By the return movement of the piston-rod the opposite end of the rocker is actuated in the usual well-known manner for the purpose of changing again the position of the parts.

F represents a spring-plate, bent in form of a bow, which is provided at each end with a proper opening, f, by means of which and proper bolts it is securely held in its proper position upon the machine.

f^1 f^1 represent prismatic projections secured to the lower face of the spring, at its center, the purpose of which will be hereinafter explained.

f^2 represents an auxiliary spring, less in length than the spring F, which is bent in the opposite direction, and is secured to the upper face of the latter by means of the socket-piece f^3 and set-screw f^4.

f^5 represents a hollow stud, threaded upon its exterior, which is rigidly secured at its base to the upper face of the spring F, and is extended upward through a proper opening in the upper spring.

f^6 f^6 represent nuts located on the stud f^5, one above the spring f, and the other below.

When the spring is in its proper position, it will be observed that its prismatic projections f^1 are in the vertical plane which passes through the center of the tappet.

The power of the spring may be readily increased or diminished by properly adjusting the nuts f^6. If these be so moved as to increase the distance between the central portions of the main and auxiliary springs, the ends of the latter being tightly clamped to the main spring, the power of the spring, as a whole, will be increased, because the parts by this means are made more rigid, one spring being braced against the other.

If, however, the distance between the central portions of the main and auxiliary springs be diminished, the power of the spring, as a whole, will be diminished.

If desired, the auxiliary spring may be thrown out of action by disconnecting the ends of the same from the main spring.

G represents a plunger, adapted to move

freely in the hollow stud f^5, which is united at its lower end to the upper part of the tappet-piece by means of the link g.

g^1 represents a set-screw, held by a proper thread in the interior of the upper part of the hollow stud f^5, which is provided with a ball or weight, g^2.

g^3 represents a spring, preferably of rubber, which is placed between the upper end of the plunger and the lower end of the set-screw.

The operation is substantially as follows: The tappet mechanism being actuated in the manner previously described, the valve-stem will be thrown to shift the valves in the following manner: By the movement of the rocker one inclined face of its prismatic projection is caused to come in contact with the adjacent face of the corresponding projection upon the spring; and by the movement of these parts upon each other, the spring consequently is lifted until the apex of the rocker-prism reaches the apex of the spring-prism, when the spring, being no longer held, necessarily descends again, and, by means of the opposite face of the prism, drives the rocker-prism and the valve-stem connected therewith in the proper direction to shift the valve.

The initial movement of the stem is given by the movement of the prisms upon each other; but the final movement is effected by the link g, which is, in fact, a member of a toggle-joint, the rocker-arm serving as the other member.

The distance that the valve is thrown is determined by the position of the actuating-spring relatively to the plunger.

By screwing down the set-screw, the spring will necessarily be raised, and held above its normal position, because the base upon which the plunger rests is fixed, as far as vertical movement is concerned.

The effect of this action would be to increase the effective length of the link, and also the vibration of the spring, and hence necessarily the distance moved by the valve-stem.

If desired, the spring may be raised sufficiently to remove the upper prism from contact with the lower, in which case the stem will be shifted by the action of the link alone.

By screwing up the set-screw the effective length of the link is diminished, and, consequently, also, the vibration of the spring and the distance moved by the valve-stem.

The special function of the prisms is to furnish a positive point for the change of the valve.

The weight upon the set-screw serves as a reservoir of power, by resisting the sudden movement of the spring at the start, and aiding, by inertia, its weakening movement at the close, its purpose and action being similar to that of the balance-wheel of an engine.

The manner of adjusting the parts is as follows: The valve is adjusted so as to occupy a central position in the chest by turning the stem in the manner previously described. The ball set-screw is then adjusted so as to allow the prisms to overlap each other the proper distance.

In Fig. 3 is represented a different arrangement of springs, which may be employed, if desired, in place of that previously described. The spring, *per se*, is precisely like that previously described; but two are employed, one being located upon each side of the machine in the precise position occupied by the side plates, e^3, in the former arrangement. The hollow stud f^5 in this case, it will be observed, serves as a journal for the shaft e^2 of the tappet mechanism.

The sides, now, of the vertical projection of the rocker-arm are provided with prismatic projections instead of the top, as before, these projections being a section of a true screw, so that they will exactly match each other. The operation of these parts is much like that previously described. The rocker-arm being moved by the piston-rod block, the prismatic projections upon its sides are caused to come in contact with the corresponding projections on the springs, and force them outward until the apexes pass each other, when the springs react to throw the valve-stem.

Rubber buffers or washers may be placed on the rock-shaft, between the springs and shoulders of the shaft, to take the shock, if desired. By means of this special construction a positive center is obtained, because the pressure of the prism upon side of the rock-shaft balances the pressure of the other upon the other side, one pressing in one direction and the other in the opposite.

When a single spring is employed it is caused to swerve to one side of the center by the force necessary to raise the same, which force, of course, is applied upon one side. To counteract this side thrust in a single spring it is necessary to leave a certain amount of slack between the collars and the valve.

I, Fig. 1, represents the hand-lever.

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

1. In combination with the valve-chamber of a steam-pump, the removable covers, the central stud, swinging yoke, and nut, as described.

2. In a steam-pump, the combination, with a removable valve-chamber cover and clamping-yoke, of means, substantially as described, for causing the yoke to rise when free to move.

3. In combination with a valve-chest diagonally divided into two equal, or nearly equal, parts, substantially as described, a valve-stem having solid collars, as described.

4. In combination with the tappet mechanism and valve-stem of a steam-pump, the main and auxiliary springs, constructed and arranged substantially as and for the purpose described.

5. In combination with the tappet mechanism and valve-stem of a steam-pump, the main

and auxiliary springs, constructed and arranged substantially as described, and means, substantially as described, for adjusting the throw of the same.

6. In a steam-pump, the combination of the spring, the link, and plunger, as shown, and for the purpose described.

7. In a steam-pump, the combination with the spring, the link, the prisms, the plunger, and set-screw, arranged as shown, and for the purpose described.

8. The combination, in a steam-pump, of the following elements, viz: a valve-stem, a link, and spring for actuating the link, and mechanism, substantially as described, for determining the throw of the same.

9. In combination with a diagonally-divided valve-chest, each part of which is provided with a stuffing-box, a valve-stem having solid collars, as and for the purpose described.

This specification signed and witnessed this 21st day of August, 1878.

JOHN GATES.

Witnesses:

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R. HOLLABAUGH.