No. 704,270. Patented July 8, 1902.

E. REYNOLDS.

CONTROLLING MECHANISM FOR STEAM ENGINE REGULATORS.

(Application filed May 8, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

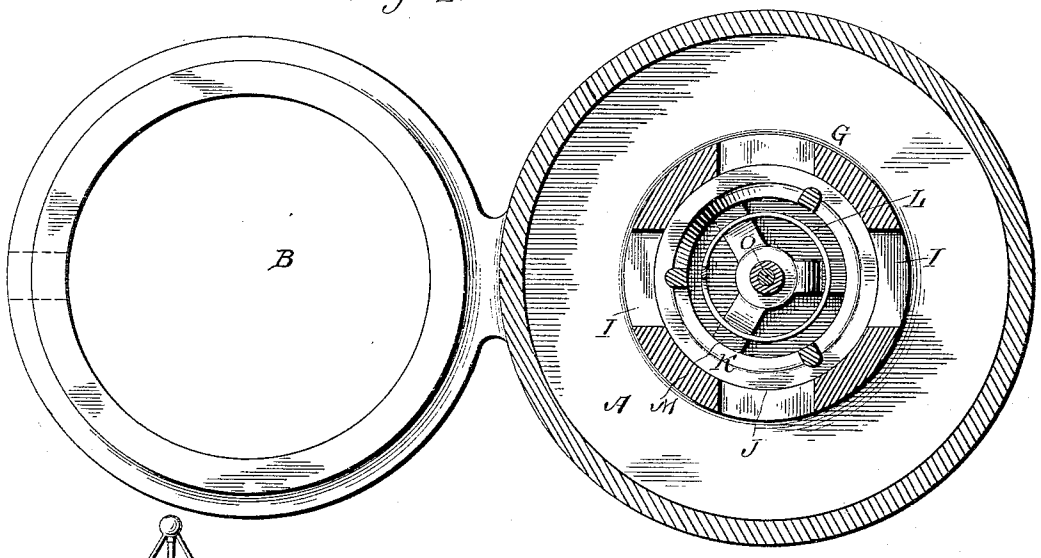

Fig. 3.

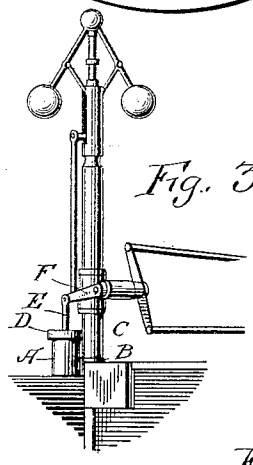

Fig. 1.

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Fig. 5

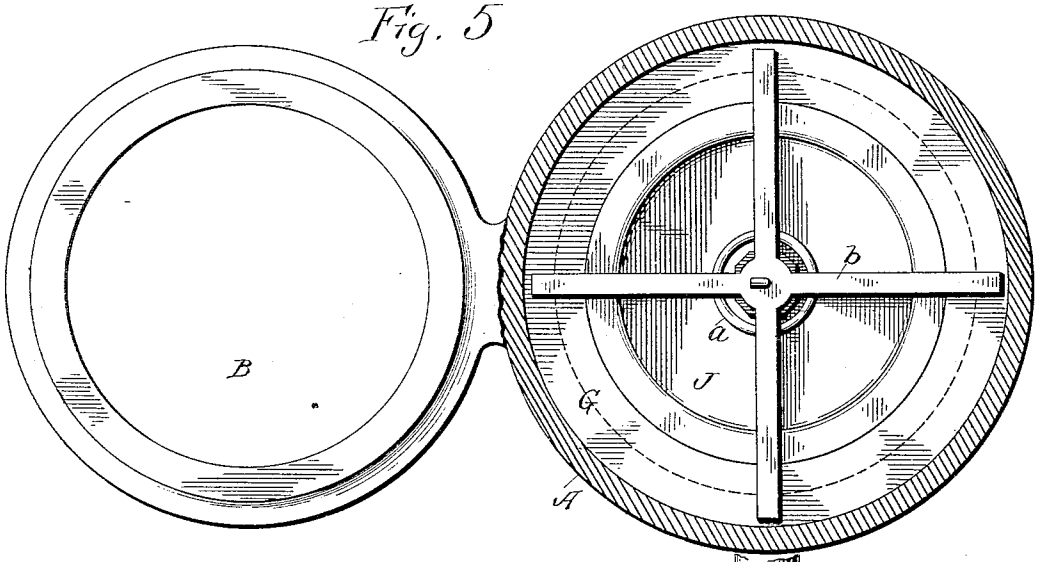
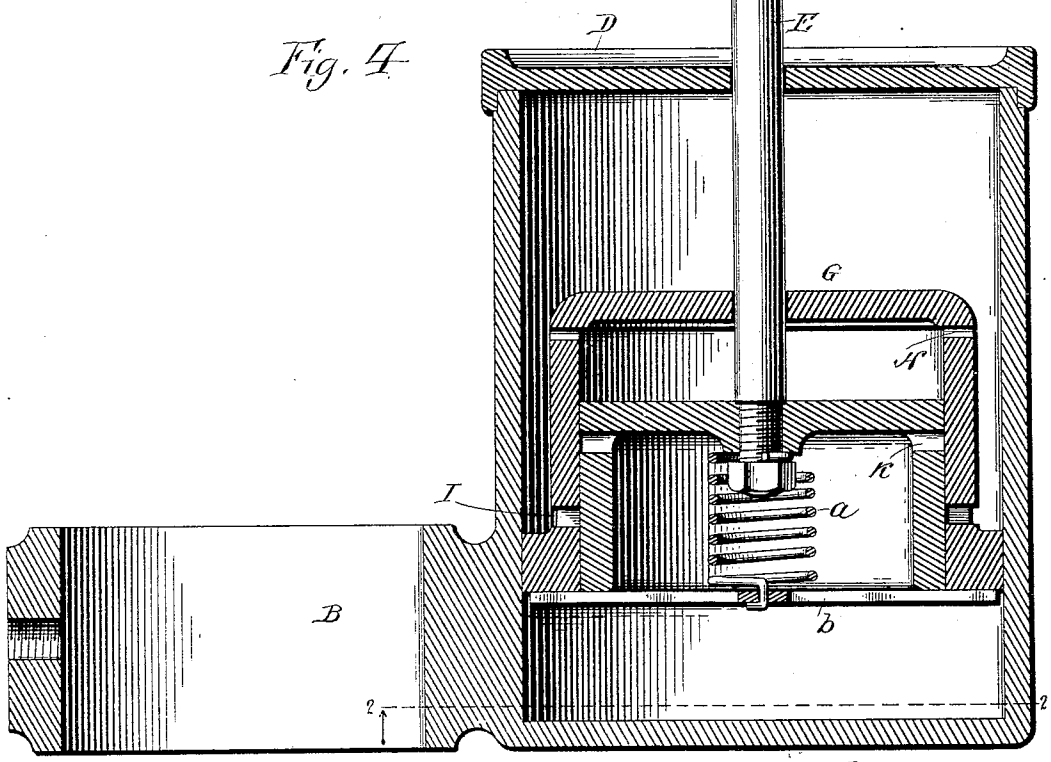


Fig. 4



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UNITED STATES PATENT OFFICE.

EDWIN REYNOLDS, OF MILWAUKEE, WISCONSIN.

CONTROLLING MECHANISM FOR STEAM-ENGINE REGULATORS.

SPECIFICATION forming part of Letters Patent No. 704,270, dated July 8, 1902.

Application filed May 8, 1900. Serial No. 15,973. (No model.)

To all whom it may concern:

Be it known that I, EDWIN REYNOLDS, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Controlling Mechanism for Steam-Engine Regulators, of which the following is a specification.

My present invention pertains to improvements in regulator-pots for steam-engines, the construction and advantages of which will be hereinafter set forth, reference being had to the annexed drawings, wherein—

Figure 1 is a vertical longitudinal sectional view of the pot; Fig. 2, a transverse sectional view taken on the line 1 1 of Fig. 1; Fig. 3, a perspective view showing the relation of the pot to other portions of the engine; Fig. 4, a vertical longitudinal sectional view of a modified form of the pot; and Fig. 5, a transverse sectional view on the line 2 2 of Fig. 4.

The main object of the present invention is to provide a simple and efficient means for preventing fluctuations of the regulator, while the special object is to lock or hold the regulator in any position to which it may happen to come to rest against a force of any magnitude which is exerted for a less time than that required to discharge the fluid from above or below the valve.

Referring to the drawings, and more particularly to Figs. 1, 2, and 3, A denotes the main body of the pot, preferably, though not necessarily, formed with an extension B, adapted and designed to be attached to the standard C of the regulator. The pot is provided with a suitable cover D, through which extends a rod E, said rod being connected with the regulator-arm F and moved up and down, as that moves, to effect a change of cut-off. Rod E is firmly attached to the upper end of a piston G, which, as shown in Figs. 1 and 2, is made in the form of an inverted cup and is provided near its upper end with a series of relatively small passages or openings H, while below said openings or at a slight distance above the outwardly-extending flange of the piston is another series of ports or openings I, which are made relatively large. Mounted and working within the cup-shaped portion of the piston is a valve J, provided with lateral ports K, which under certain conditions register with the ports I. Normally the ports are out of alinement in the position indicated in Fig. 1, and to hold the valve in such position a spring L is employed. Said spring at its lower end is connected to and rests upon a spider-frame M, secured within the lower end of the piston, while the upper end of the spring bears against the lower face of a plate N. A screw O extends freely up through the spider-frame and is connected to the plate N, the screw serving to limit the upward movement of the plate, and consequently the effect of the spring on the upward movement of the valve. A second spring P is seated between the upper face of the valve and the piston and tends to hold the valve in its normal position. This spring may, however, be omitted without altering the action of the device.

The operation is as follows: Rod E, as above noted, is connected to the regulator and is moved up and down therewith, as that moves, to effect a change of cut-off. If the rod tends to move downward, it carries the piston with it, creating what may be termed a "plus" pressure below it. No motion will take place, however, until the pressure or degree of force exerted is sufficient to raise the valve J. The upward motion of the valve is regulated by the velocity with which the water or other fluid used in the pot can be discharged from the holes H. Hence with a given force exerted and steadily applied to the rod F a certain time will elapse before the valve can move up sufficiently to uncover the ports I, this time being controlled by the size and number of the holes H. When the valve is raised to such a height that the ports I are opened, the largely-increased area of opening allows a rapid flow of the liquid from the lower to the upper side of the piston and a correspondingly rapid downward movement of the piston. When the piston is moved to the new position required to meet the supposed change in rod, it comes to rest, and the valve settles by gravity through the liquid until it again rests on the spring L. If the force is applied to the rod F in the opposite direction, then the piston will tend to move up, creating a minus pressure below the same. This tends to draw the valve downward, compressing the spring L and draw-

ing in the liquid through the holes H at the top of the piston, thus regulating the time which must elapse before ports K in the valve can register with ports I of the piston. When this does occur, there is a free movement of the piston in an upwardly direction. When the supposed motion of the piston is ended and it again comes to rest, the spring L returns the valve to the position indicated in Fig. 1, plate N and screw O preventing it from rising higher than the position shown.

In Figs. 4 and 5 a modified construction is illustrated. In this form the rod F is passed freely through the upper portion of the piston and is connected directly to the valve. A spring *a* is interposed between the lower end of the rod and a spider *b*, the ends of the spring being connected to said parts, so that under normal conditions the spring tends to hold the valve in the position indicated in Fig. 4. The construction of the piston and the valve is otherwise similar to that illustrated in Figs. 1 and 2. In the operation of the device, as here shown, an upward movement of the rod tends to draw the valve in an upwardly direction, creating a minus pressure below the same; but said upward movement is checked by reason of the liquid moving but slowly out through the ports or openings H, the spring of course being put under stress as the valve moves upward. So soon as the lower end or edge of the valve comes above the ports I the liquid above the piston has free access to the space below the piston, and the rod, with the valve, and also the piston may move up quickly. When the parts have come to the required position to meet the change in the load, they come to rest, and the spring, acting through the spider *b*, draws the piston in an upwardly direction, so that the parts come to the position indicated in Fig. 4, except that they are higher up in the pot or casing. If a force is exerted in a downwardly direction on the rod A, it creates a plus pressure below the piston and valve, and the rod and valve are prevented from moving rapidly by reason of the liquid coming in but slowly through the openings H. As the valve moves downwardly there is of course a slight movement of the piston, caused by the plus pressure below acting on the flange or under face of the piston adjacent to the edge of the valve. This movement is proportional to the relative areas of the valve and of the interior of the pot or casing. With ordinary proportions of valve and pot this motion is not great enough to cause an appreciable change in cut-off and may be disregarded. So soon, however, as the ports I and the ports K come into alinement the liquid below the piston and valve has free access to the upper portion of the pot and the rod may have free downward movement. The parts of course when the change has taken place tend to assume their normal positions and lock the rod against further movement or against a force of any magnitude exerted for a short period.

While I have shown the rod as connected to an arm of the regulator, it is of course apparent that the rod may be connected to any movable part of the regulator without departing from the spirit of my invention.

Though the apparatus is shown in a vertical position, I do not desire to limit myself to that arrangement, as in practice the device has been found to give entire satisfaction when placed in a horizontal position.

Having thus described my invention, what I claim is—

1. In combination with a movable member of a regulator for steam-engines, means for holding said member against a force of any magnitude exerted for a short period, and permitting the movement thereof when said force is exerted for a greater period, and finally holding the regulator in its new adjusted position.

2. In combination with a movable member of a regulator for steam-engines, a fluid-controlling device directly connected thereto and adapted and arranged to hold said member against any sudden movement, but permitting the same to move after a stated period of time, and finally to hold it in its adjusted position.

3. In combination with a movable member of a regulator for steam-engines, a fluid-containing pot or chamber; controlling devices mounted and working therein, comprising a piston and valve carried thereby, said valve normally closing the passages through the piston; and direct connections intermediate the movable member of the regulator and the controlling devices mounted in the pot.

4. In combination with a movable member of a regulator for steam-engines, a pot or chamber; a piston mounted therein; connections intermediate said piston and the movable member of the regulator; a valve working in conjunction with said piston; and means for holding the valve in such position relatively to the piston that the piston and rod will be prevented from being moved to any extent through the exertion of a force of any magnitude for a short period, but which will permit the parts to move when said force has been exerted for a period of any length, and will lock the parts in their adjusted position when they come to rest.

5. In combination with a movable member of a regulator for steam-engines, a pot or chamber; a piston mounted therein having openings formed near its upper end and ports I below the same; connections intermediate said piston and the movable member; a valve working within said piston and adapted normally to close the ports; and means for holding said valve in such position.

6. In combination with a movable member of a regulator for steam-engines, a pot or chamber; a valve G mounted therein and provided

with openings H near its upper end and ports I near its lower end; connections intermediate said piston and the movable member; a valve mounted in said piston and provided with ports K; a spring adapted to hold said valve in its elevated position with the ports out of alinement; and means for limiting the upward movement of said spring.

7. In combination with a movable member of a regulator for steam-engines, a pot or chamber; a piston G mounted therein and provided with openings H near its upper end and with ports I near its lower end; a valve mounted therein and provided with ports K; a spider M secured to the piston below the valve; a spring mounted upon said spider; a plate N interposed between the upper end of the spring and the valve; and a screw or stem O extending through the spider and connected to the plate, and adapted and arranged to limit the upward movement of the spring.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWIN REYNOLDS.

Witnesses:
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E. T. ADAMS.