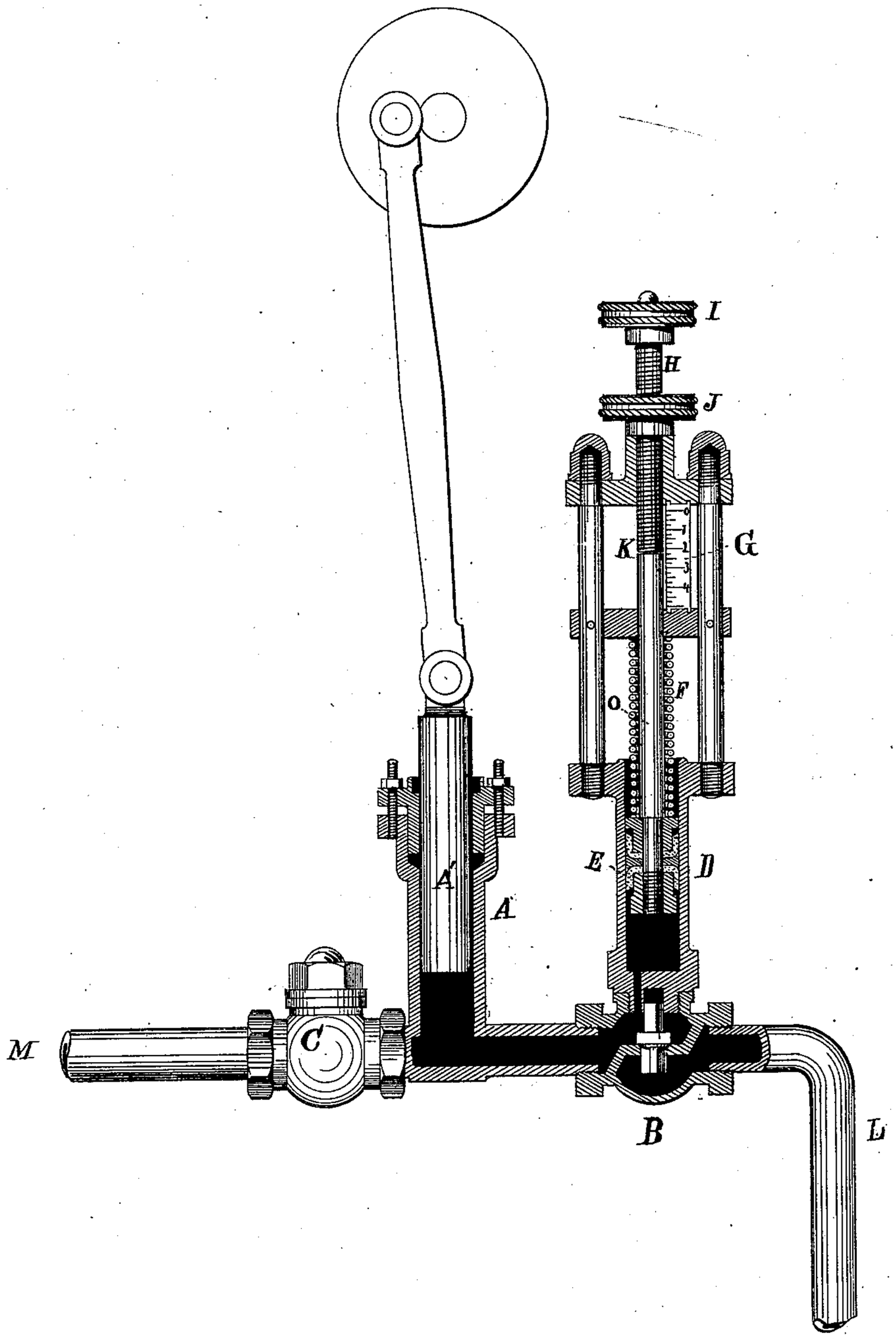
H. S. MAXIM.

Feed-Water Regulator.

No. 204,747. Patented June 11, 1878.



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HIRAM S. MAXIM, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN FEED-WATER REGULATORS.

Specification forming part of Letters Patent No. **204,747**, dated June 11, 1878; application filed November 12, 1877.

To all whom it may concern:

Be it known that I, HIRAM S. MAXIM, of Brooklyn, county of Kings, and State of New York, have invented a new and useful Apparatus for Regulating the Supply of Feed-Water to Steam-Boilers, of which the following is a description, reference being had to the drawing, forming a part of this specification.

My present invention relates to a new mode of regulating the supply of water to steam generators or boilers by changing the discharge of the feed-pump.

It consists of an auxiliary cylinder or barrel provided with a close-fitting piston of about the same size as the feed-pump, the same being connected to the feed-pump, between its two valves, in such a manner that it may diminish the discharge of the pump by moving in a direction opposite to that of the pump-piston.

It is designed to obviate the many difficulties heretofore encountered in regulating the volume of water thrown into boilers by feed-pumps attached to or worked by steam-engines.

In very nearly every case where the feed-pump of a boiler is attached to the engine the pump is made of a size from two to six times as large as would actually be required to supply the boiler with water if it was allowed to work all the time and discharge its full volume into the boiler at each stroke. This is done to allow an ample margin and to enable the engineer to fill the boiler quite full in a short time at will.

With pumps so attached the volume of discharge is generally regulated by partially closing a valve in the suction-pipe, and not allowing the pump to fill; but this mode is objectionable from the great danger of air getting into the pump, and thus preventing it from pumping at all, for it must be remembered that, when only water sufficient to partially fill the pump is allowed to enter, the plunger lifts above the water, and a vacuum is formed between the plunger and the water. The tendency for air to get in and fill this space is very great, from the fact that the stuffing-box of the plunger is always wearing out, and is liable to leak. Moreover, in fast-running engines the meeting of the ascending water and the descending plunger in a vacuum produces a pounding that is not only disagreeable to the ears, but is also destructive to the pump and its connections. Again, with engines placed in boats, where the pump is attached to some working part, it is often desired to put a definite volume of water into the boiler at each stroke of the engine, whether running fast or slow. This cannot be done by the usual mode, from the fact that the pump will have more time to fill at a slow speed than at a high speed, and will thus put a much greater volume of water in than is required.

With coil or pipe boilers it is necessary that a certain and definite volume of water should enter at each stroke, and that the relative volume as compared with the steam should be readily adjusted as the point of cut-off or the pressure is changed.

I am aware that this has been done by so constructing the pump that its stroke could be changed; but this is a costly and cumbersome expedient, and cannot be changed while the engine is running; besides, it cannot be applied at all to that class of engines where the pump is attached to the cross-head or forms the cross-head itself.

This my present invention completely obviates all the above-named faults of existing modes, and is at once a cheap, simple, compact, and reliable instrument, that may be attached to any feed-pump, and it may be changed at will without stopping the engine, and, when once adjusted, may be relied upon. It is also in its favor that the engineer can learn from sight to what extent the pump is working, and if working at all.

The accompanying drawing shows my invention partly in section and partly in elevation.

A is a pump of the usual kind, B being its suction-valve, and C its discharge-valve. D is the cylinder or barrel of my attachment, it being in this case the same size as the pump itself. It is connected to the suction check-valve B above the seat, and is thus connected substantially as the pump itself—viz., between the two valves B and C.

E represents the piston moving freely in the barrel D; F, a strong spiral spring; G, a graduated scale; H, a long screw provided with

the thumb-nut I and binding-nut J. K indicates the point of contact of the piston-rod O and screw-rod H. L is the suction-pipe, and M the discharge-pipe leading to the boiler.

The stroke of the plunger of pump A is equal to the distance from 0 to 5 on scale G.

The operation is as follows: The plunger E being pressed down to the bottom of barrel D by the action of spring F, and the pump started, water will enter the suction-pipe on the upward stroke of the pump, and on the descent of said plunger a portion of the water will enter the barrel D and raise the plunger E until the rod O reaches the joint K, when its further movement in this direction is arrested by coming in contact with rod H. Thus, as no more water can enter the barrel, the remainder is forced through the eduction check-valve C, and so into the boiler. On the raising of the plunger A′ again the water is first drawn from the barrel D until the plunger E reaches the bottom. Then, as its downward motion is arrested, the remainder of the water necessary to fill the pump-barrel A is drawn through the induction check-valve B. Should the screw H be turned down until the plunger E was firmly pressed to the bottom of the barrel D, then there could be no movement of said plunger, and the full volume of the plunger of pump A would be drawn in and discharged at each up-and-down stroke, just as it would were the attachment removed. Then, again, should the screw be run up until its lower end reached the point 0 on the scale G, no water could be pumped, for the pump would completely fill from and discharge into the barrel D, and no water would be taken in at L or discharged at M. When one plunger went up the other would come down, and vice versa; but should the end of the screw be placed at a joint below 0, then a volume of water corresponding to this distance multiplied by the area of piston E would enter at each stroke of the pump. The tension of spring E should be such that it will press the piston down and the water into the pump before any is taken through the pipe L. Still it must not be so stiff as not to yield before the water enters the boiler.

When the screw H is adjusted at the proper point the binding-nut J should be turned down and the screw secured from changing its position.

When this apparatus is attached to a pump the engineer can observe at a glance whether the pump is working or not, for should it lose its water from any cause the movement of rod O will be changed and its clicking against screw H will cease. Therefore, by either eye or ear, he is enabled to know whether water is entering the boiler or not. This apparatus may be made with a solid plunger, as with the pump, and it may be attached to any portion of the pump or to a branch pipe leading from the pump; and, when desired, a buffer or dash-pot may be placed between the ends of rods H and O to remove all noise and jar from the pump and valves. The scale G may be made to slide so that the joint may be adjusted to suit various sizes of pumps.

I am aware that a plunger-valve has been employed with a pump to open by the pressure of water and allow the water to pass back into the induction-pipe, and that the same has been provided with a spring and an adjusting-screw.

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

1. The combination, with a feed-water pump, of an independent yielding plunger, E, in the water space between the two valves of the pump, and a stop, H, to regulate the amount of end motion allowed to such plunger, substantially as and for the purposes set forth.

2. The combination, with the feed-pump and yielding plunger E, of the scale G and adjusting-stop H, substantially as and for the purposes set forth.

3. The barrel D, plunger E, spring F, adjusting-stop H, and device for connecting the barrel to the water-space of a feed-pump between the valves thereof, substantially as and for the purposes set forth.

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Witnesses:
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