2 Sheets--Sheet 1.

H. S. MAXIM.

Automatic Pumping-Engines.

No. 158,105. Patented Dec. 22, 1874.

Fig. 1

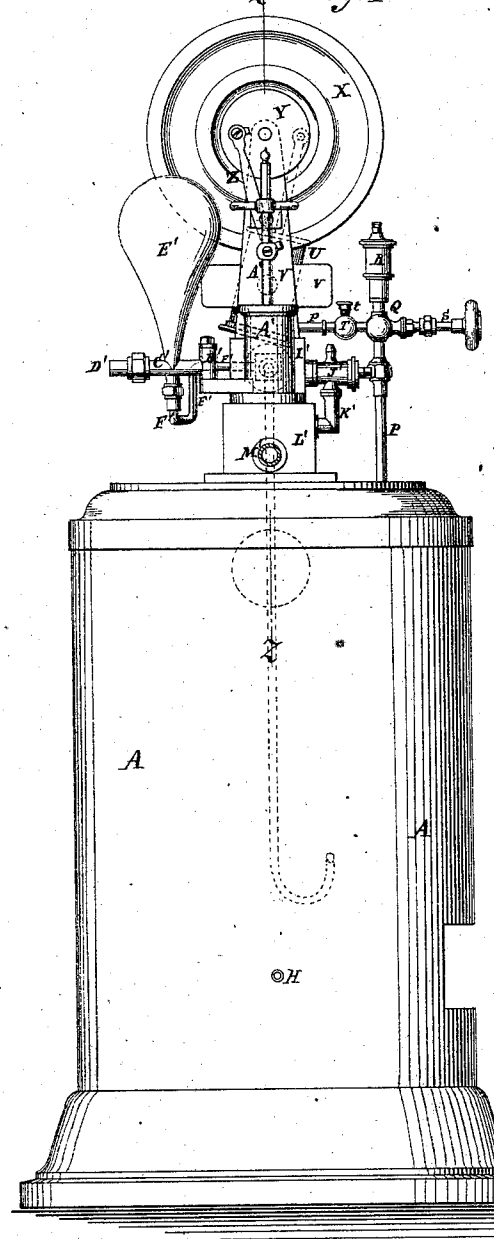
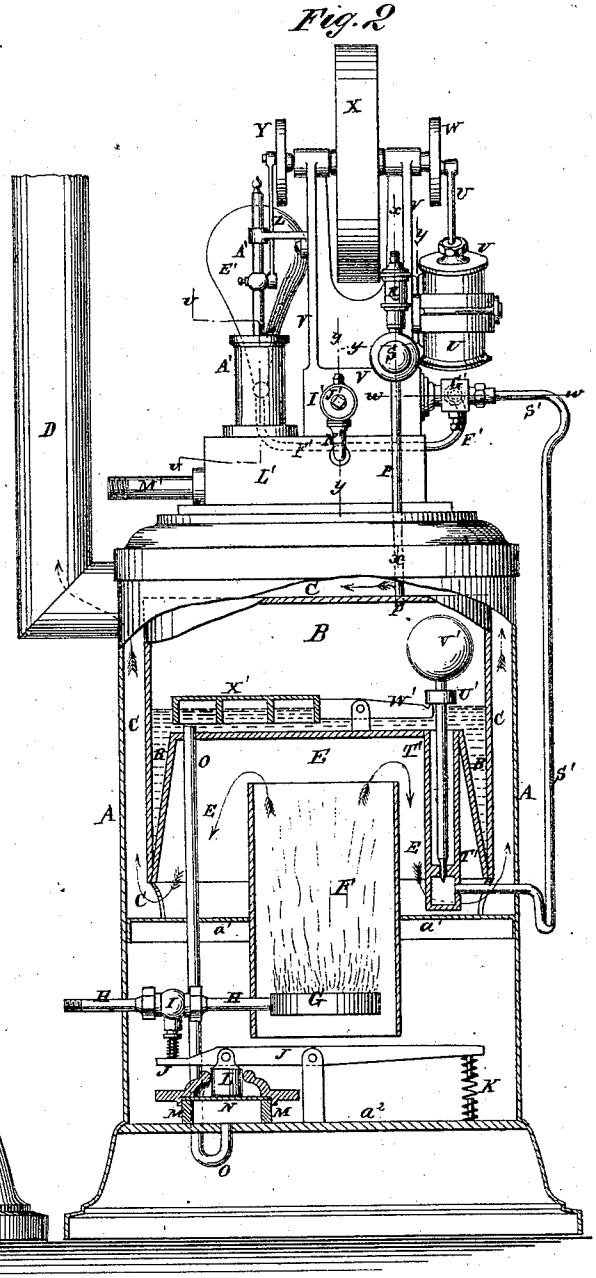


Fig. 2



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2 Sheets--Sheet 2.

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Fig. 3

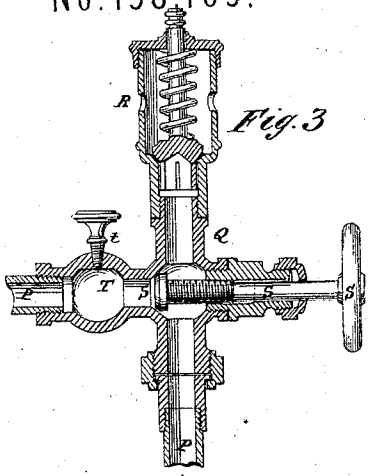


Fig. 6

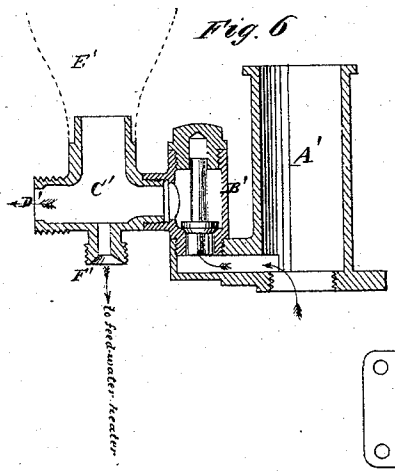


Fig. 4

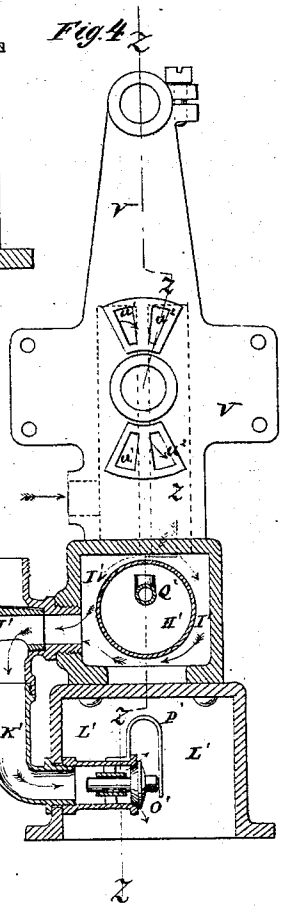


Fig. 5

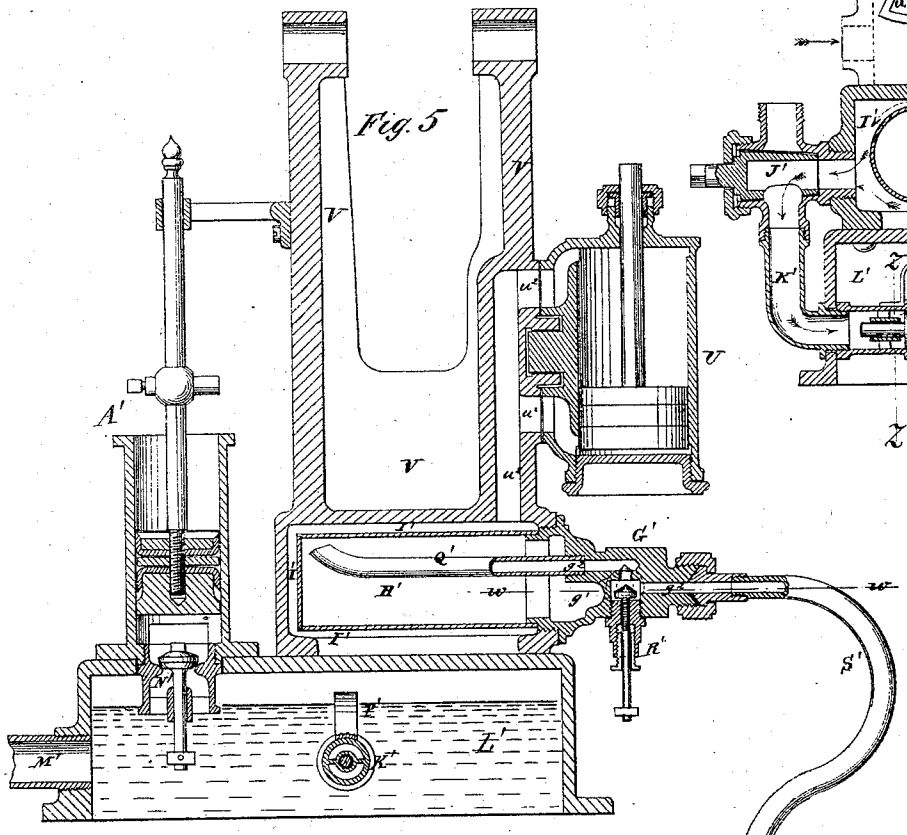
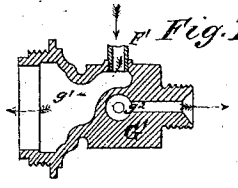


Fig. 7



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UNITED STATES PATENT OFFICE.

HIRAM S. MAXIM, OF NEW YORK, N. Y.

IMPROVEMENT IN AUTOMATIC PUMPING-ENGINES.

Specification forming part of Letters Patent No. **158,105**, dated December 22, 1874; application filed October 20, 1874.

To all whom it may concern:

Be it known that I, HIRAM S. MAXIM, of the city, county, and State of New York, have invented a new and useful Improvement in Automatic Pumping-Engine, of which the following is a specification:

Figure 1, Sheet 1, is a side view of my improved pumping-engine. Fig. 2, Sheet 1, is a side view of the same turned one-quarter around, and showing the boiler in section. Fig. 3, Sheet 2, is a detail section taken through the line *x x*, Fig. 2. Fig. 4, Sheet 2, is a detail section taken through the line *y y y y*, Fig. 2. Fig. 5, Sheet 2, is a detail section taken through the lines *z z z z z*, Fig. 4, and *z z*, Fig. 2. Fig. 6, Sheet 2, is a detail section taken through the line *v v*, Fig. 2. Fig. 7, Sheet 2, is a detail section taken through the lines *w w*, Figs. 2 and 5.

Similar letters of reference indicate corresponding parts.

The invention will first be fully described, and then pointed out in the claims.

A represents the outer case, which incloses the boiler and fire-chamber. B is the boiler, which is secured in the upper part of the case A, and is made smaller than said case, so as to leave space C, for the escape of the products of combustion upon all sides of the boiler B, and from which space the said products of combustion pass off through the flue D, as indicated by the arrows 1. E is the fire-chamber, which is formed in the lower part of the boiler B, and is in the shape of a truncated cone. This construction leaves a thin stratum of water all around the sides of the fire-chamber, so that the formation of steam will begin very soon after the fire has been started. The fire-chamber E is separated from the lower part of the interior of the case A by a cross-partition, *a'*, through a hole in the center of which passes, and in which is secured, the fire-pot F. The fire-pot F is made in the shape of a short tube open at both ends, and in its lower part is placed the burner G, which is made in the shape of a shallow circular dish, having numerous holes in its upper side for the egress of the combustible (gas or kerosene) to be consumed. The burner G is made smaller than the fire-pot or tube F, to allow air to pass in freely to support combustion, which air enters through an opening in the side or bottom of the case A. The burner G is secured to the end of a supply-pipe, H, which passes through the walls of the tube F and case A, and through which the combustible is introduced. In the pipe H, between the case A and fire-pot F, is placed a check-valve, I, the stem of which rests upon the end of a lever, J, and is closed by the upward movement of the end of the said lever J. The lever J is pivoted to a stud attached to the bottom a^2 of the case A, and its other end is held up, allowing the valve I to stand open, by a coiled spring, K, interposed between it and the said bottom a^2. To the lever J, between its forward end and fulcrum, is pivoted a cylindrical or other shaped block, L, which passes down through a similarly-shaped hole in the cover of the vessel M, secured to the bottom a^2. The lower end of the block L rests upon a flexible diaphragm, N, secured water-tight in the upper part of the vessel or chamber M. The vessel M is connected with the boiler B by a pipe, O, so that the pressure in the said vessel M and in the boiler B may be the same.

By this arrangement, when the pressure in the boiler B increases, the diaphragm N will be raised against the weight of the block L, and the force of the spring K closing the valve I more or less, according to the amount of pressure in the boiler B and vessel M. A small hole is drilled through the valve I to enable enough of the combustible to always pass through to support a small flame, and thus prevent the flame from being extinguished by the closing of the valve I, so that, as the valve I again opens upon the diminution of the pressure, the flame will immediately increase, the formation of steam being thus increased and diminished automatically, as required. From the boiler B the steam passes through the pipe P to the engine. With the steam-pipe P is connected the four-way casting or coupling Q, with the inlet and outlet arms of which are connected the parts of the said steam-pipe P. With the upper arm of the casting Q is connected a safety-valve, R. With the fourth arm of the casting Q is connected the throttle-valve S. Upon

the outlet-arm of the casting Q is formed a globular enlargement, T, the cavity of which is designed to receive oil for oiling the inner parts of the engine. The oiler T is supplied with oil through a hole in its upper side, which hole is closed by a screw-plug, t'. From the pipe P the steam enters the engine U through the inlet-ports u^1, and escapes from it through the exhaust-ports u^2, which ports are opened and closed by the oscillations of the said engine U, which is pivoted to the frame-work V attached to the top of the case A. The piston-rod of the engine U is pivoted to the crank-pin of the small crank-wheel W attached to the journal of the fly-wheel X. The journals of the fly-wheel X revolve in bearings in the frame-work V, and to the other journal of said wheel is attached a crank-wheel, Y, to the crank-pin of which is pivoted the end of the connecting-rod Z, the other end of which is pivoted to the rod of the pump A′. The pump A′ is attached to the frame-work V upon the side opposite to the engine U, is single-acting, and the water escapes from it through the valve-chamber B′ into the four-way casting C′, with one arm of which the discharge-pipe D′ is connected. With the upper arm of the casting C′ is connected the air-chamber E′ to cause a steady flow of water. With the lower arm of the casting C′ is connected a small pipe, F′, to conduct feed-water to the boiler B. The other end of the pipe F′ is connected with a casting, G′, through a passage, g^1, in which the feed-water passes into the chamber H′, which is placed in a chamber, I′, formed in the lower part of the frame V, and into which the exhaust steam is led from the exhaust-ports u^2 of the engine U. From the chamber I′ the exhaust steam escapes through the three-way cock J′, from which it may be allowed to escape into the air. When, from the location of the machine, or from any other cause, it is desirable to condense the steam instead of allowing it to escape into the air, the three-way cock J′ is adjusted as shown in Fig. 4, which causes the exhaust steam to pass through the pipe K′ into the chamber L′, with which the suction-pipe M′ is connected, and from which the water passes into the pump A′ through the valve N′. The inner end of the exhaust-steam pipe K′ is provided with a valve, O′, which is held in place by a light spring, P′, and is designed to prevent the water from passing from the chamber L′ into the said pipe K′. The pipe of the valve N′ projects downward into the chamber L′, so that the upper part of said chamber L′ may remain filled with air to cushion the water as it rushes into the chamber L′, and thus prevent the hammering that would otherwise be caused by the intermittent inflow of the water.

As the water is heated in the chamber H′ it flows out through the pipe Q′, which is placed in the upper part of the said chamber H′. The inner end of the pipe Q′ is open, and is curved upward slightly, and its outer end is connected with the passage g^2 of the casting G′. The casting G′ is provided with a screw-valve, R′, to prevent the ingress of feed-water, when desired. With the outer end of the passage g^2 of the casting G′ is connected the upper end of the pipe S′, the lower end of which passes in through the case A, beneath the lower edge of the ring part of the boiler B, and enters a valve-chamber in the lower end of the tube T′. The tube T′ passes up through the fire-chamber E, and its upper end opens into the cylindrical part of the said boiler B. U′ is the valve, the stem of which passes up through the tube T′, and to its upper end in the upper part of the boiler B is attached a weight, V′. W′ is a lever, which is pivoted to a support attached to the boiler B. One end of the lever W′ rests beneath a shoulder formed upon or a collar attached to the valve-stem U′, and to its other end is attached a float, X′, made in the form of an inverted vessel, and which may have its cavity divided up into compartments by cross-partitions. The weight of the float X′, and the weight of the weight V′, so nearly balance each other that a slight increase in the buoyancy of the float X′ causes it to be overbalanced by the weight V′, and closes the valve U′.

The casting G′ is screwed into the mouth of the chamber I′, as shown in Fig. 5, so that by disconnecting the feed-water pipe F′ S′ the said casting G′ may be screwed out and removed, taking with it the feed-water heater H′ Q′, enabling said feed-water heater to be easily cleaned and repaired when required.

In starting the machine, the boiler B is filled with water to about the water-line. As the formation of steam begins, the steam confined in the cavity of the float X′ tends to raise it, and thus keeps the valve U′ tightly closed. As the water decreases in the boiler B the float X′ gradually sinks and raises the weight V′, which opens the valve U′, and admits a supply of feed-water. As the float X′ again rises into its former position the valve U′ is again closed, and so on, the machine keeping the boiler B constantly supplied with water.

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

1. The four-armed casting Q, provided with the safety-valve R, the throttle-valve S, and the oiler T t, in combination with the steam-pipe P, leading from the boiler to the engine of a pumping-engine, substantially as herein shown and described.

2. The combination of the chambers I′ and H′ and the pipe Q′ with the feed-water pipe F′ S′, the exhaust-ports u^2 of the engine U, and the frame-work V, that supports the pump and the engine, substantially as herein shown and described.

3. The casting G′, provided with two passages, g^1 g^2, and the valve R′, in combination with the feed-water pipe F′ S′, the feed-water heater H′ Q′, and the chamber I′, substantially as herein shown and described.

4. The combination of the air-chamber L′ with the inlet-valve N′ of the pump A′, and with the suction-pipe M′, substantially as herein shown and described.

5. The combination of the three-way cock J′, the pipe K′, and the spring-valve O′ P′, with the outlet of the steam-chamber I′, that contains the feed-water heater H′ Q′, and with the water-supply chamber L′, substantially as herein shown and described.

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Witnesses:
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T. B. MOSHER.