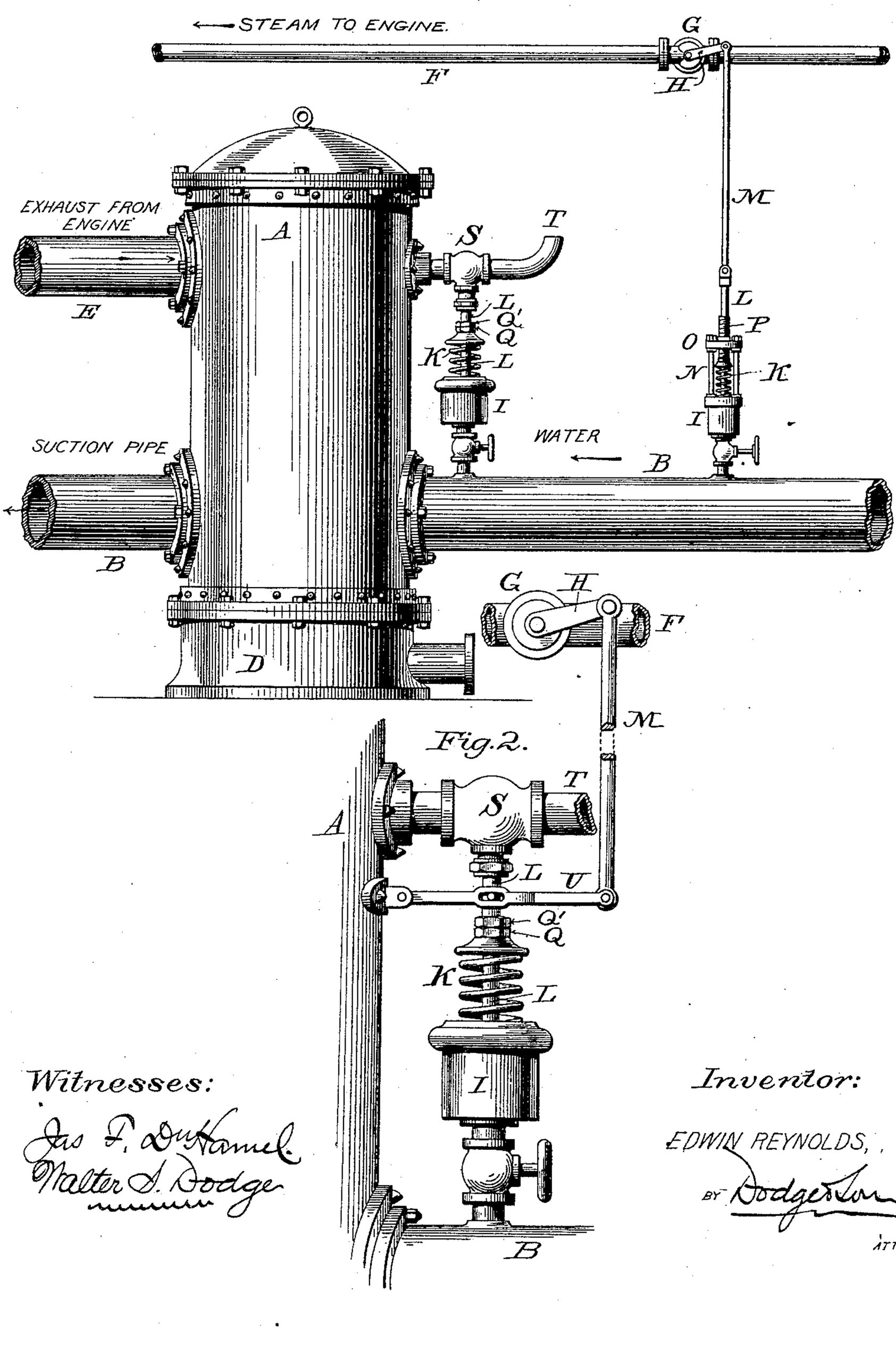
(No Model.) 2 Sheets—Sheet 1.

E. REYNOLDS.

STEAM PUMPING ENGINE.

No. 318,504. Patented May 26, 1885.

Fig. 1.



Witnesses:

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

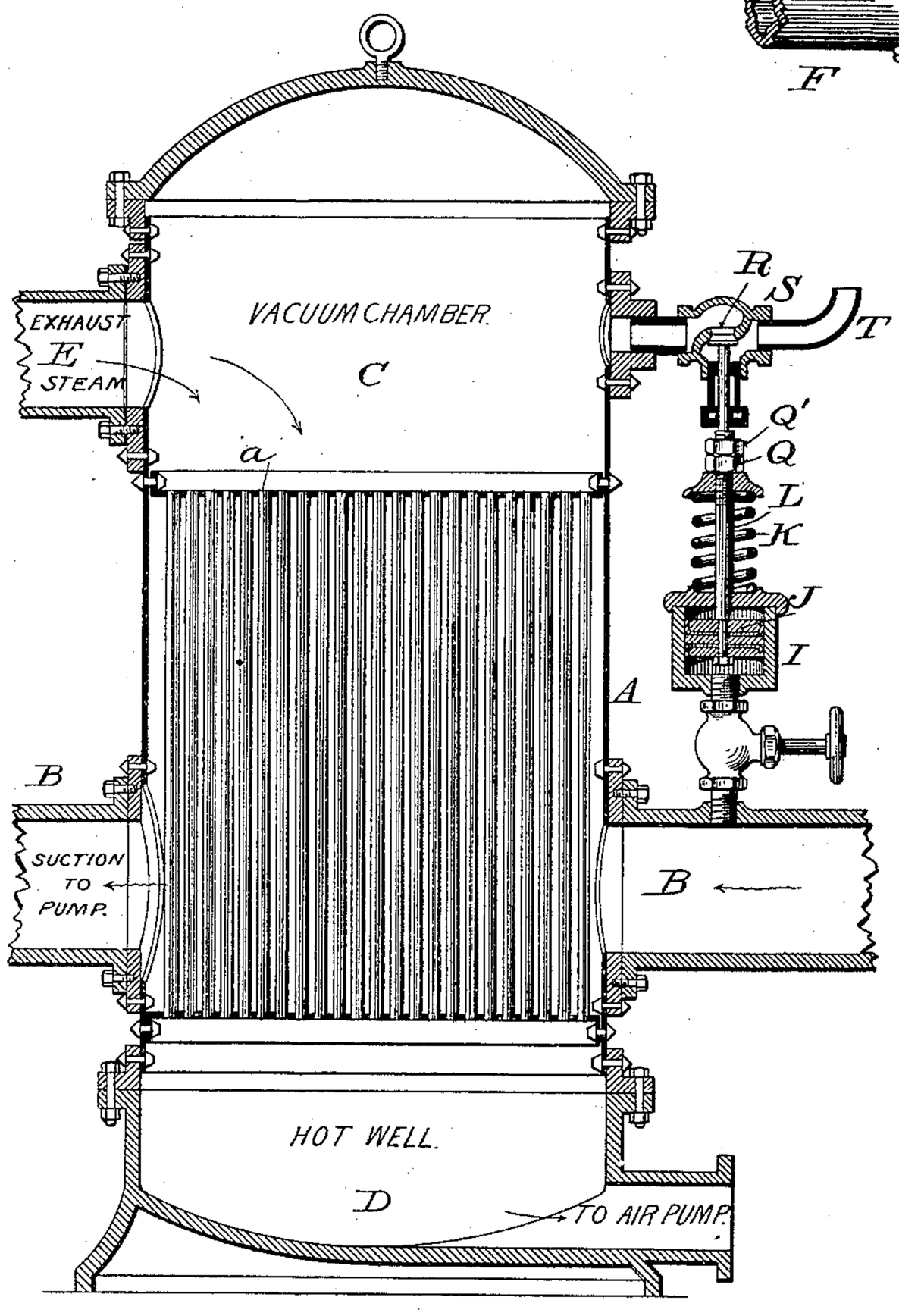
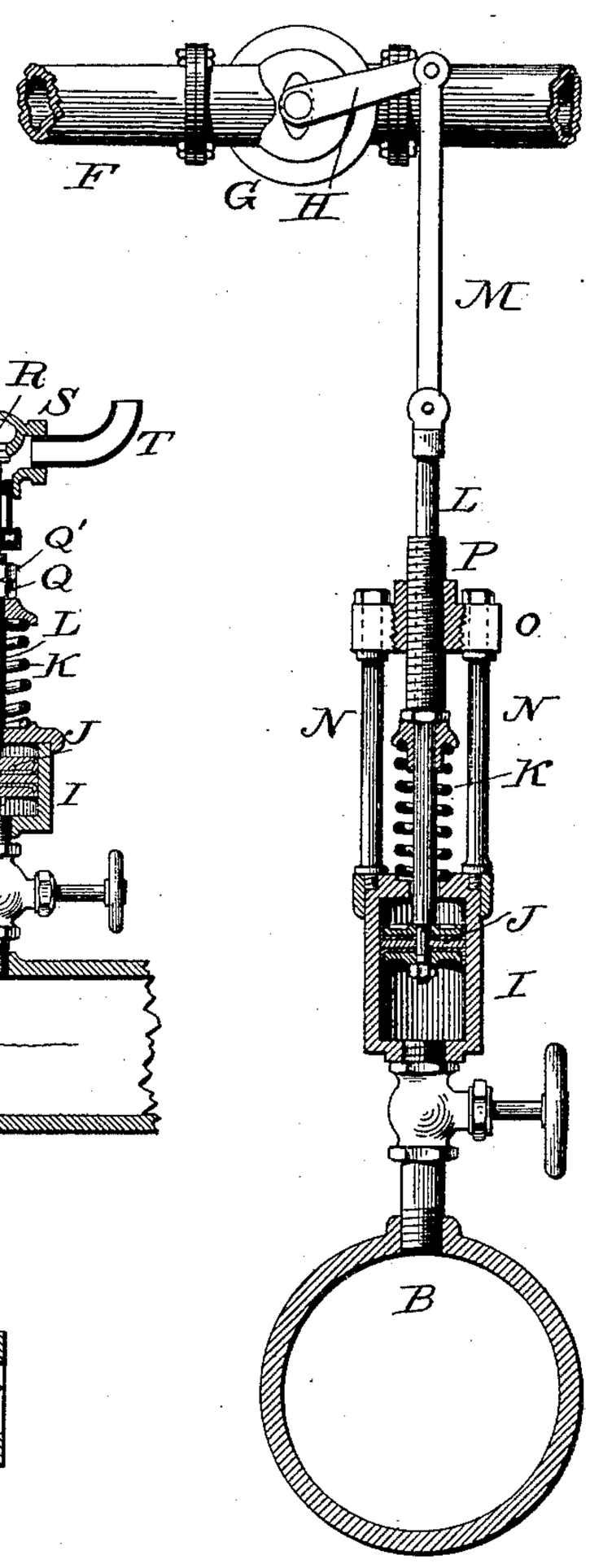


Fig. 4.



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UNITED STATES PATENT OFFICE.

EDWIN REYNOLDS, OF MILWAUKEE, WISCONSIN.

STEAM PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 318,504, dated May 26, 1885.

Application filed December 27, 1884. (No model.)

To all whom it may concern:

Be it known that I, EDWIN REYNOLDS, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Steam Pumping-Engines, of which the following is a specification.

My invention relates to steam pumping machinery, and is designed to prevent accidents thereto due to the stoppage of the suction-pipe or like cause.

The invention consists in applying to the suction-pipe of a pumping apparatus a valve-controlling device, one or more, connected with the throttle-valve of the steam-pipe and with an air-inlet valve communicating with the vacuum-chamber of the condenser, so constructed and arranged that it shall be actuated and made to cut off steam and admit air whenever the vacuum increases above a predetermined point. The steam-valve mechanism may be omitted, and merely the air-valve be used.

In the accompanying drawings, Figure 1 is a side elevation of the condenser, showing also the steam supply and exhaust pipes of the engine and the automatic device for admitting air to the vacuum-chamber of the condenser; Fig. 2, a view showing the steam and air valves both connected with and actuated by the same piston; Fig. 3, a sectional view of the condenser and regulating device arranged to admit air to the vacuum-chamber thereof; Fig. 4, a sectional view of the mechanism controlling the steam-supply. I may here remark that I make no claim separately to the steam-controlling devices.

In the ordinary course of operating steam pumping machinery there is always a liability of the column of water or other fluid in the suction-pipe being interrupted or broken through clogging of the suction-pipe or from other cause, and in case of such interruption the machine is suddenly relieved of its load, as in one revolution the pump is filled with fluid and in the next revolution is empty, and the plunger meeting with no resistance and being urged forward by the full pressure of the steam on the piston will in a very short time attain a dangerous velocity. For this and other reasons it is deemed advisable that an attendant shall always be at hand when the machine is in operation.

I overcome the difficulty or avoid the danger mentioned by providing mechanism which automatically admits air to the vacuum-chamber of the condenser and thus neutralizes the exhaust from the engine, or which thus admits and simultaneously cuts off the supply of steam to the engine in whole or part. Where very large and heavy machinery is employed it will be found often desirable to adopt both provisions; but for smaller or lighter machinery the air-inlet valve may be used alone.

A, Figs. 1 and 2, indicates a tubular condenser; B, the suction-pipe thereof; C, the vacuum-chamber; D, the hot well, and E the inlet-pipe through which exhaust-steam from the engine enters the vacuum-chamber of the condenser. The condenser is here represented as having the vacuum-chamber and hot well connected by tubes *a*, through which the steam passes and in which it is condensed, the water of suction-pipe B being caused to pass around and between the pipes to effect such condensation, this being a common and well-known plan of construction. The suction-pipe B, by which water enters the condenser, is the one which is liable to clog or in which from one cause or another the water-column is liable to be interrupted.

F indicates the steam-pipe by which live steam is supplied to the engine to run it, which pipe is provided with a throttle or other valve, G, having a lever, H, attached to its stem, as shown in Figs. 1 and 3.

I indicates a cylinder applied to and in communication with suction-pipe B, and containing a piston, J, which is normally raised and held up by a strong spiral spring, K, encircling its stem L, which stem extends upward and is connected by a link, M, with the valve-lever H.

From the top of cylinder I uprights or rods N extend upward, carrying at the upper ends a cross-bar, O, through which passes a threaded tubular sleeve, P, the lower end of which bears upon the spring or upon a cap applied thereto, so that the compression and the consequent lifting-power of the spring may be varied as required. In practice the adjustment is such

that the spring shall overcome or withstand the normal suction of pipe B, with which its lower end communicates, as stated, and as shown in Figs. 1 and 3. When, however, the pipe B is clogged or the inflow of water is in any way impeded, the increased suction in the pipe draws down piston J and with it the piston-rod, link M, and valve arm or lever H, thereby closing the valve partially or entirely, as the case may be, and in this manner stopping the engine or keeping it at low speed.

A second cylinder I is applied to the suction-pipe and provided, like the first, with a piston, J, spring K, and stem L, as shown in Figs. 1 and 2; but instead of the cross-head and tubular sleeve, the stem is threaded and carries a nut and jam-nut, Q and Q′, by which the compression of the spring may be regulated as required. The upper end of stem L in this case bears the valve-plug R of a globe or other valve, S, controlling an air-inlet pipe, T, opening into the vacuum-chamber C of the condenser.

So long as the suction remains at its normal point in pipe B, the spring K, which is set for a slightly-higher resistance, will hold the valve-plug to its seat and prevent the inlet of air to the vacuum-chamber; hence the suction of the air-pump, which, as usual, connects with the hot well, will draw the exhaust-steam from the engine into and through the condenser; but the moment the air-inlet T is opened air enters the vacuum-chamber, thus neutralizing the vacuum therein and causing the engine to stop for want of power to keep it in motion.

In Fig. 1 the two devices are shown as separately applied to the suction-pipe and independent of each other, so that if one fails the other may still act; and in Fig. 2 the two devices are shown combined in one, the connection with the valve-lever being made through a pivoted arm, U, which is interposed between the piston-rod and the steam-valve lever in order to give the latter a longer movement. Any other suitable connection may, however, be adopted.

A weighted lever may obviously take the place of the spring, and a flexible diaphragm instead of the piston.

Having thus described my invention, what I claim is—

1. In combination with the suction-pipe of a pumping-engine and with a condenser, a cylinder communicating with the suction-pipe, a piston within said cylinder sustained against the normal suction thereof, an air-inlet valve communicating with the vacuum-chamber of the condenser, a valve controlling the steam-supply, and connecting devices, such as shown and described, connecting the piston with the air-inlet valve and with the steam-valve, substantially as described and shown.

2. In combination with steam-supply pipe F and its valve G, condenser A, provided with air-inlet T, having valve S, cylinder I, communicating with the suction-pipe of the condenser, and piston J, mounted in said cylinders and connected with valves G and S, substantially as and for the purpose set forth.

3. In combination with the suction-pipe of a steam-engine and with a condenser, a cylinder communicating with the suction-pipe, a piston within said cylinder sustained against the normal suction of the pipe, an air-inlet valve communicating with the vacuum-chamber of the condenser, and a rod or connecting device connecting the piston and the air-inlet valve, whereby an abnormal suction is caused to open the valve and admit air to the vacuum-chamber, substantially as described.

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