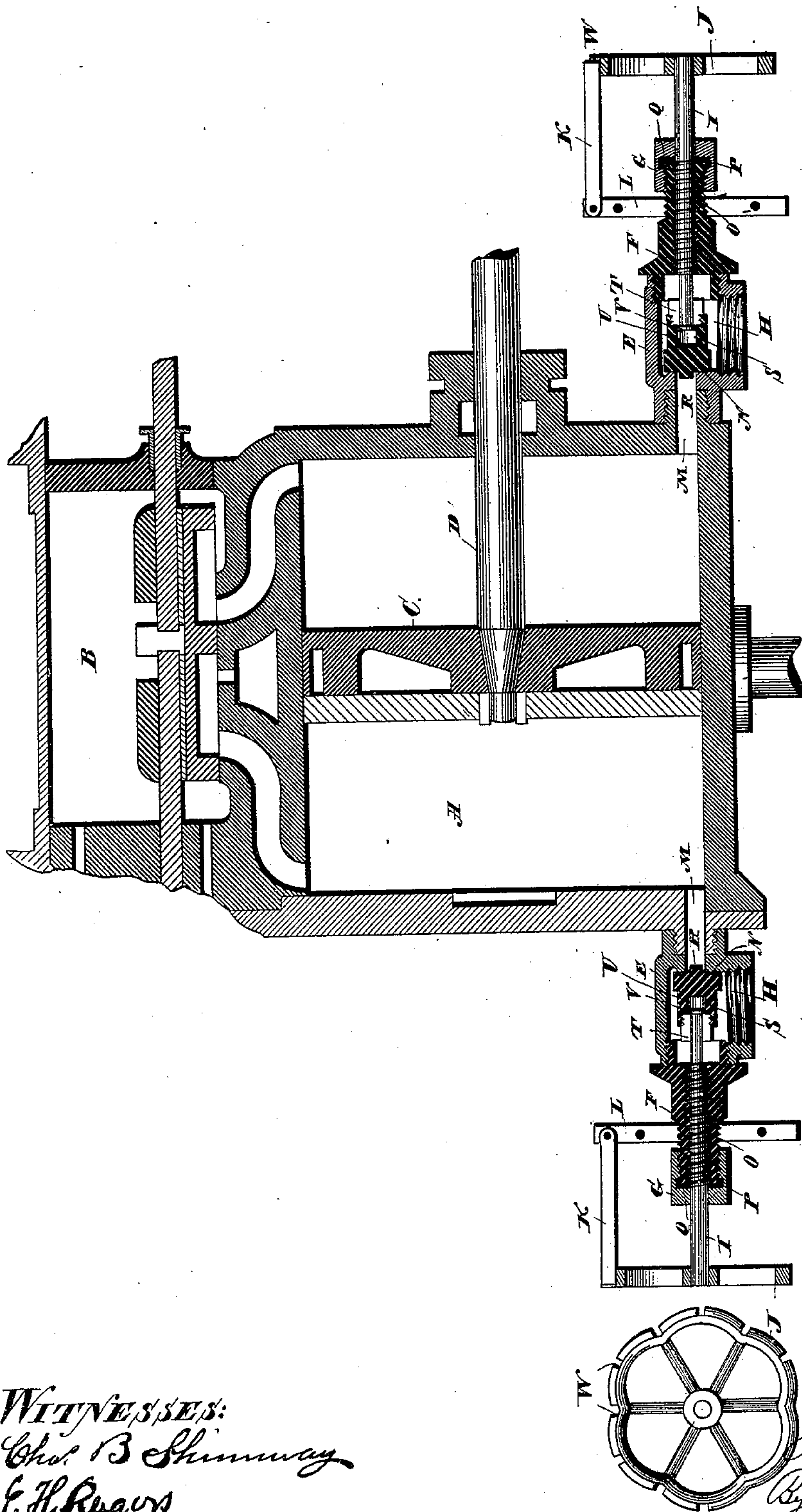


(No Model.)

H. HAAB.
LOW PRESSURE ENGINE.

No. 404,905.

Patented June 11, 1889.



WITNESSES:

Chas. B. Shinnway

E. H. Rogers

INVENTOR

Henry Haab.

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Att'y.

UNITED STATES PATENT OFFICE.

HENRY HAAB, OF BRISTOL, CONNECTICUT, ASSIGNOR OF ONE-HALF TO
ELISHA S. HOLLISTER, OF SAME PLACE.

LOW-PRESSURE ENGINE.

SPECIFICATION forming part of Letters Patent No. 404,905, dated June 11, 1889.

Application filed December 22, 1886. Serial No. 222,253. (No model.)

To all whom it may concern:

Be it known that I, HENRY HAAB, residing at Bristol, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Low-Pressure Engines; and I do declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing, which forms a part of this specification.

My invention relates to an improvement in that class of condensing-engines in which a vacuum is produced in the cylinder, the object being to provide drip-discharge valves normally free to open, securing a free discharge of water both when the engine is at work and when it is not at work, requiring the minimum expenditure of power for their operation, insuring a uniform action of the engine, and combining simplicity and cheapness of construction with durability, reliability, and efficiency in use.

With these ends in view my invention consists in the combination, with a cylinder in which a vacuum is produced in the normal action of the engine of which it forms a part, of a drip-discharge valve made adjustable to the amount of condensation and arranged to be opened by pressure within the cylinder, whether of steam and water or water alone, and closed when a vacuum is formed in the cylinder solely by the pressure of the atmosphere, to which it is directly exposed.

My invention further consists in certain details of construction, as will be hereinafter explained, and pointed out in the claims.

The accompanying drawing is a view in vertical longitudinal section of an independent pumping-engine embodying my invention.

The steam-cylinder A, steam-chest B, piston C, and piston-rod D are of ordinary construction and operation, a vacuum being produced in the cylinder by the condensation of the steam. At each end of the said cylinder and at the lower edges of the heads thereof is located an automatic drip-discharge device, each consisting of an elbow E, nuts F and G, a valve H, valve-stem I, a wheel J, latch K, and frame L, as shown. The elbow of each device contains a discharge-opening M, leading from the interior of the cylinder to the

outer air, and a valve-seat N, located in such opening. The nut F of each device is fitted into the elbow and provided with an exteriorly and interiorly threaded shank O, upon which the nut G is adjustably mounted, the said nut being provided with a chamber P to receive a packing Q of suitable material. Each valve H is provided at one end with a guide R, extending through the valve-seat, and at the other end with a threaded chamber S, receiving an adjustable two-part box-bearing T, with a space U between its inner end and the end wall of the said chamber. The valve-stem I is threaded and extends through the nut F and the shank O thereof, and is provided at its forward end with a shoulder V, occupying the space U of the valve, which is mounted upon the stem, with a capacity for longitudinal reciprocation thereon. The wheel J is firmly secured to the outer end of the valve-stem and provided in its periphery with a series of transverse slots W, which receive the latch K, the same being pivoted in the frame L, which is mounted upon the shank O and held in place between the nuts F and G, as shown.

Having described in detail the construction of my improvement, I will now proceed to set forth the mode of its operation.

When the steam is admitted into one end of the cylinder, the pressure produced therein opens the valve of such end by simply overcoming its gravity, whereby the water which is condensed in such end of the cylinder is freely discharged, and discharging completely fills and so closes the discharge-opening of the valve and prevents the escape of steam through the same, the valve being adjusted so as to conform its discharging capacity to the amount of water to be discharged through it, which is practically constant and readily observed and determined. The expansion of this live steam forces the piston into the opposite end of the cylinder, in which a vacuum has been produced by the condensation of the steam last admitted to such end of the cylinder. The expanded steam is now condensed with the creation of a vacuum in its end of the cylinder, the valve opened, as described above, being then immediately closed by the pressure of the atmosphere upon

its outer end. Then as steam is admitted into the opposite end of the cylinder the pressure therein opens the valve of such end and the condensed water is freely discharged, the piston is driven to the other end of the cylinder, the steam last admitted condensed, a vacuum created, and the valve last opened closed, and so on. It will thus be seen that the valves are normally free to open under even so little pressure as is required to overcome their gravity, that they are alternately and automatically closed solely by the direct pressure of the atmosphere upon their outer ends, and that the vacuum is never broken in the cylinder.

In the normal operation of the engine the valve on that side of the cylinder to which the steam is last admitted is pushed open by the steam, and, instead of being closed again by the pressure of the atmosphere upon its outer end, it is left open in consequence of the establishment of an equilibrium of atmospheric pressure on each side of the valve by the rushing of air into the said end of the cylinder after the piston has made its last stroke, to take the place of the last charge of steam, which escapes through the valve without condensation, which is prevented by the closing of communication between the cylinder and condenser by the operation at this time of the ordinary cut-off valve of the engine. In case, however, a valve should by any chance be left closed when the engine stops, it will be pushed open again by the weight of any water remaining in the cylinder, which, as described, is filled with air when the engine stops, so that there is always a perfect discharge of water from the cylinder, which is therefore prevented from being strained by the freezing of accumulated water in it. This feature of reducing the power required to open the valves to so much as is simply required to overcome their gravity particularly adapts my invention for use in the condensers of independent pumping-engines, which are operated under a low pressure of steam. My invention secures to such engines not only the discharge of the water of condensation from their cylinders with the expenditure of very much less power than has heretofore been required for the purpose, but also a more regular and even action than has been secured before, and that with less attention from the engineer.

I would have it understood that I do not limit myself to the exact construction and ar-

rangement of parts herein shown and described, but hold myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of my invention.

I am aware that high-pressure, but not vacuum, engines have heretofore been provided with normally - closed drip - valves opened against the pressure of springs. I do not, therefore, broadly claim an automatic drip-valve; but

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

1. In a condensing-engine, the combination, with a steam-cylinder in which a vacuum is produced by condensation in the normal operation of the engine, of a drip-discharge valve constructed and arranged to be opened by pressure within the cylinder, closed when a vacuum is formed therein solely by the pressure of the atmosphere, to which its outer end is directly exposed, and made adjustable in its opening to conform to the amount of water condensed, whereby the condensed water is freely and completely discharged without the expenditure of any power other than that required for moving the valve, and whereby the holding of water in the cylinder after the engine is stopped is avoided, substantially as set forth.

2. In a condensing-engine, the combination, with a steam-cylinder in which a vacuum is produced by condensation in the normal operation of the engine, of two automatic drip-discharge valves respectively located at the lower edges of the opposite ends of the cylinder, each of the said valves being constructed and arranged to be opened by pressure within the cylinder, closed when a vacuum is formed therein solely by the pressure of the atmosphere, to which its outer end is directly exposed, and made adjustable in its opening to conform to the amount of water condensed, whereby the condensed water is freely and completely discharged without the expenditure of any power other than that required for moving the valve, and whereby the holding of water in the cylinder is avoided, substantially as set forth.

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

HENRY HAAB.

Witnesses:

E. S. HOLLISTER,
CHAS. B. SHUMWAY.