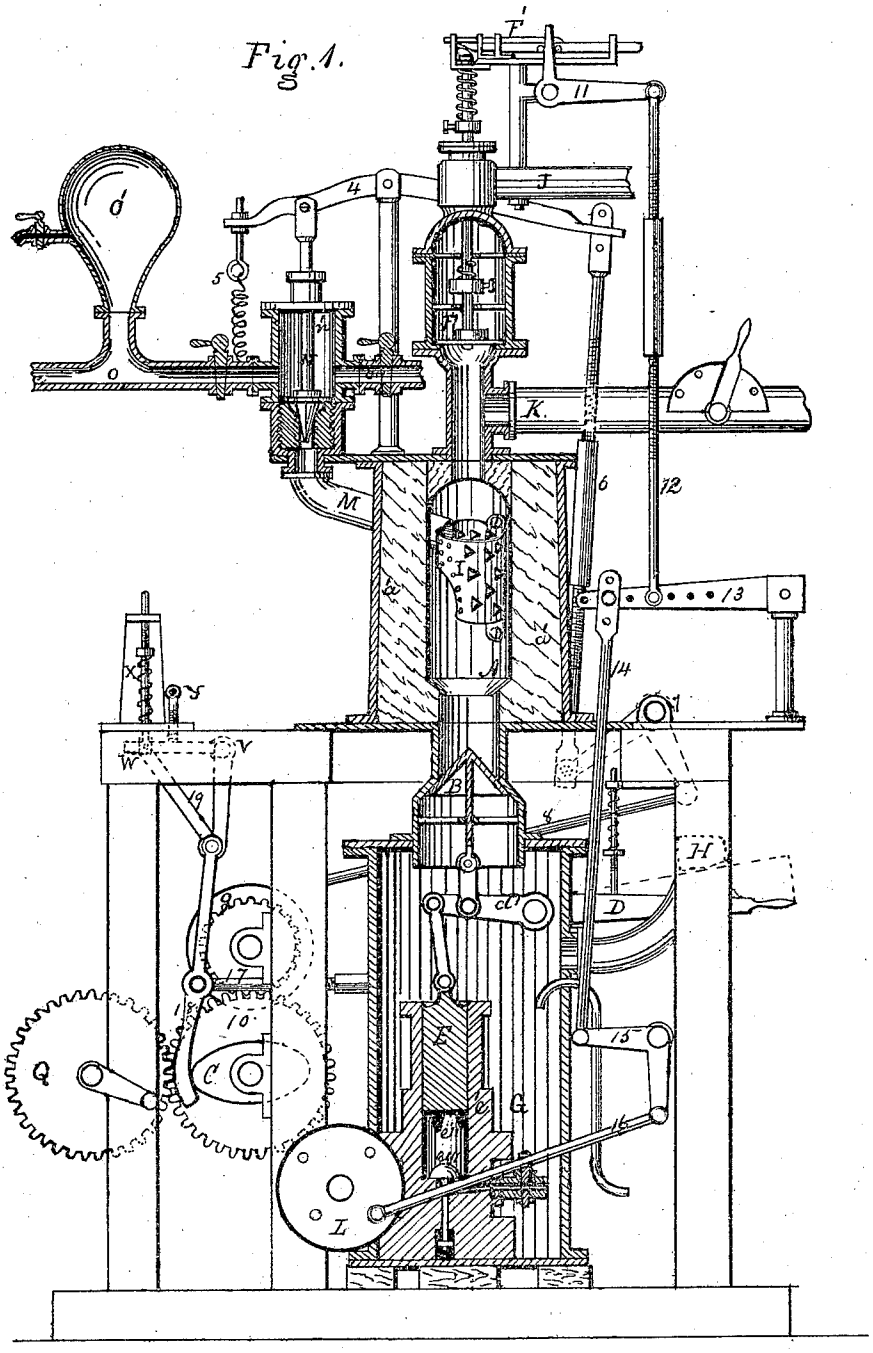
2 Sheets--Sheet 1.

J. HOUPT.

Improvement in Jet-Condensers for Steam-Engines.

No. 131,351. Patented Sep. 17, 1872.

Fig. 1.



WITNESSES.

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INVENTOR.

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2 Sheets--Sheet 2.

J. HOUPT.

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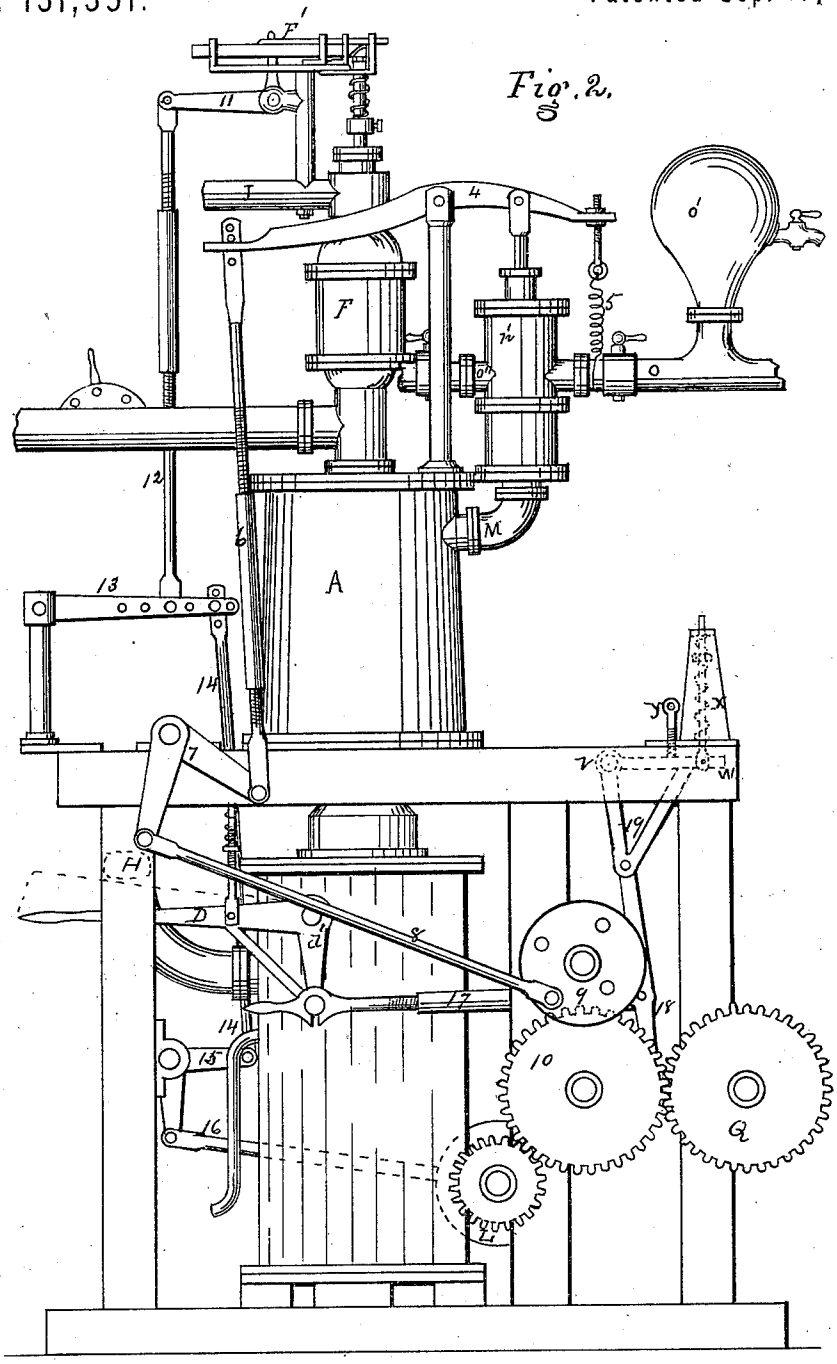
Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN HOUPT, OF SPRINGTOWN, PENNSYLVANIA.

IMPROVEMENT IN JET-CONDENSERS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **131,351**, dated September 17, 1872.

To all whom it may concern:

Be it known that I, JOHN HOUPT, of Springtown, in the county of Bucks and State of Pennsylvania, have invented certain Improvements in Jet-Condensers for Steam-Engines, of which the following is a specification:

My said improvements relate to the self-clearing jet-condenser, for which Letters Patent, dated April 19, 1870, were granted to me, and reissued May 31, and numbered 3,999. The first part of my invention relates to the operation of the bottom valve of the condenser whereby it closes by a positive motion to allow the vacuum to be produced, and opens freely on the entrance of the next puff of steam from the cylinder; the object of this part of my invention being to cause the double functions of the said condenser—*i. e.*, its clearing condensing functions—to be effected more perfectly. Another part of my invention relates to a spring-valve in a case communicating with the upper end of the condenser, in combination with a sliding stop, in such a manner that the said valve will be held firmly closed while the first puff of steam from the cylinder of the engine passes through the condenser, and will then be left free to open from any excess of pressure of the remaining exhaust-steam in the condenser above that of the atmosphere; the object of this part of my invention being to retain no more steam for condensation in the condenser than will prevent the entrance of atmospheric air. Another part of my invention relates to a water-tank and plunger in communication with each other through suitable openings, and a lever and an elastic stop, in combination with the bottom valve of the condenser, in such a manner that the cam causes the lever to close the bottom valve of the condenser by a positive motion, and thus leaves it to be afterward freely opened by the first puff of exhaust-steam; the object of this part of my invention being to produce the requisite movements of the said valve in a smooth and steady manner, or without any jarring or irregularity. Another part of my invention relates to a perforated curved plate of sheet metal, secured by one of its vertical edges to the inner side of the condenser, in such a manner as to cause a tangential entrance of the jet of cold water to be turned or deflected in a circular direction around in the condenser, and also at the same time to permit portions of the water to spurt through the perforations in the plate; the object of this part of my invention being to facilitate the condensation of the steam confined within the said condenser, by a more perfect or thorough distribution of the cold water. Another part of my invention relates to the mode of preventing the water in the jet-conducting pipe from becoming warmed before it enters the condenser.

Figure 1 is a vertical section of my improved condenser and its adjunctive devices for operating the same, embodying my invention. Fig. 2 is an elevation, showing the rear side of the parts, shown in Fig. 1.

A is the condenser; B, the bottom valve of the condenser; C, a cam which gives motion to the lever D and plunger E, whereby the movements of the valve B are regulated; F is the spring-valve and case whereby the pressure of the steam in the condenser is controlled, and the entrance of atmospheric air prevented; F′, the sliding bolt for holding the valve F firmly down while the first puff of steam is passing through the condenser; G is the water-tank in which the plunger E operates; H, the elastic stop, (see dotted lines,) whereby a rebound is given to the rising arm of the lever D in starting the upward movement of the valve B; and I, the curved perforated deflecting plate in the condenser A. The outer sides or walls of the condenser A are made of iron, and the inner side thereof lined with a thick layer of wood, *a′*, or its equivalent poor conductor of heat or cold. The bottom valve B is conical and opens outward and downward; it is articulated to lever D, the fulcrum of which latter is at *d′*. The shorter end of lever D is articulated to the plunger E, which latter is adapted to slide up and down within a case, *e′*, which has V-openings *e″*, which communicate with the water-tank G; and has also a bottom valve, *e‴*, which permits the water to enter from the tank G when the plunger E is being started upward, and the V-openings allowing the water to pass out as the plunger sinks downward, until the said V-openings are gradually closed. When the valve B is blown open by the first puff of the exhaust-steam the plunger E descends in the case *e′* until the V-openings are closed, thus

checking it gradually and at the same time the long arm of lever D strikes against the elastic bearing H, and, rebounding, gives the upward start to the plunger, and the further depression of the said arm of the lever D and the consequent elevation of the shorter arm, by the positive action of the cam C upon the lever, closes the valve B. (See Fig. 1.) The spring-valve F and its case are secured so as to communicate with the upper end of the condenser A, at a short distance above the opening of the exhaust steam-pipe K. The said valve is kept closed by a spring pressure which is but little in excess of that of the atmosphere, and consequently will open and allow steam to pass out of the condenser A into and through the exit-pipe J, when the pressure of the steam in the condenser A is but a little greater than the pressure of the atmosphere, and, therefore, during the entrance of the first puff of exhaust-steam to clear the condenser of air and water through the bottom valve, the spring-valve F would open and prevent the required downward passage of said first puff, if the said spring-valve was not permanently held down in the meantime. To effect this the sliding bolt F′ is provided and operated by a crank, L, and articulating connecting-rods, so that before the first puff of steam enters the condenser A the sliding bolt F is pushed over the upper end of the spindle or stem of the valve F′, and thus holds the valve permanently down upon the condenser A and prevents the escape of any steam through it until the bottom valve B is closed, when instantly the bolt F′ is withdrawn, and so much of the second portion of the steam retained in the condenser by the said valve F as may be found sufficient to preclude the air and produce the vacuum required. The pipe J is intended to enter the furnace-chimney and have a few spiral turns therein to prevent the entrance of cold air into the pipe, and thus prevent any condensation of the steam therein. The plunger E slides freely up and down in a case, e', which is fixed in a vertical position on the bottom of the water-tank G. A communication between the tank and the case e' is afforded by V-shaped openings e'', (two of which only are shown,) and also through a valve, e''', in the bottom of the case e', so that, as the plunger moves downward in the cylinder e', it forces the water out through the openings e'', which latter becoming gradually smaller, the plunger consequently descends more and more slowly until it is stopped by closing the said openings, and at the same instant the longer arm of the lever D, to which the plunger E is articulated, strikes against the under side of the elastic stop H, and, rebounding, starts the plunger E and consequently the valve B upward, and the valve B then closing by a positive motion derived from the cam C, the water entering through the gage-cock and the valve e''' and following the rising plunger prevents the occurrence of any vacuum beneath the plunger until the latter uncovers the V-openings and allows the water to enter through them also. The jet-water deflecting-plate I is punched with numerous triangular holes made by cutting through two sides and bending the thus-divided metal in an inward direction, so as to afford stops whereby the impinging water will be deflected outward through the said curved plate, and then the said plate secured permanently by one of its edges to the inner side of the condenser A, and finally curved in an involute form, leaving an increasing space between for the jet-water to pass freely through the numerous perforations as it is driven by the force of the jet (which enters through the condenser tangentially) over the inner side of the said deflector, and thus distributed in the most favorable manner for causing a sudden condensation of the steam and the production of the vacuum required. The injecting-pipe M and its valve N communicate with the valve-chamber n' and the water-supplying pipe O, which latter is intended to communicate with any sufficiently-elevated reservoir to force the water in a rapidly-moving jet into the condenser at the moment when the said valve N is raised for the purpose, an air-chamber, O′, being in communication with the pipe O at a short distance in advance of the valve N, which serves as a cushion to receive the reacting force of the current consequent upon the sudden closing of the conical valve N, and also by reaction to give increased force to the current produced by the next opening of the said valve. For the purpose of preventing the valve-chamber n' and that part of the pipe M which is in immediate communication therewith from becoming warmed by the steam as it passes into the condenser A, a small pipe, O″, fitted with a suitable regulating-cock, is to be adjusted to allow a small portion of the water in the said pipe M and valve-chamber n' to flow steadily out, and thus provide for a constant accession of the cold water to the pipe M and valve-chamber n'. The valve N is operated immediately and alternately by the lever 4 and spring 5, which are connected to the main driving-wheel Q by the intervening adjustable rod 6, lever 7, rod 8, crank-wheel 9, and gear-wheel 10. The sliding bolt F′ is operated immediately by the lever 11, which is connected to the said main driving-wheel Q by the intervening adjustable rod 12, lever 13, rod 14, lever 15, rod 16, crank-wheel L, and gear-wheel 10. The valve B of the condenser A is operated mainly by the lever D, in connection with the plunger E in the water-tank G and the elastic bearing H′, the said lever D being put in periodical motion through the arm d', rod 17, swing bar 18, and cam C on the shaft of the gear-wheel 10. The swing-bar 18 is articulated to the lower corner of a triangular piece, 19, the corner V of which is pivoted to a stationary part of the frame of the machine, while the corner W is suspended from a spring, X, the tension of which latter is adjusted by means of a screw-stem, Y, which

bears upon the upper edge of the piece 19 at any point near the said spring X. The object of this device is to allow the upper end of the swing-bar 18 to give or move inward toward the cam side, when the machine is driven with unusual rapidity for the purpose of relieving the bar 18 of the rigidity which the impact of the cam O would otherwise encounter under an unusual speed.

I claim as my invention—

1. The devices consisting of the lever D, plunger E, water-tank G, and elastic bearing H, or their equivalents, in combination with the valve B, the said devices being arranged to operate together, substantially as hereinbefore described, for the purpose of periodically closing the said valve B by a positive motion, and also allowing it to be periodically opened by the first puff of the exhaust-steam entering the condenser, substantially as hereinbefore set forth.

2. The spring-valve F, in combination with the upper end of the condenser A, substantially as and for the purpose hereinbefore set forth.

3. The perforated curved deflecting plate I within the condenser A, in combination with the tangential jet-opening therein, the said parts being constructed and arranged to operate together substantially as and for the purpose hereinbefore set forth.

JOHN HOUPT.

Witnesses:
BENJ. MORISON,
WM. H. MORISON.