R. HARDESTY.

CONDENSER FOR STEAM-ENGINES.

No. 182,115. Patented Sept. 12, 1876.

Fig 3

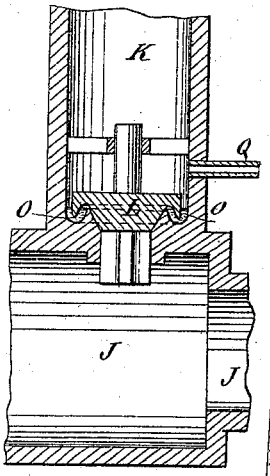


Fig. 1

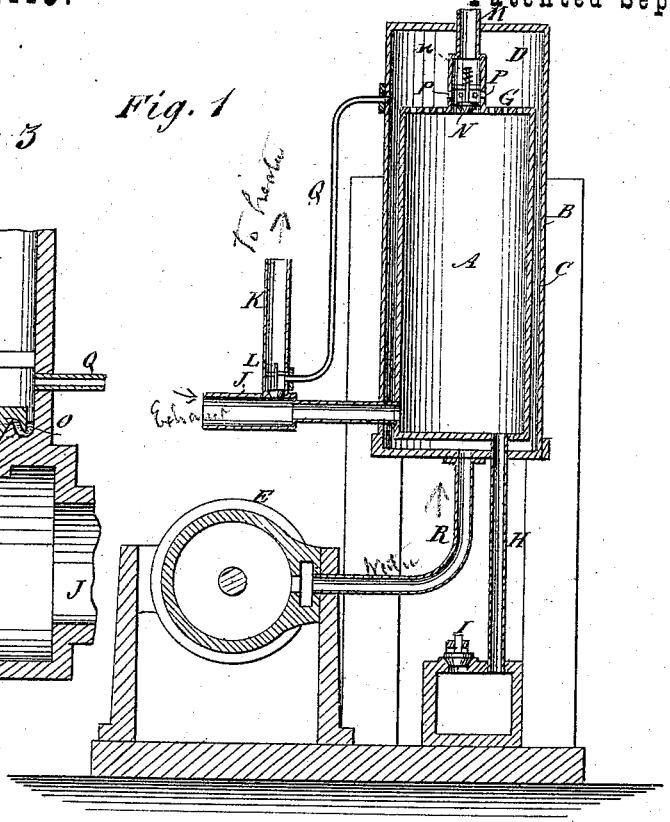
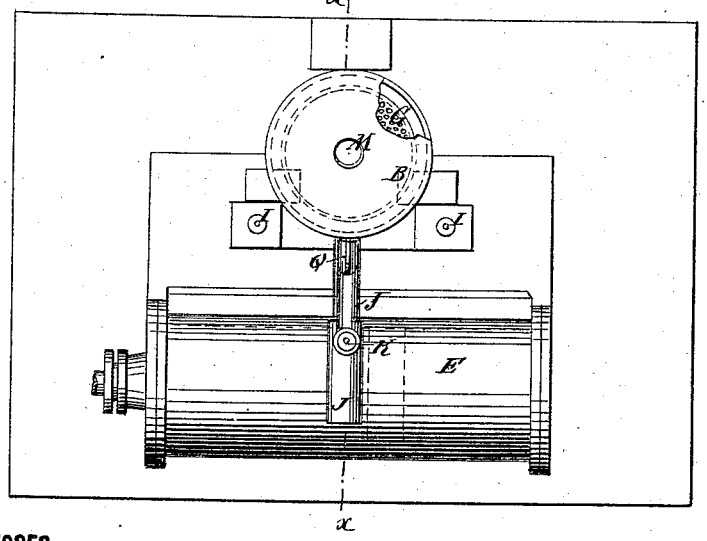


Fig. 2



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ROBERT HARDESTY, OF SHEPHERDSVILLE, KENTUCKY.

IMPROVEMENT IN CONDENSERS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **182,115**, dated September 12, 1876; application filed July 11, 1876.

To all whom it may concern:

Be it known that I, ROBERT HARDESTY, of Shepherdsville, in the county of Bullitt, and State of Kentucky, have invented a new and Improved Condensing Attachment to High-Pressure Steam-Carriages, of which the following is a specification:

My invention consists of a novel contrivance of apparatus for use in connection with high-pressure steam-engines, as an aid to the same by condensing some of the steam, the said apparatus being contrived so as not to increase the back pressure on the engine in case the steam is not all condensed.

Figure 1 is a sectional elevation of my improved attachment taken on the line *x x* of Fig. 2, and Fig. 2 is a plan view. Fig. 3 is a detail, showing the contrivance for packing the valves.

Similar letters of reference indicate corresponding parts.

The invention comprises a condensing-cylinder, A, surrounded by an iron casing, B, with a space, C, between the condenser and casing of half an inch to an inch in every part, except the top. At the top the casing extends above the condenser far enough to form an air-chest, D. The condenser will be placed in a perpendicular position as near the engine as can be with convenience.

The condensing-water will be forced in between the casing and condensing-cylinder at the bottom by a pump, E, through pipe R, and ascend to the air-chest. The top G of the condensing-cylinder is perforated so as to admit the condensing-water in a shower. At the bottom it has a pipe, H, to conduct the water off. This pipe must be furnished with valves I, enough to let off all the water. These valves are so arranged as to open upward when there is pressure from within, and to close when the vacuum creates a pressure from without.

J is a pipe, to be attached to the engine to receive the exhausted steam. This pipe conveys steam into the condenser; but before reaching the condenser it has a branch, K, by which a portion of the steam is conducted past the condenser into the heater. This pipe J should be about three times as large from the engine to the branch as from the branch to the condenser, thereby conducting about two-thirds of the steam past the condenser and one-third into it.

The branch has a valve, L, where it branches, that admits steam through it to the heater.

The steam that passes into the condenser will have a free passage out of it through a pipe, M, that passes through the air-chest and conducts it to the heater. This pipe, at its connection with the condensing-cylinder, has a valve, N, which is concealed in the air-chest, that admits the passage of steam to the heater. With the valve N is connected a small spring, *n*, to make the said valve N lighter than the valve L in the branch pipe K, and thus insure a current of steam through the condenser that will clear it of air on starting the engine, no matter how light the pressure of steam may be, so that it be above the pressure of the atmosphere. If the valves N and L were of equal weight with two-thirds of the steam passing through the branch pipe K to the heater, all that passed to the condenser A B might be condensed before any could pass through the said condenser to the heater, and might thus allow the air in the condenser to remain there. A double-acting force-pump may be attached to the pitman for a convenient way of furnishing the condenser with water; but any kind of force-pump that will supply the condenser will do. I prefer that the water shall be supplied by the engine to which the aid is attached, so that the flow of water will stop when the engine does; but it matters not in what way the pumps are attached, so that a regular and proper quantity of water is supplied, and nothing is claimed on the force-pump alone.

When an engine lets off its exhausted steam, this combination will send it to the air by two passages, as long as it is above the pressure of the atmosphere. At the same time a powerful condenser will be at work, commencing to act when the piston is still. The engine being on the center, it cannot fail to produce a very complete vacuum before the engine has performed any considerable part of its stroke.

I have contrived a water-packing for the valves, in case of any imperfection in their working. The valves are so arranged that

when they shut down, the outer edge of the doors and the passage which they stop form a small groove, O, at the top. A little stream of water is sent on the valve, which instantly fills the groove and prevents the passage of air. The pipe that passes through the air-chest has some small holes, P, to supply the valve with water. The branch valve is supplied by a tube, Q. This tube should leave the casing about one inch above the top of the condensing-cylinder, and enter the steam-pipe just above the valve. It should be supplied with a stop-cock, that the water may be cut off, or the supply regulated.

The way the condenser is arranged, when the engine stops, all the water above the condensing-cylinder will soon pass through it, thus cutting off the supply of water to the valves. When the engine starts, the water will rise in the air-chest until the air becomes sufficiently compressed to force the water through as fast as the pump supplies it. This will again supply the valves with water.

It will be seen that this invention suits both the high-pressure and low-pressure engine. If there is any exhausted steam above the pressure of the atmosphere, it will exhaust part of it into the air and condense the remainder. If the steam is below the pressure of the atmosphere, it will exhaust it by condensation. It gives the engineer no trouble but to see that it is in working order. He can start or stop or reverse the engine without touching it. It will all the time perform its part. It will not be costly to construct, and can be fitted to engines now working as if made with a view to its use.

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

The vertical cylinder A, perforated at top, having spring-valve N, and provided with pipe M, in combination with case B, having pipe connected with force-pump E, and the tubes J K Q, having valve L, substantially as and for the purpose specified.

ROBERT HARDESTY.

Witnesses:

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