J. B. ROOT.

AIR-PUMP AND CONDENSER.

No. 188,958. Patented March 27, 1877.

Fig. 1.

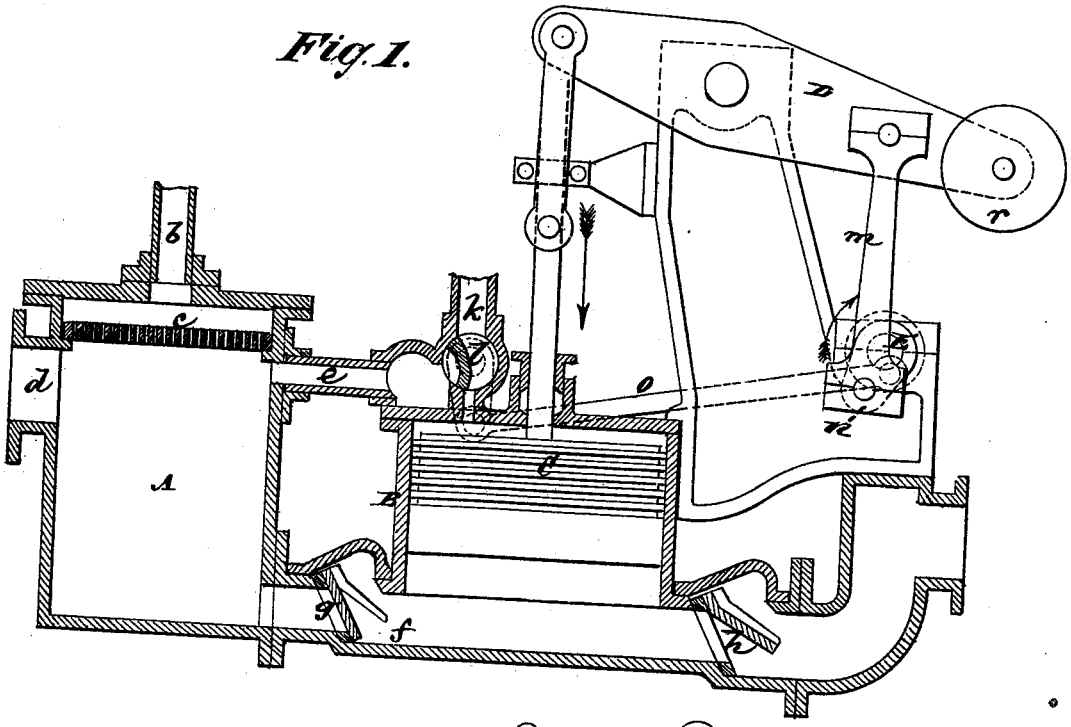
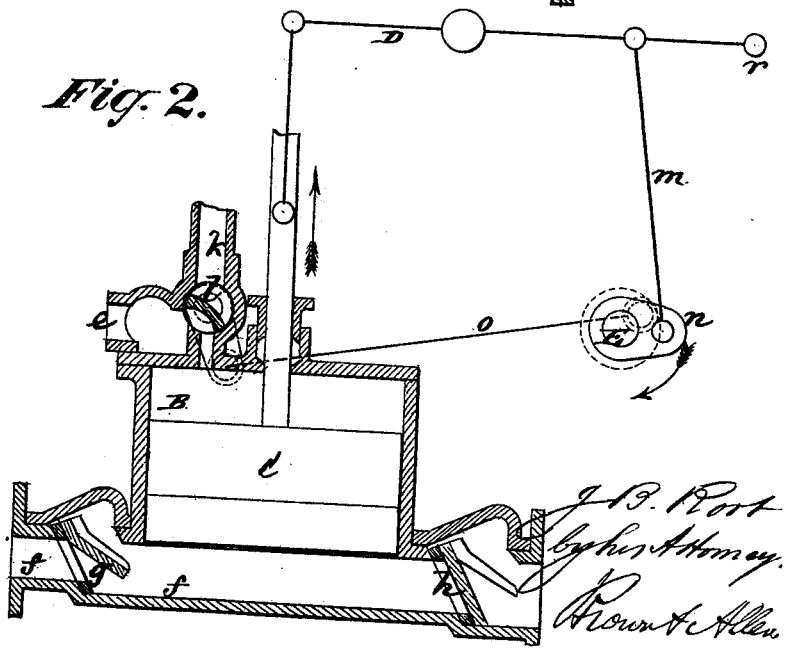


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN B. ROOT, OF PORT CHESTER, NEW YORK.

IMPROVEMENT IN AIR-PUMPS AND CONDENSERS.

Specification forming part of Letters Patent No. **188,958**, dated March 27, 1876; application filed August 12, 1876.

To all whom it may concern:

Be it known that I, JOHN B. ROOT, of Port Chester, in the county of Westchester and State of New York, have invented a certain new and useful Improvement in Combined Air-Pumps and Condensers for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing which forms part of this specification.

This invention relates to an apparatus designed to be used as an attachment to a non-condensing steam-engine for converting the latter into a condensing-engine, and consists in a novel combination of a steam-driven air-exhaust pump, with a condenser, passages, valves, and mechanism connected with the condenser and air-pump for introducing the exhaust steam of the engine to the condenser, for exhausting the air, and carrying off the water of condensation, and for operating and controlling the action of the pump, substantially as hereinafter described.

In the accompanying drawing, Figure 1 represents a sectional elevation of an apparatus constructed in accordance with the invention for attachment to the exhaust-pipe of a non-condensing engine, to convert said engine into a condensing one, and showing the piston of the steam-driven air-exhaust pump used in said apparatus as descending to expel the exhausted air and any water of condensation along with it. Fig. 2 is a similar view or diagram, in part, showing said piston as in the act of ascending to exhaust the air.

A is a condenser, to which the injection water may be admitted from above by a pipe, *b*, onto and through a sprinkler, *c*. This condenser it is proposed to connect by an upper branch, *d*, with the exhaust-steam pipe of a non-condensing engine.

B is the working-cylinder of the pump, arranged to occupy an upright position, and in communication above and below by passages *e f* with the condenser A, the lower *f* of said passages containing the foot-valve *g* of the condenser, which valve is interposed between the lower end of the condenser A and the lower end of the working-cylinder B of the pump, and which is opened in alternate relation by the action of the piston C with the delivery-valve *h*, controlling the outlet to the hot well or elsewhere from the under side of said piston.

The upper or opposite end of the cylinder B is provided with a steam-induction pipe, *k*, which is controlled by a plug or other induction and eduction valve *l*, constructed to alternately open the steam-induction pipe *k* to said end of the cylinder B, for the purpose of giving the piston C its downward or expelling stroke, and to establish communication between the upper end of the cylinder and the condenser A by the passage *e*, for the purpose of exhausting and condensing the steam from above the piston C in the upward or reverse stroke of the latter.

The downstroke of the piston C is of course effected by the live steam as it is introduced to the top of said piston by the valve *l*, but after such steam has performed its duty in the cylinder B and is condensed, by the valve *l* establishing communication between the top of the cylinder B and the condenser A, then the piston C is in equilibrium and the same is lifted or returned to its normal position by a weight or other acting force. Thus the piston C is connected with the one end of a walking-beam, D, which serves, by means of a pitman, *m*, and crank *n*, to rotate a shaft, E, on which is an eccentric that, by means of a rod, *o*, actuates the valve *l*. The outer end of the beam D carries a weight, *r*, which acts as a counter-balance to the piston C, and may be used to give to said piston its up or exhausting stroke; or the shaft E may carry a fly-wheel that will effect this latter result and carry the crank *n* over its dead-centers; or the apparatus may be duplicated and the two apparatuses be set to work in opposite relations with each other, and be coupled so that each one will assist the other. Thus the apparatus is automatic in its action and may readily be attached to the exhaust-pipe of a non-condensing engine to convert the latter into a condensing one. If desired, the shaft E of said apparatus may be coupled with the driving-shaft of the main engine, to assist in driving said apparatus or to insure its operation in timely relation with the main engine.

I claim—

The combination with the pump-cylinder B and its piston C, of the condenser A, having an inlet or nozzle, *d*, for attachment to the exhaust-pipe of a steam-engine, the valve *g* arranged between the lower end of the condenser and open bottom or end of the pump-cylinder, the delivery-valve *h*, the steam-induction passage *k* to the upper or closed end of the pump-cylinder, the passage *e* connecting said end of said cylinder with the upper end of the condenser, an induction and eduction valve, *l*, controlling said passages *k e*, and means for mechanically returning the pump-piston when in equilibrium, substantially as and for the purpose herein set forth.

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Witnesses:
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