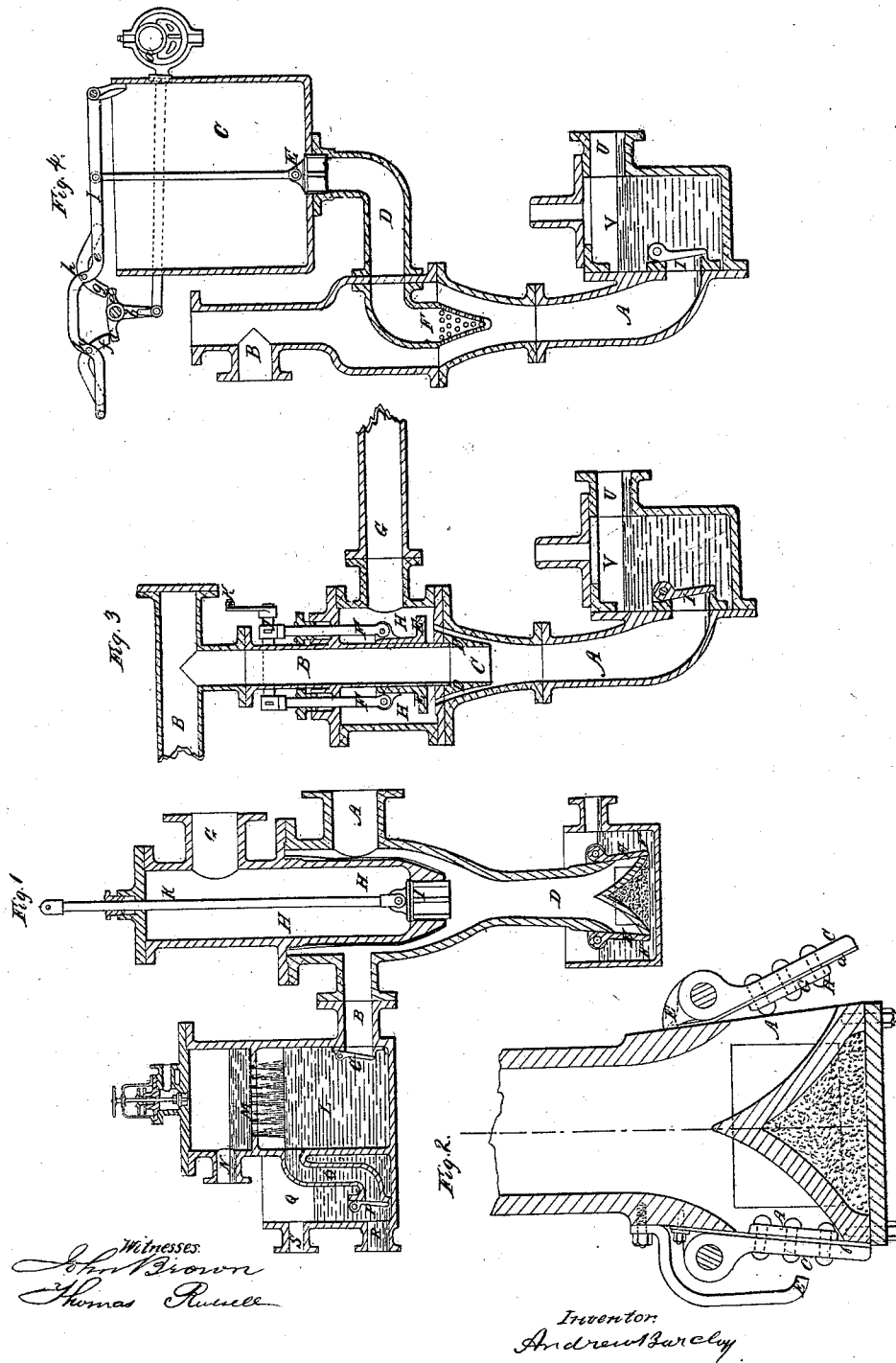


*A. Barclay*

*Ejector and Steam Condenser*

*N<sup>o</sup> 106,452.*

*Patented Aug. 16, 1870.*



# UNITED STATES PATENT OFFICE.

ANDREW BARCLAY, OF KILMARNOCK, NORTH BRITAIN.

## IMPROVEMENT IN EJECTORS AND STEAM-CONDENSERS.

Specification forming part of Letters Patent No. **106,452**, dated August 16, 1870.

### *To all whom it may concern:*

Be it known that I, ANDREW BARCLAY, of Kilmarnock, North Britain, have invented an Improvement in Ejectors and Condensers; and I do hereby declare the following to be a full, clear, and exact description of the same.

This invention relates to certain apparatus for effecting a speedy and economical condensation of the exhaust-steam escaping from the cylinders of steam-engines, by the employment of which the construction of such engines is much simplified. The apparatus is attached to the exhaust pipe or pipes of the engine, and consists of certain passages, chambers, and valves, operating together as fully described hereafter, so that water is discharged intermittently into the exhaust-steam, which is thus condensed, and is then, with the condensing-water, forced into a suitable cistern or cisterns.

### *Description of the Drawing.*

Figure 1 is a sectional elevation of my improved condenser; Fig. 2, a detached view of part of the apparatus drawn to an enlarged scale; and Figs. 3 and 4, modifications.

### *General Description.*

In Fig. 1, the branch A is that to which the exhaust pipe or pipes of the engine is or are connected.

The steam, on entering the instrument, passes partly into the branch B and blows open the valve C, while that part of the steam which does not pass out through the valve C escapes down the chamber D and blows out the water contained in the lower part thereof, through the valve E, into the surrounding cistern F.

At the upper part of the instrument the branch G is situated. It is connected to a cistern of water, which flows in and fills the chamber H, in the bottom of which the valve or cock I, attached to the rod or spindle K, is fitted to a correspondingly-formed valve-seat. The spindle K is connected by rods to a cam or eccentric driven by the engine, so that the valve I is intermittently lifted and then allowed to fall and close on its seat.

The chamber L is that in which the feed-water is heated. Its upper part, above the

perforated plate M, is connected to a water-cistern by a pipe coupled to the branch N. The water falls into the cistern L through the perforations in the plate M.

The action of this form of blow-through condenser is as follows: That part of the exhaust-steam which opens the valve C is instantly condensed on coming into contact with the water contained in the chamber L. The water is thereby heated, and intended to be employed as feed-water for supplying the boiler or boilers, or for any other purpose.

The heated water escapes by the passage O, through the valve P, into the cistern Q, and it may be either pumped or drawn off through the branch R, or allowed to overflow through the branch S.

Directly that the part of the steam which passes into the lower part of the condenser comes into contact with the water therein it blows it out through the valve E, and at the same instant the valve I is lifted, which allows cold water to fall through the lower part of the condenser, which instantly condenses any vapor that may remain therein. At the same time it fills the lower part of the condenser, so as to be acted upon and blown out by the steam at the next exhaust. As the engine is in action the operations now specified are continuously repeated.

Fig. 2 is an enlarged section of the lower part or valve-box of the blow-through condenser, given here for the purpose of showing its construction more clearly than that is indicated at Fig. 1.

The valve-box A is, by preference, square in plan, with a rectangular opening, A, at either side, closed by a flap-valve, C.

The lower part of the valve-box is of pyramidal form, with the sides of the pyramid slightly curved, as shown at D, and the hollow underneath is filled in with Portland cement or other material.

The valves C are fitted with stops, so that they may not open more than a certain fixed distance.

The stops may be applied in various forms, two of which are shown at Fig. 2, at E and F, respectively.

The valve C is, by preference, lined with india-rubber, as shown at *a* and *b*, Fig. 2, it be-

ing held firm and close to the valve C by an interior plate, G, held by rivets H.

It is preferred to construct the chief part of the instrument with air-spaces, or in any other way, to reduce their tendency for conducting heat. To this end an air-space is shown at Fig. 1 by the dark shading at the sides of the chamber H.

Fig. 3 is a vertical section, showing another modification of the condensing apparatus as it may be applied to condense the exhaust-steam of steam-engines. In this case, instead of passing the steam into an annular space round the water-passage, the water may be passed into the annular space and the steam through the central passage.

A is a condenser, which communicates with the exhaust-port of the engine by the exhaust-pipe B, to the bottom end of which a nozzle, C, is fitted, through which the exhaust-steam passes to the condenser A.

The water or condensing liquid passes into the condenser by the annular space D, its admission being regulated by the valve E, which is opened and closed by the rods F, operated by a wiper-shaft, J, provided with a crank, K, which may be actuated by any of the methods usually employed to operate the valves of steam-engines. The condensing-water is contained in a tank communicating with the annular-chest H, into which it flows by the pipe G.

The condenser is supplied with a blow-through valve, I, opening into the chest V, which is provided with an overflow-pipe, U, through which the water used in condensing the steam may be drawn off and used for any purpose or allowed to run to waste.

With this, as in the preceding modification, an auxiliary condensing apparatus may also be applied, from which the feed-water required for supplying the boiler or boilers may be taken.

The working of this arrangement of the condensing apparatus is as follows: When the exhaust-valve of the engine is opened the exhaust-steam escapes down the pipe B, and through the nozzle C into the condenser A, where it comes in contact with the water in the condenser, and forces it through the valve I into the chest V, part of the steam being condensed in consequence, and the remainder is condensed by the injection-water admitted through the annular space D during each lift of the valve E.

Fig. 4 is a vertical section, showing another modification of the apparatus.

A is a condenser; B, the pipe leading from the exhaust-port of the engine-cylinder. C is the cistern, which contains the water which escapes into the pipe D during each lift of the valve E; thence it passes through the perforated pipe or rose F into the condenser A.

The valve E is operated by an eccentric, *a*, actuating a crank, *b*, on the axis of which two tappets, *c* and *d*, are keyed, which lift the lever *e* by acting upon the pawls *f* and *g*. As soon as the tappet *c* has passed the point of the pawl *f* the lever *e* drops and closes the valve E, and on the return stroke the tappet *d* lifts the pawl *g*, and opens the valve at the same time the tappet *c* passes under the pawl *f*, which is centered on the axis *h*, and is ready for another lift.

The action of this modification is similar to the preceding, and therefore need not be further referred to.

#### Claims.

1. A chamber closed at the lower end by a water-trap, in combination with a discharge pipe or nozzle, valve I, and a surrounding annular steam-passage, when the condensing water is discharged intermittently by the operation of said valve, substantially as described.

2. A narrow pipe or passage communicating with the exhaust-ports of an engine, and with a water-reservoir, and provided with a valve operating so as to discharge water intermittently into said passage, when the latter is contracted below the point where the water is discharged into it, as described.

3. The combination, with the said chamber, of a water-reservoir and a valve closing the communication between the two, and operated substantially as described.

4. The cistern L and valve C, combined with the receiving-chamber, and with the cistern F, as specified.

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

ANDREW BARCLAY.

Witnesses:

JOHN BROWN,  
THOMAS RUSSELL.