

(No Model.)

E. BAINES.
Feed Water Heater.

No. 234,903.

Patented Nov. 30, 1880.

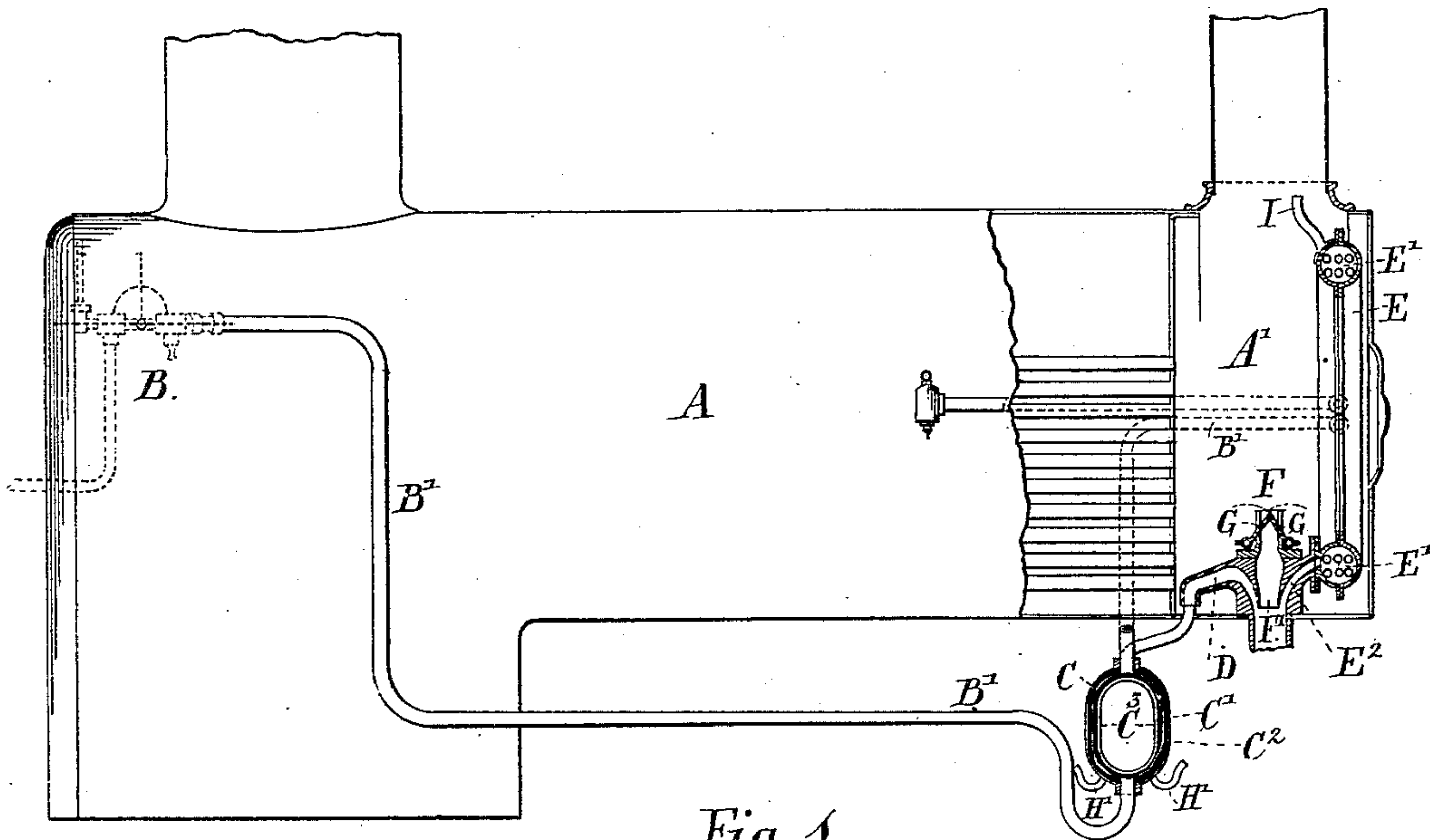


Fig. 1.



Fig. 4.

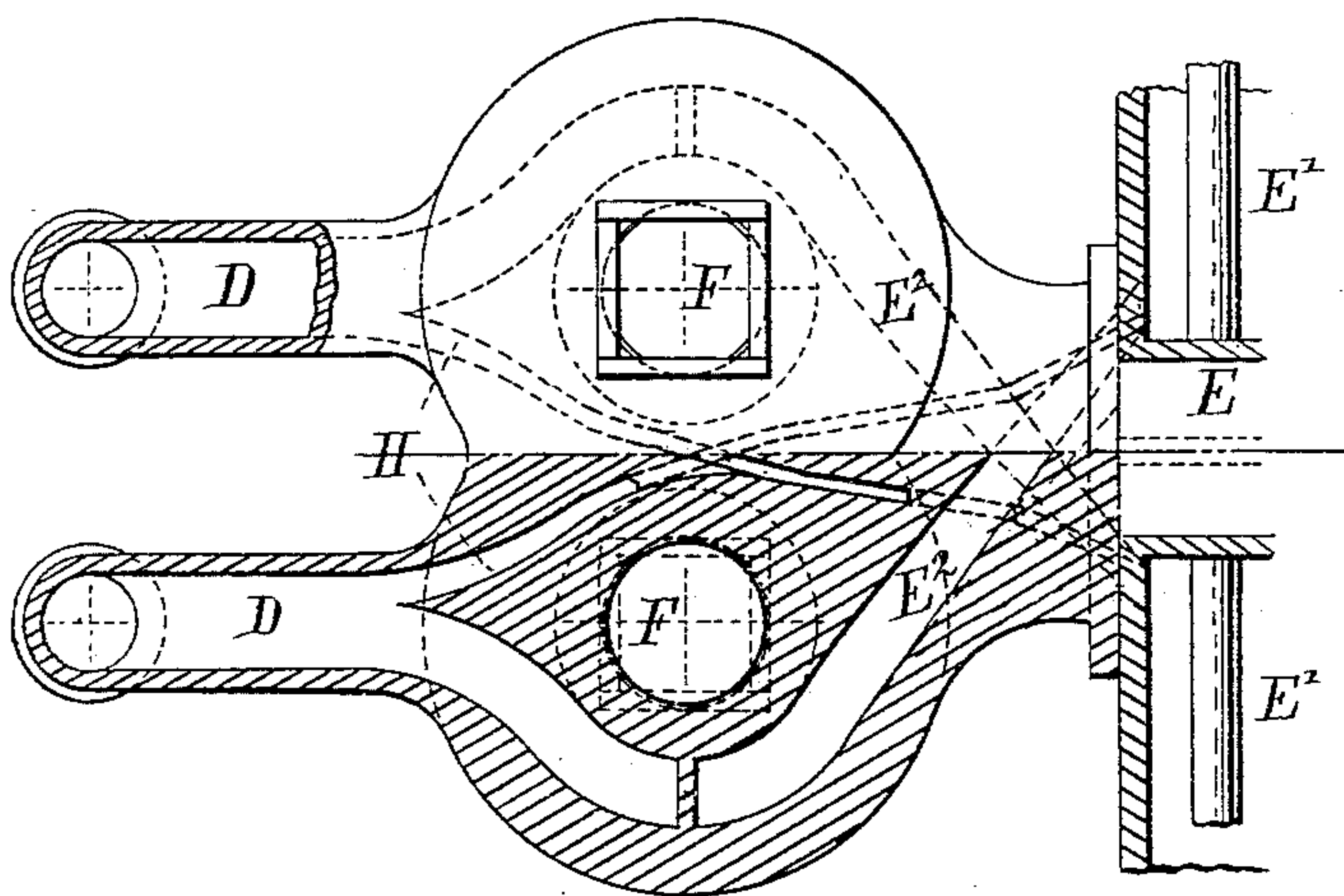


Fig. 3.

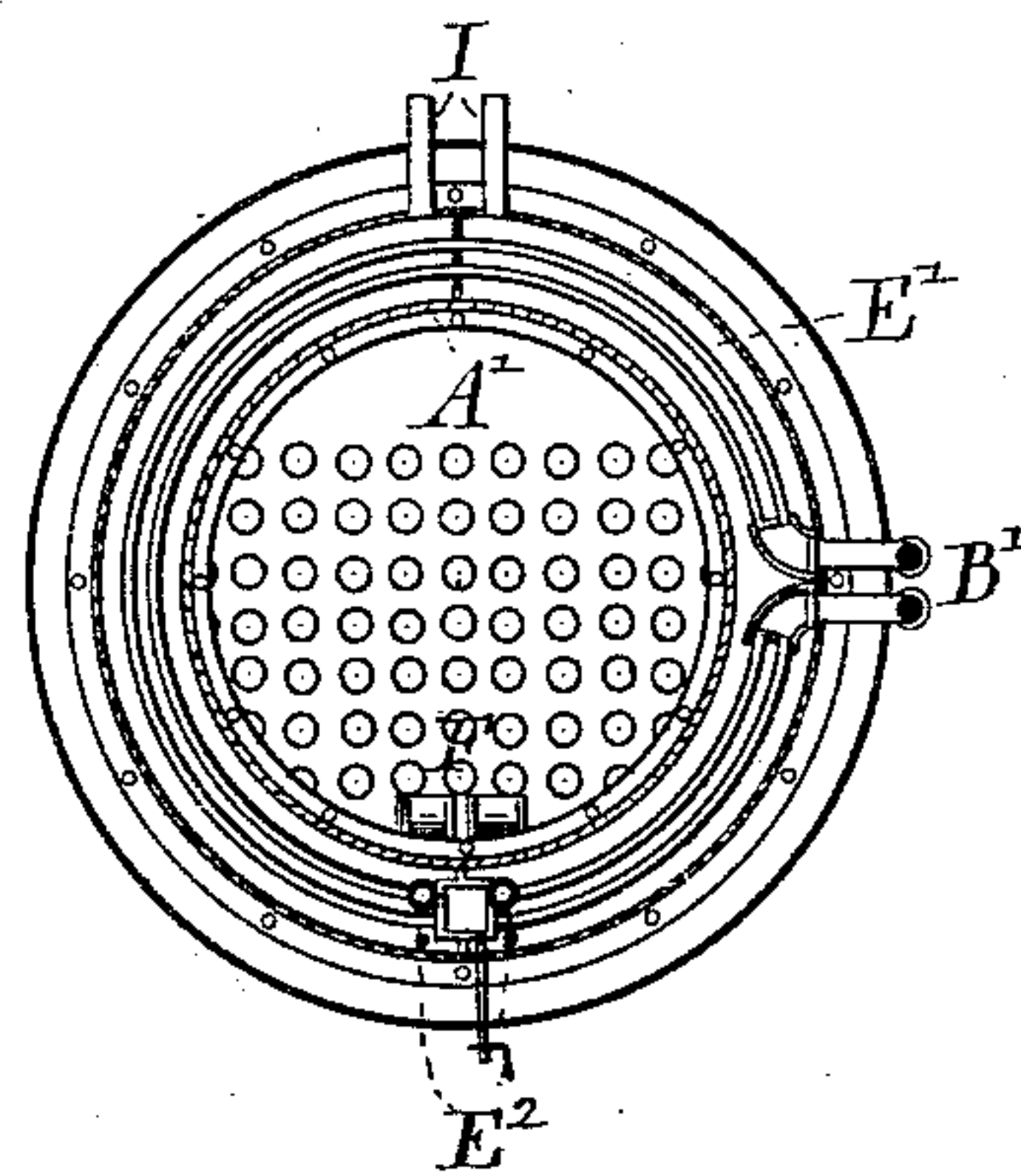


Fig. 2.

Witnesses:

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UNITED STATES PATENT OFFICE.

EDWARD BAINES, OF OAKVILLE, ONTARIO, CANADA.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 234,903, dated November 30, 1880.

Application filed July 12, 1880. (No model.)

To all whom it may concern:

Be it known that I, EDWARD BAINES, of Oakville, in the county of Holton, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

This invention has relation to a feed-water heater for locomotive-boilers in which the water is heated by a portion of the exhaust-steam in heating-chambers of novel construction and arrangement.

Referring to the accompanying drawings, Figure 1 is a side view of a locomotive-boiler fitted with my improvements. Fig. 2 is a cross-section through the smoke-box. Fig. 3 is a detail of the exhaust-pipes, showing the steam and water passages, and Fig. 4 a plan of first heater.

A is the boiler; A', the smoke-box; and B, the water-injector, which draws the water from the tender in the usual way, and forces it into the boiler; or, instead of an injector, a pump may be used.

C is a cylindrical vessel supported under the boiler substantially in the position shown, or in any other convenient place, and connected to the feed-water pipe at each end. This vessel is provided with a steam-chamber, C', and a water-chamber, C'', which are concentrically arranged within the vessel, and connected, respectively, to the feed-water pipe B' and the steam-passage D, leading from the exhaust-pipe.

The water-chamber is made very shallow, and is formed on the inside of the steam-chamber by means of an inner wall or packing, C³.

E is an annular heater placed within the smoke-box. This heater is provided with a steam-chamber, E', which is connected, by passages E², with the exhaust-pipes, and in this chamber a number of small water-pipes are placed, which are coupled to the water-pipe B', and through which the feed-water is forced in its passage to the boiler.

F are the exhaust-nozzles, provided with the usual vertical outlet for the steam, but in addition are provided with steam-passages D and E², which lead, respectively, to the first and second heater. The openings to these passages from the main exhaust-pipe are pro-

ected by a depending sleeve or curtain, F', which serves the double purpose of dividing the exhaust-steam and insuring the lateral passage of a portion to the heaters, and also prevents the exhaustion of the steam in the heaters, which would occur were not the openings protected. Each exhaust-nozzle is fitted with a pair of hinged valves, G G, arranged in a conical form, and adapted, by means of a weight or spring, to close the opening of the exhaust-nozzle after each blast of the steam. These valves should be arranged to open equally from the center of the exhaust-pipe.

H are water-passages, which drain the condensed steam from the second or smoke-box heater into the steam-chamber of the first heater, from which the condensed steam is, in turn, drained by means of the trapped pipes H', placed at or near the bottom of the heater. These pipes should be provided with valves, for the purpose of governing the outlet, and a receiving-box to collect the condensed water.

I are exhaust-pipes from the second heater, which may be provided with valves, if desired, for the purpose of preventing the admission of air.

From the fact that locomotives commonly used on railroads have two engines with separate cylinders, exhaust-pipes, &c., I have deemed it advisable to make the heaters sectional, each section corresponding with and having separate connections with the exhaust-pipe; but this construction may be modified, if thought desirable.

In operation, the water passing from the injector is forced into the water-chamber of the first heater, when it is spread in a thin film—say three-eighths of an inch more or less over the surface of the heated steam-chamber. The water then passes into the small tubes of the second heater, where it is subjected during its entire passage around the heater to the heat of the exhaust-steam contained in the chamber inclosing the tubes, and finally passes off into the boiler.

The action of the exhaust-steam is as follows: The major portion of the steam at each blast passes out of the vertical passage; but a portion, owing to the expansive nature of the steam and the sleeves F', escapes laterally into the side passages leading to the

heaters, and as the blasts follow each other rapidly sufficient steam and heat is forced into the heaters to heat the water. The lateral escape of the steam is greatly aided, without obstructing the exhaust-pipe, by constructing the steam-passages with an upward inclination with sleeves, as shown.

In practice the exhaust of the steam can be controlled to regulate the draft through the flues and the inlet of steam into the heaters by means of the valves placed, respectively, in the exhaust-pipes and valves or tapering nozzles placed on the outlets of the heaters, and as a modification in construction the first water heater may be cut off and an increased volume of steam injected into the smoke-box heater, which would then have to be provided with an outlet for the condensed steam in addition to the exhaust-steam outlet.

The advantages in arranging two heaters in connection with the exhaust-pipes over a single and larger heater within the smoke-box are as follows: Less room is occupied by a smaller heater in the smoke-box than a larger one, and the draft, not being so much obstructed, is materially increased by reason of the increased draft-space when a smaller heater is employed. The thin film of water in the lower heater, being in a heated state when forced into the small tubes in the second heater in the smoke-box, does not condense the exhaust so much in the second heater, and being subjected during its entire passage around said heater, while already hot from the first heater, to the heat of the exhaust-steam contained in the chamber inclosing the water-tubes, the water is heated to a greater degree than if a single heater were employed, and finally passes into the boiler in a highly-heated state.

I am aware that a feed-water heater has been patented consisting of two coils of pipes, one within the other, and that another patent describes a locomotive having two feed-water heaters, one being heated by the exhaust from one cylinder, and the other from the other.

I claim as new and desire to secure by Letters Patent—

1. In locomotives, the combination, with the steam-exhaust pipes, of the heaters C and E, said heaters being arranged substantially as shown, and connected to the exhaust-pipes by the steam-passages D and E', as and for the purpose set forth.

2. The combination of the steam-exhaust pipes and the heaters C and E, said parts being connected substantially as described, and provided with devices for controlling the exhaust of the steam from each.

3. In locomotives, the combination, with the exhaust-pipes provided with the curtain or sleeve F', of the lateral steam-passages D and E' and the heaters C and E, arranged and operating substantially as and for the purpose set forth.

4. In locomotives, the combination of a water-feeding apparatus, the water-pipe B', heaters C and E, and the exhaust-pipe provided with steam-connecting passages to the heaters, substantially as and for the purpose set forth.

5. The combination, with the exhaust-pipe having steam-passages connecting with the heaters C and E, of the valves G, arranged and operating substantially as and for the purpose set forth.

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Witnesses:

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