

(No Model.)

J. WHEELLOCK.
INJECTOR CONDENSER.

No. 278,476.

Patented May 29, 1883.

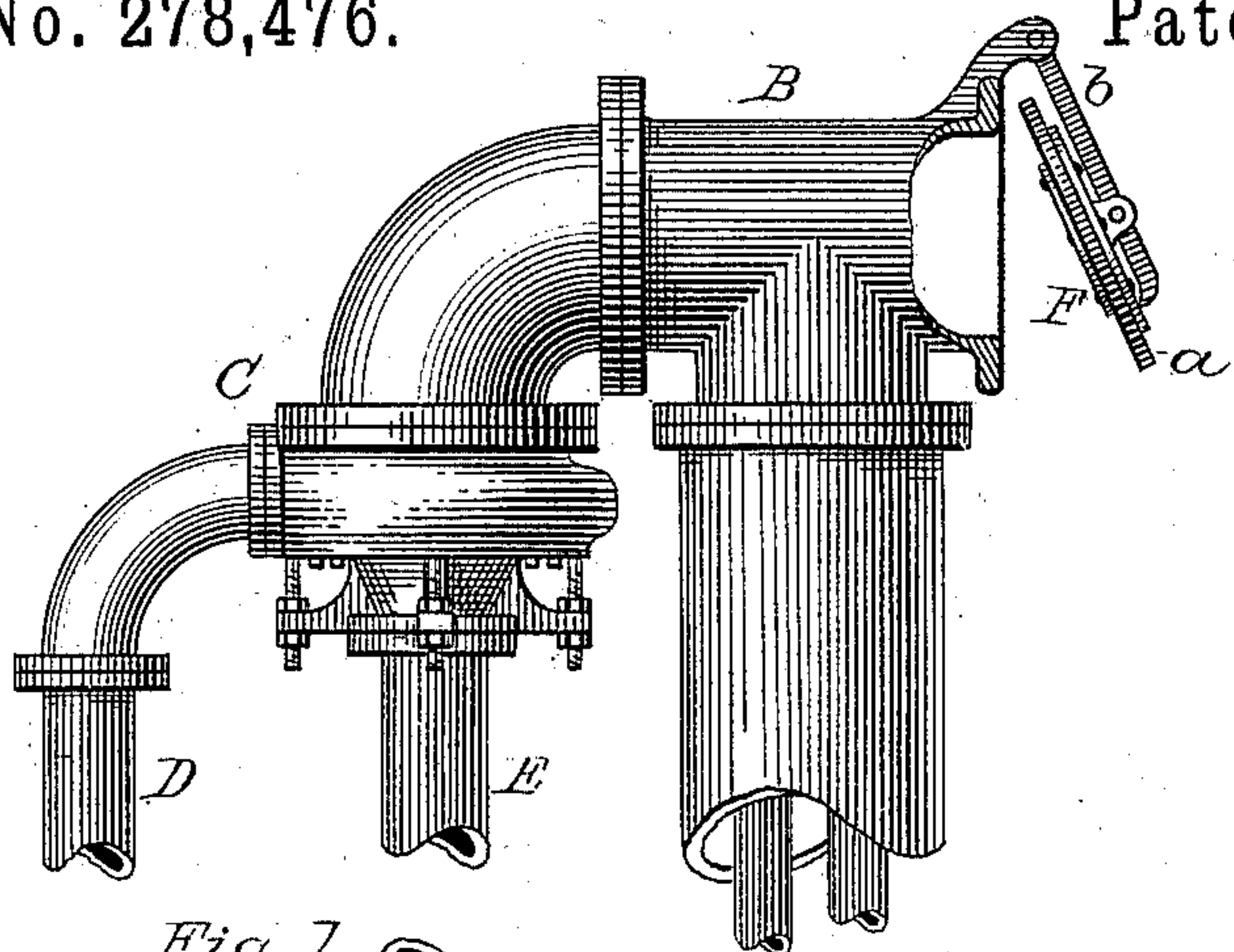


Fig. 1.

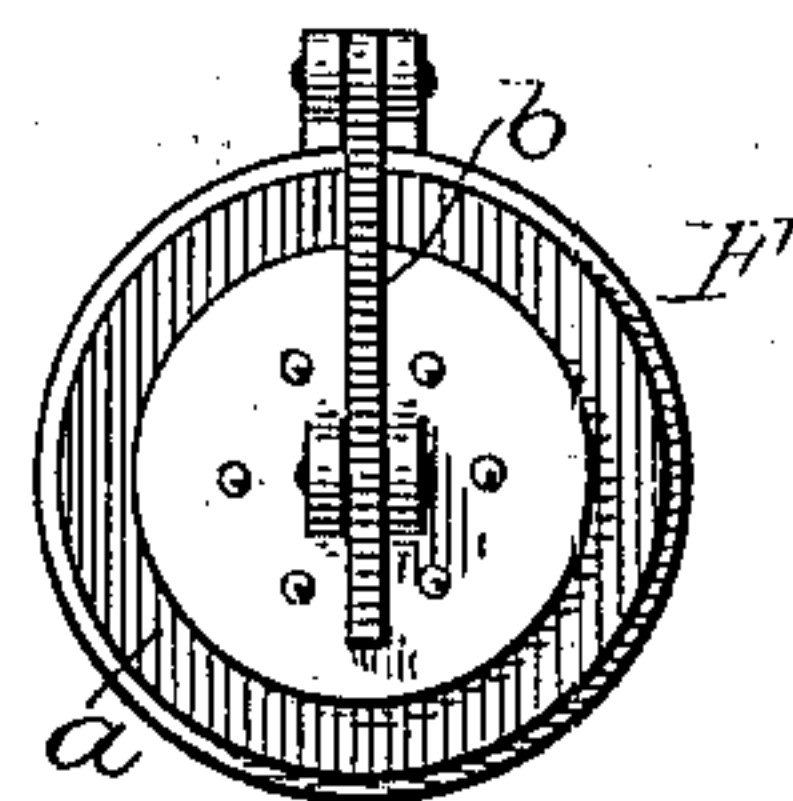
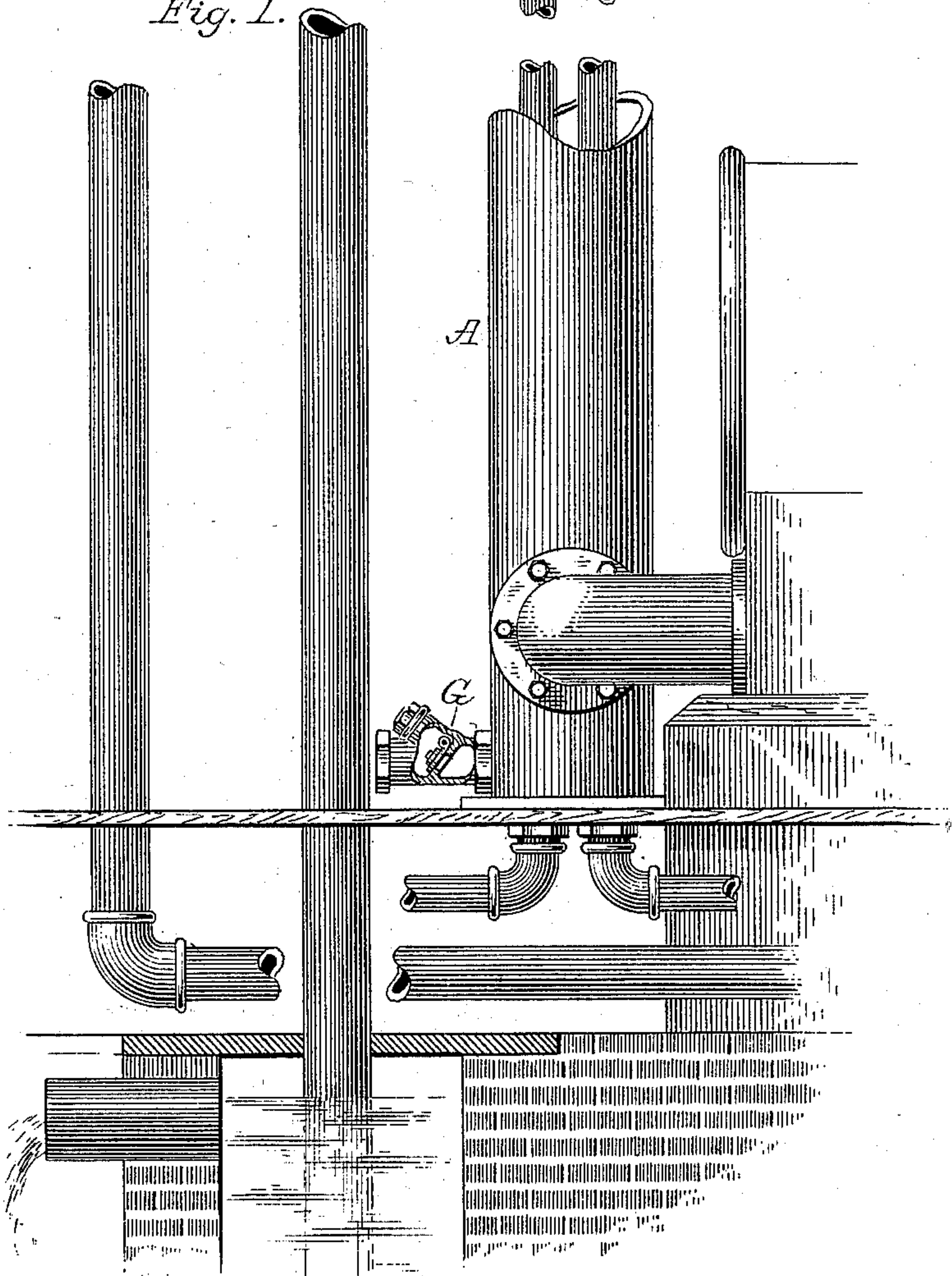


Fig. 2.

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JEROME WHEELOCK, OF WORCESTER, MASSACHUSETTS.

INJECTOR-CONDENSER.

SPECIFICATION forming part of Letters Patent No. 278,476, dated May 29, 1883.

Application filed March 10, 1883. (No model.)

To all whom it may concern:

Be it known that I, JEROME WHEELOCK, of the city and county of Worcester, in the State of Massachusetts, have invented certain new and useful Improvements in Injector-Condensers for Steam-Engines; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part thereof, is a clear, true, and complete description of the several features of my invention.

So far as my knowledge extends, all varieties of condensing apparatus heretofore devised for operating on the injector-condenser principle have been so organized that steam-engines connected therewith could only work advantageously so long as they operated as condensing-engines; or, in other words, so long as the injector-condenser maintained a desirable vacuum incident to the proper co-operation of condensing water and the exhaust-steam. It is well known that as soon as such a condenser fails to induce a vacuum back-pressure of exhaust-steam ensues, greatly disadvantageous to the proper working of the engine; and the object of my invention is to enable an engine to work as a condensing-engine so long as the injector-condenser is operating under favorable conditions, and to operate as a non-condensing engine without back-pressure, should the injector-condenser at any time fail to induce a useful vacuum.

I am aware that pump-condensers have heretofore been provided with valves for permitting exhaust-steam to escape when the pump is not in operation, and also that exhaust-steam has been passed through a condensing-coil provided with an injector, and with a valve at its exit-aperture for permitting a portion of the steam to escape at each stroke of the engine, after passing through the condenser, and also that condensing chambers and heaters have been provided with valves, through which exhaust-steam could escape after it had traversed said chambers and heaters.

My improved injector-condenser is the first, so far as my knowledge extends, wherein, when a column of water in the pipe below and connected to the injector-chamber is insufficient for maintaining a useful vacuum, the exhaust-steam is permitted to freely escape directly

from the exhaust-pipe, and without passing through the injector-chamber; and also wherein, as soon as said water column is supplied, said escape of steam is cut off, and it is all then caused to pass into and through the injector-chamber. I have also for the first time, as I believe, in connection with an engine operating with an injector-condenser, provided for keeping the exhaust-passages of the engine free from water by coupling the cylinder to a vertical exhaust-pipe by means of a horizontal branch pipe entering the exhaust-pipe at a point considerably above its base, and providing said exhaust-pipe at its base with a check-valve, so that while the latter prevents air from entering when a vacuum is induced within the exhaust-pipe, it permits the escape of water from said exhaust-pipe before it can rise to the height of the entering branch pipe.

Figure 1 is a side view of an injector-condenser embodying my invention in its best form. Fig. 2 is a front view of the same.

The exhaust-pipe A, somewhat above its foot, communicates with the exhaust-passages of a steam-cylinder. The pipe B on top of the exhaust-pipe is at one end coupled by an elbow with the chamber C, containing the injector-nozzle, and communicating respectively with the cold-water-injection pipe D and discharge-pipe E, the latter being at its base immersed in a hot-well in the usual manner.

The parts thus far described externally resemble one of the injector-condensers heretofore patented by me, and the exhaust-pipe preferably contains vertical feed-water pipes, as also heretofore patented by me in connection with injector-condensers. It is, however, to be distinctly understood, as hereinbefore indicated, that the construction of the injector-condenser and its accompanying parts, as thus far described, can be widely varied without in any manner affecting any portion of my present invention, provided the pipe E be arranged to serve as a water-column pipe for maintaining a vacuum in the condenser, varying according to the height of the water therein.

The novel feature now presented consists in the application to the exhaust-pipe, at any suitable point, of the automatic exhaust-steam relief valve or gate F. As shown in the drawings, Figs. 1 and 2, said valve is located at the

top of the exhaust-pipe, and at one end of the pipe B, and I prefer it to be located at that point; but good results would accrue if it were placed above said pipe B—for instance, in a vertical extension therefrom—or below said pipe, in the side of the exhaust-pipe A. This valve is composed of a flat disk, *a*, hinged centrally to an arm, *b*, which is in turn hinged at its upper end to the front face of the pipe B, and normally, by its own weight, said valve should rest against the coincident surface of the end of said pipe B, the same being properly finished off and serving as a valve-seat. The disk should be so clad, or be composed of such material, as will afford a practically airtight closure of the opening which it guards, and the weight of the arm *b* should be sufficient to insure the normal contact of the valve-disk with its seat. With the exhaust-steam relief-valve thus constructed and arranged it will be seen that so long as the pipe E of the injector-condenser contains a column of water, and thereby maintains a vacuum, the valve-disk will be held to its seat by atmospheric pressure, but that whenever said condenser fails to so operate the least excess of pressure within the exhaust-pipe causes the valve to open and to permit the free exit of exhaust-steam, the valve being alternately opened and closed at each stroke of the engine-piston. In some cases I prefer that the pipe B be arched directly from the top of the exhaust-pipe to the injector-condenser, and the valve F then located a short distance below the top of the exhaust-pipe.

It will be obvious that the form and construction of the automatic exhaust-steam relief-valves may be almost indefinitely varied without departure from my invention, so long as the valve can be held to its seat by a column of water within the pipe below and connected to the injector-chamber, or the desired relief against back-pressure be thereby afforded, and an engine be consequently enabled, according to circumstances, to operate either as a condensing-engine or to exhaust as freely as a non-condensing engine.

I have hereinbefore referred to the exhaust-pipe A as containing vertical pipes for the circulation of water which contributes to the condensing operation, and also enables an exchange of heat from the exhaust-steam to said water, thus imparting to the latter a desirable feed-water temperature. These feed-water pipes naturally cause water from condensed steam to accumulate in the exhaust-pipe A at its base, and I have for the first time combined therewith a check-valve, G, which is located at the base of said pipe, and opens outwardly within an outlet-pipe, and

permits the free discharge of water without any liability of admitting air to the condenser. The base of the exhaust-pipe extends considerably below the connection of said pipe with the horizontal branch pipe A', which communicates with the exhaust-passage of the steam-engine cylinder, and therefore said passage can never be unduly charged with water.

I am aware that condensing-chambers have been heretofore provided with foot-valves for discharging the water from the condenser, and it is to be understood that I make no claim to such valves, except in combination with and located at the base of the vertical exhaust-pipe, below its connection with the branch pipe which communicates with the engine-cylinder.

Referring to the exhaust-steam relief-valve, Fig. 1, it will be seen that if the flanged face of the pipe B be annularly grooved for the reception of a projecting rubber ring as a packing, the valve-disk can then be composed of metal, and it is to be understood that I have practically used such valves and rings with good results.

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

1. In an injector-condenser embodying a water-column pipe below and connected to the injector-chamber, and a vertical exhaust-pipe connected with the top of the injector-chamber, the combination, with said exhaust-pipe, injector-chamber, and water-column pipe, of an automatic exhaust relief-valve in said exhaust-pipe, substantially as described, whereby when the water-column pipe is free from water steam may freely escape directly from the exhaust-pipe without entering the injector-chamber, and also whereby a column of water in the pipe below said chamber will cause the valve to be held to its seat and the exhaust-steam to enter the injector-chamber, as set forth.

2. The combination, with a steam-engine cylinder and an injector-condenser, of an exhaust-steam branch pipe leading from the cylinder, a vertical exhaust-pipe extended at its base below its connection with said branch pipe, and a check-valve at the base of the exhaust-pipe, substantially as described, whereby water in the exhaust-pipe is automatically discharged and prevented from obstructing the exhaust-passage of the cylinder without liability of admitting air to the condenser, as set forth.

JEROME WHEELOCK.

Witnesses:

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