

(No Model.)

L. SCHÜTTE.

JET CONDENSER.

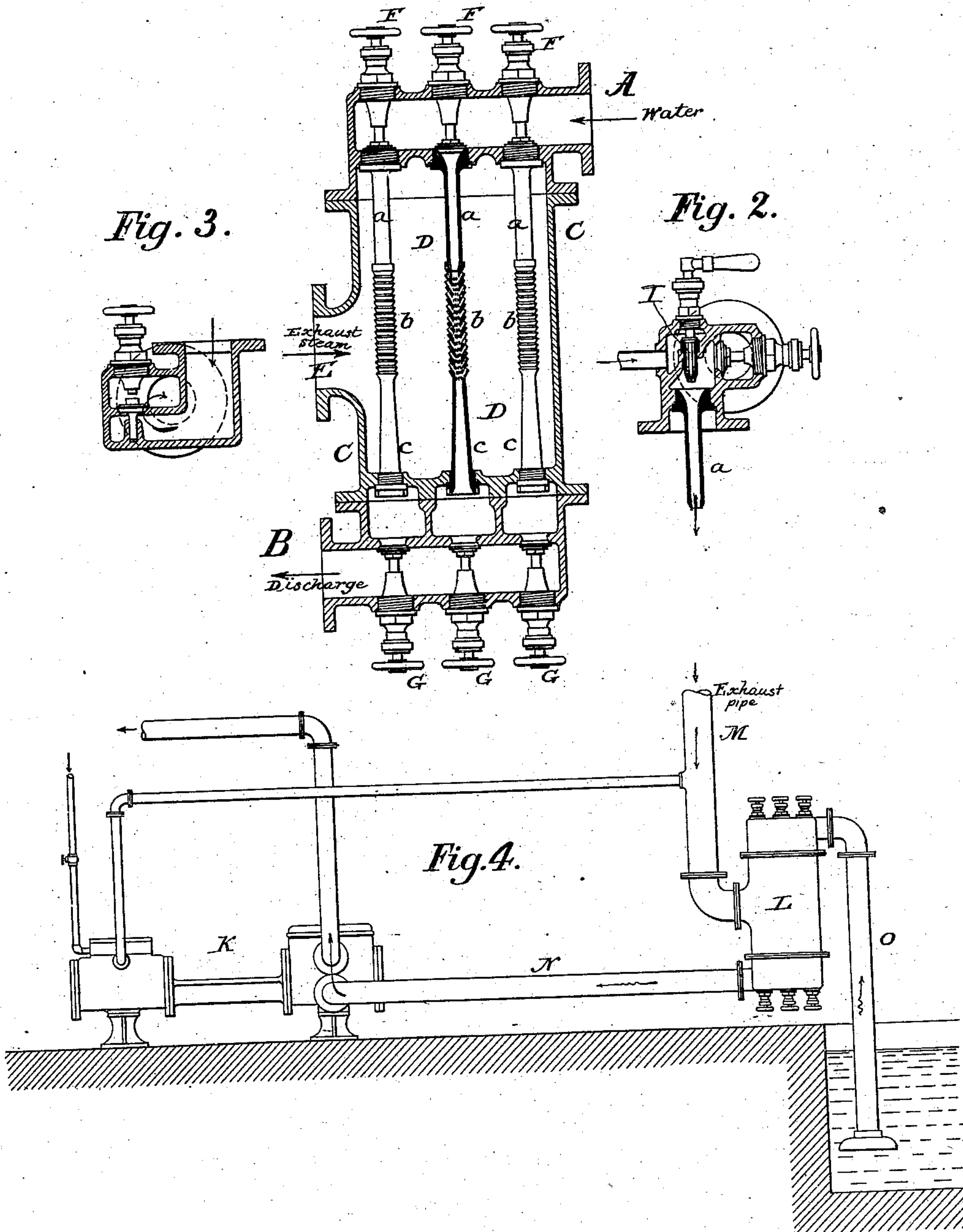
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Fig. 1.

Fig. 3.

Fig. 2.



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JET-CONDENSER.

SPECIFICATION forming part of Letters Patent No. 293,791, dated February 19, 1884.

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

To all whom it may concern:

Be it known that I, LOUIS SCHUTTE, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain Improvements in Jet-Condensers, of which the following is a specification.

This invention has reference to what are commonly known in the art as "water-jet condensers," which are constructed in various forms, differing from each other only in matters of detail, an excellent type of which may be found in Letters Patent of the United States No. 285,864, dated October 2, 1883.

The object of the present invention is to make provision for a regulation of the capacity of the apparatus, and thereby the regulation of the consumption of water. While a single jet-condenser allows of but little or no regulation in the consumption of water, it may be applied within certain ranges; but where the apparatus is larger than necessary there will be an excess of water used, and where the apparatus is not of sufficient size the vacuum produced will be less than it would otherwise be. In most cases this difference in result will be so small as to be practicably admissible; but there are conditions encountered in practice where the range is so wide that means must be provided to reduce the size of the apparatus. To this end I combine several jet-condensers, each independent of the other, with sources of supply common to the series, and with valves or equivalent means by which either condenser may be thrown into or out of action independently of the others.

In the accompanying drawings, Figure 1 represents a central longitudinal section through an apparatus or system containing three condensers or sets of jet apparatus. Fig. 2 represents a cross-section of the water-inlet and water-tube modified to answer the requirements when an additional steam-jet may be demanded to supply water to the condenser under suction. Fig. 3 represents a cross-section of the water-discharge modified in form to render the valve automatic. Fig. 4 is a side elevation, illustrating my apparatus in combination with an exhaust pipe and pump.

Referring to Fig. 1, A represents a pipe or conductor through which the water is intro-

duced into the apparatus; B, a pipe or conductor through which the water is finally delivered; and C, a body or chamber with the respective ends of which the supply and delivery pipes are connected, as shown. The chamber or tube C is provided with an inlet, E, in one side, through which it is supplied with exhaust-steam.

Within the body C, I mount a three-jet apparatus, D, each consisting of a water-tube, *a*, a combining or mixing tube, *b*, and a flaring delivery-tube, *c*, which, in the present instance, are substantially identical in form and arrangement with those represented in Patent No. 285,846, before referred to. Each of the condensers D communicates at one end with the water-supply A and at the opposite end with the delivery-tube B. At their upper or receiving ends each condenser is provided with a valve, F, by means of which its communication with the water-supply may be closed. The lower or delivery end of each condenser, or the chamber in which it discharges, is provided with a valve, G, by means of which communication between the condenser and the delivery-pipe B may be closed.

Under the above arrangement it will be seen that by means of the two valves F and G at its opposite ends either one of the condensers D may be placed in or shut off from communication with the supply and delivery tubes at will, independently of each other. In this manner the capacity of the apparatus, considered as a whole, may be varied as conditions may require, in order to secure the highest degree of economy and efficiency.

Referring to Fig. 4, which illustrates one of the applications of my jet apparatus, K represents a steam-pump; L, the body of the condensing apparatus, and M the pipe for supplying exhaust-steam to the condenser; N, the delivery-pipe to convey water from the condenser to the suction side of the pump; O, the water-supply to the condenser.

My apparatus will be of advantage in either of two cases: first, where the primary object is to pump water in varying quantities the condenser may be placed in the suction-pipe to condense the steam or create a vacuum, and thus relieve the pump of a portion of the work

which it would otherwise be required to perform; secondly, where the primary object is to create or maintain a vacuum or condense steam of varying volume and deliver the water to a higher level. The vacuum maintained in condensers of this class depends to some extent on the speed with which the water enters and traverses the combining-tube. If, therefore, a definite quantity of water is being pumped, the combined areas of the different sets of combining-tubes should correspond to this quantity. If the quantity of water be too small, an undue increase in temperature, and a consequent reduction in vacuum, will result, while on the other hand an excess in area of the tubes will cause the flow to be slow and will result in a corresponding decrease in the vacuum. It will be seen, therefore, that to obtain the full advantage of the circumstances which may be encountered in each case it is of importance to have a regulation in capacity such as my combination of two or more condensers will effect.

I have represented in Fig. 1 the valves G, in the ordinary form of screw-valves provided with hand-wheels; but valves of any suitable form or construction may be employed. It is also obvious that the form of the apparatus and the arrangement of the passages may be modified to any extent desired, provided two or more condensers are adapted to be thrown into and out of action at will, with supply and delivery passages common to the series. The water entering the pipe A will pass through such valves F as may be open, and thence through the communicating water-tube *a*, the combining-tube *b*, and finally through the valve G to the discharge B. In the course of its passage through the combining-tube the water will be acted upon and will combine with and will have the effect of condensing and carrying forward the steam which enters through the openings or inlets in the tube *b*.

In certain cases it is necessary to lift the water to the apparatus. For this purpose I propose to provide a supplemental steam-jet, in the same or substantially the same manner as represented in Patent No. 285,846. In Fig. 2, I is a nozzle or jet-tube provided with controlling-valves and adapted to deliver live steam into the nozzle of the water-tube *a*.

In the modification of the discharge-valves represented in Fig. 3 it will be observed that the valves proper are check-valves opening outward into a common passage, so as to be opened by the outflowing water. Opposite each valve there is a hand-screw, by means of

which the valve may be forced to its seat, and thus held in a closed condition. The outwardly-opening valves thus applied are closed automatically in the event of there being a vacuum within the apparatus, and for this reason they are of advantage in certain cases.

Having thus described my invention, what I claim is—

1. The combination of two or more water-jet condensers, each comprising a water-tube, a condensing-tube, and a discharge-tube, with sources of water supply and delivery common to the series, and means, substantially as described, whereby the condensers may be thrown into and out of action independently.

2. In combination with two or more jet-condensers, each comprising a water-tube, a combining-tube, and a discharge-tube, a pipe or discharge forming a water-inlet common to the series, a pipe or discharge forming a water-outlet common to the series, and an exhaust-inlet also common to the entire series.

3. The combination, with two or more jet-condensers combined with inlets and outlets common to the series, of check-valves combined with the discharge ends of the respective condensers.

4. The combination, with the series of jet-condensers communicating with a discharge pipe or passage common to the series, of the check-valves communicating with the individual condensers, and means, substantially as described, for holding said check-valves in closed positions independently of each other.

5. In combination with two or more jet-condensers, each having a water-tube, a combining-tube, and a discharge-tube and separate closing-valves, a casing provided with a common water-inlet, a common discharge-inlet, and an exhaust-inlet, an exhaust-connection from an engine, and a suction-pipe to a pump, substantially as described.

6. In combination with a jet-condensing apparatus comprising two or more jet-condensers and valves for placing the same independently into and out of action, substantially as described, a steam-pump, a conductor delivering the exhaust-steam therefrom to the series of condensers, and a delivery-pipe forming a communication between the delivery ends of the condensers and the suction-port of the pump, whereby the exhaust-steam is applied to assist in delivering the water to the pump.

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