G. H. STARBUCK.
Siphon-Condenser.

No. 207,827. Patented Sept. 10, 1878.

Fig. 1.

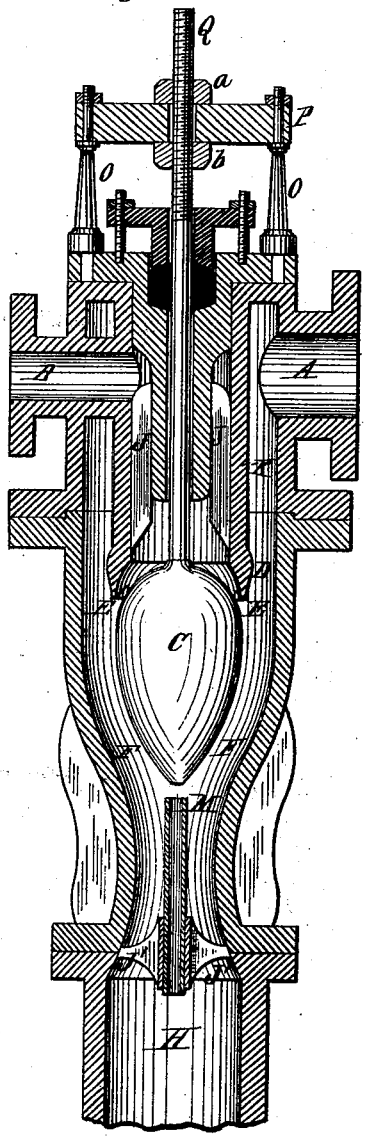
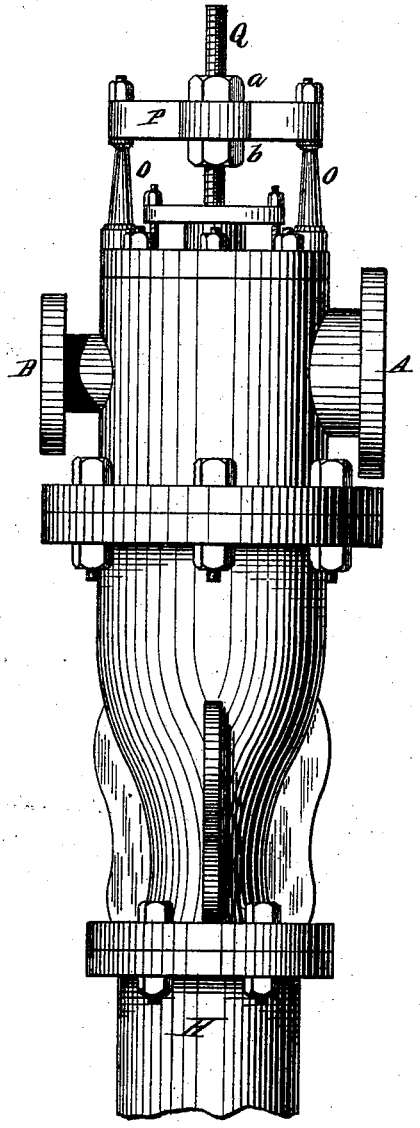


Fig. 2.



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GEORGE H. STARBUCK, OF TROY, NEW YORK.

IMPROVEMENT IN SIPHON-CONDENSERS.

Specification forming part of Letters Patent No. **207,827**, dated September 10, 1878; application filed August 13, 1878.

To all whom it may concern:

Be it known that I, GEORGE H. STARBUCK, of Troy, county of Rensselaer and State of New York, have invented certain new and useful Improvements in Siphon-Condensers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Figure 1 is an axial section and partial elevation of my improved condenser, and Fig. 2 an outside view or elevation of the same.

Like letters in both figures indicate corresponding parts.

My invention has relation to that class of steam-condensers wherein the steam is received into a chamber in which there is a greater or less vacuum produced, either by the usual process of siphoning, or by the application of any known form of exhaust-pump, and in which the desired condensation is produced by mingling a current of water with the steam.

The object of the invention is, primarily, to increase the effectiveness of the condenser, and it involves, also, a reduction in the expense of manufacture, increased simplicity of the working parts of the machine, and less liability to wear or get out of order, as well as greater ease and accuracy of regulating the valve which controls the inlet and outlet ports.

To accomplish all of this the invention consists in certain novel arrangements or combinations of parts, all of which will be hereinafter first fully described, and then pointed out in the claims.

A is the steam inlet or passage, communicating with the annular chamber formed by the exterior casing and the interior cylinder K, the two latter converging in such manner as to form the annular passage D, which should at least be equal in area to the port A.

B is the inlet for the water, which, passing within the cylinder K, is regulated by the conical adjustable valve C, forming, with the bottom of cylinder K, an annular water-delivery, E. This passage E can be so regulated in size by the valve as to afford the proper supply of water to effect the desired condensation of steam, and thus avoid any waste of water; and in case of the introduction of any foreign substances, as frequently occurs, the valve C may be lowered, and the passage E washed out without the necessity of taking the condenser apart.

The stem Q of valve C extends through the head of the casing, which is provided with an ordinary stuffing-box, and said stem is raised or lowered through the cross-bar P, mounted upon studs O, by means of the nut *a*. The nut *b*, below bar P, serves to fix the valve-stem, and through it the valve, in any desired position, thus insuring a uniform supply of water to the condenser.

The valve C is located within the lower section of the outer casing and below the mouth of the water-cylinder, by which arrangement a passage for the water is afforded which is practically unimpeded by the valve-stem. The valve is lowered to increase the quantity of water discharged, and elevated to diminish it.

J J are vertical plates, one or more of which may be employed, mounted vertically within the water-cylinder K, dividing it into separate compartments, so that the water in its passage through said cylinder will be forced to take a downward rectilinear course, thus obviating the usual spiral motion, which I conceive to be one disadvantage in former styles of condensers.

The extension of the conical valve C downward below the annular passages D E forms an annular passage, F, with a constantly-decreasing area, for the passage of the mingled steam and water, thereby forcing them into more thorough and complete contact; and as this contact is only for a short time, the steam will, by reason of the arrangement named, the more readily give up or impart its heat to the water. In the region of the lower point of the valve the passage F is again enlarged, preferably by a regular and easy curve, as shown, avoiding any straight lines, the object of this enlargement being to afford the best possible form of outlet for the water and steam.

At the bottom of the condenser-case I place the open pipe M, which leads up nearly to the lower point of the valve. The rapid flow of water past the lower end of pipe M creates a suction through said pipe, serving to withdraw any gas or air which may remain in the chamber, and causing such gas or air to flow out with the column of water.

Around the base of the pipe M, or at any convenient point in the lower neck of the condenser, I propose to place the division-plates J′ J′, one or more, serving to maintain the column of fluid in its proper rectilinear course as it leaves the condenser.

The column of fluid is conducted from the condenser by the pipe H, extending downwardly at least thirty-three feet, and having its lower end immersed in water, as is very well understood.

The water can be supplied to the condenser, when a natural head is not attainable, by any desired and suitable form of pump.

After a vacuum has been formed in the condenser, the height pumped against will be lessened to a few feet, depending upon the amount of vacuum produced.

When constructed and arranged in accordance with the foregoing, it is found that the condensation desired is effected uniformly and effectively, as well as by an economical consumption of water.

And in further explanation of the operation of the particular style of valve employed, it may be remarked that this valve not only regulates the quantity of water which may pass through the condenser, but, what is of more importance, renders such regulation practicable for the purposes intended. The mere quantity of water could be regulated by an ordinary stop-cock in the supply-pipe, but without the desired results.

In siphon-condensers as usually constructed the annular opening forming the water-inlet, being permanent in its dimensions, affords an ample supply of water for the condensation of the maximum quantity of steam, and that with the water at its highest temperature.

Between the quantity of water required under these conditions and under the conditions ordinarily obtaining there would be a difference in the quantity required of about fifty per cent. From the necessity of keeping this annular jet of water unbroken in its passage there can be but a slight variation in the quantity admitted to the condenser when the annular passage is permanent.

By use of the valve C the annular passage may be increased or diminished in direct proportion to the increased or decreased supply of water admitted to the condenser, and hence it follows that precisely the required quantity of water (depending upon the quantity of steam to be condensed and the temperature of the water) may be admitted, because the operation of the valve C is such as to allow a small quantity of water to pass through the annular opening in a continuous and unbroken current quite as well as a larger quantity, and thus preserve the requisite economy in the use of the water.

The facility with which the condenser may be washed out without displacing the cap or other portions of the device, and the thorough mingling of water and steam, caused by the form and arrangement of the several fittings, together with the ease with which the condenser is discharged, are among the numerous characteristics of the machine which will recommend it for use over those forms now ordinarily employed.

Having thus fully described my invention, I will add that I am aware of previous forms of condensers wherein a column of water regulated by a valve has been surrounded by the jet of exhaust-steam and the mingled fluid conducted into an enlarged chamber. Under such construction a volume of water has been employed which was very much too great for the purposes intended, being, therefore, not economical, and differing from my device principally in this—that I cause the annular jet of steam to come in contact with a similar annular jet of water.

I desire, further, to add that, instead of enveloping the water by the steam, I may accomplish the reverse by simply changing the ports, though I prefer the arrangement shown, as it is found to give the best practical results.

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

1. In a steam-condenser, the annular receiving-chamber F, within which is located the adjustable valve, said chamber being gradually contracted toward its lower end, substantially as shown.

2. In a steam-condenser, the combination, with the outer casing, of an interior valve and interior cylinder, the three parts being arranged substantially as shown, so that annular passages are afforded for the water, for the steam, and for the mingled current of water and steam, for the purposes and objects named.

3. In a steam-condenser, the combination, with the outlet, of an open pipe, M, having a water-passage around it and extending up into the chamber above, substantially as shown.

4. In a steam-condenser, the combination, with the outlet, of the vertical strips J′, (one or more,) serving to operate substantially as and for the purposes set forth.

5. The combination, with the chamber of a steam-condenser, of a conical valve mounted therein, and adapted to permit the washing of said chamber, as well as to regulate the quantity of water admitted, said valve being provided with a stuffing-box and with means for setting it, substantially as shown and described.

6. In a steam-condenser, the combination, with the water-conducting cylinder, of an adjustable valve mounted below the mouth of said cylinder, and serving to force the current of water into an annular discharge, the volume of water being diminished by elevating and increased by depressing the valve, substantially as shown and described.

7. In a steam-condenser, the combination,

with the water-cylinder, of one or more vertical division-plates, J, mounted within the cylinder and above the conical valve, which regulates the size of the opening at the mouth, said plates being designed to maintain the water-current in a rectilinear direction before being deflected by the valve, substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of two witnesses.

GEORGE H. STARBUCK.

Witnesses:
F. F. HEMENWAY,
JOS. SEEBERGER.