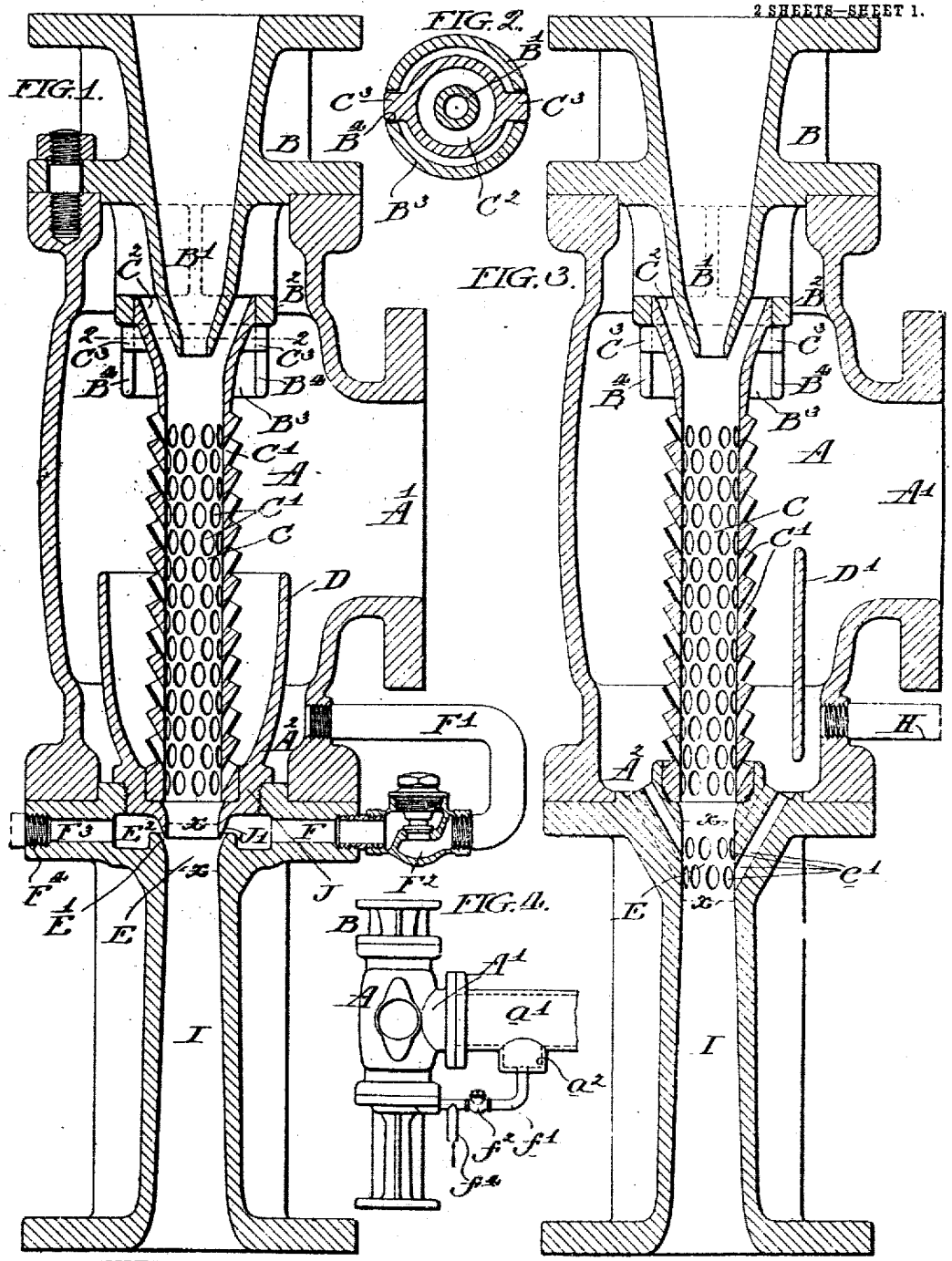
No. 816,043. PATENTED MAR. 27, 1906.

L. SCHUTTE.

CONDENSER.

APPLICATION FILED JAN. 2, 1903.

2 SHEETS—SHEET 1.



WITNESSES.

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2 SHEETS—SHEET 2.

FIG. 5.

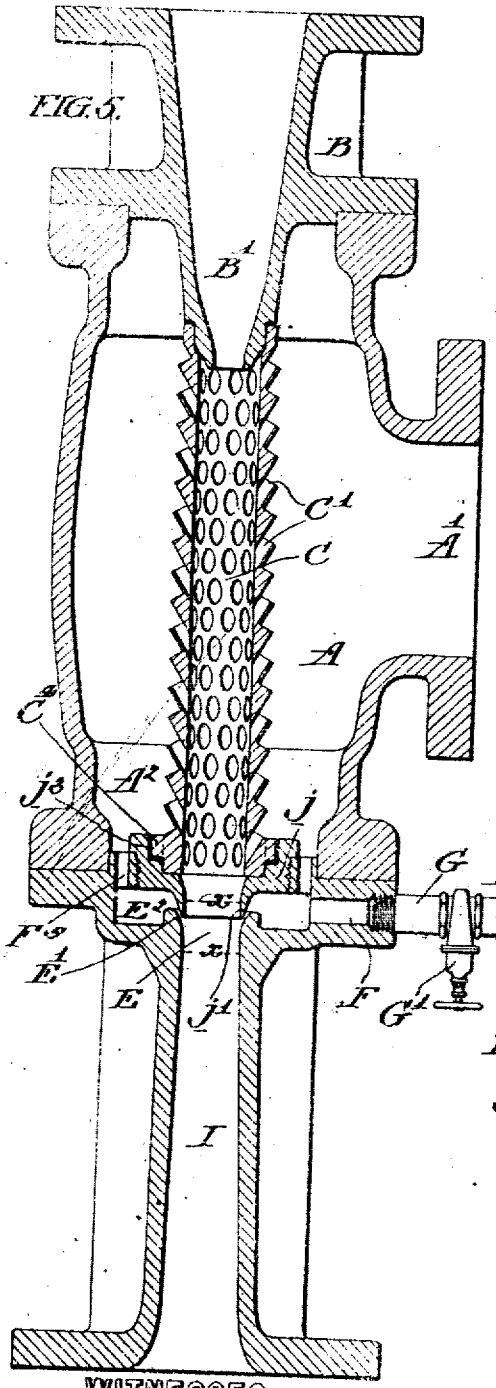


FIG. 6.

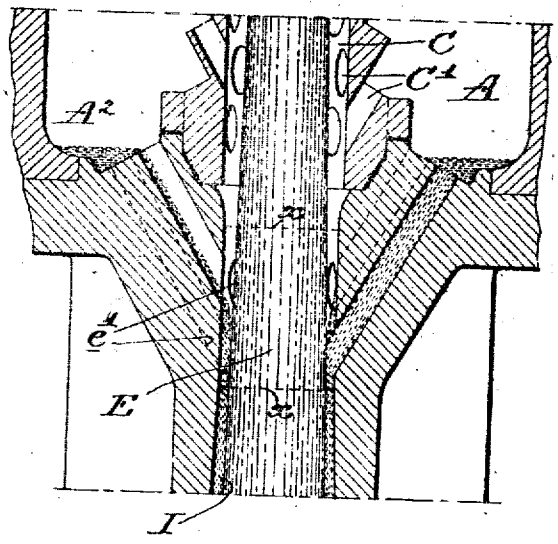
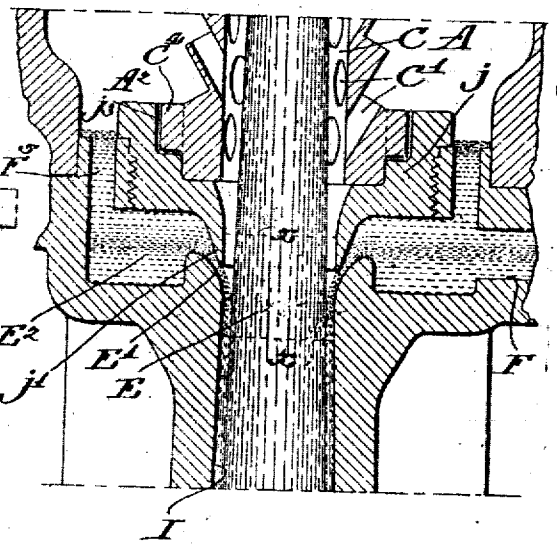


FIG. 7.



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CONDENSER.

No. 816,043. Specification of Letters Patent. Patented March 27, 1906.

Application filed January 2, 1903. Serial No. 137,409.

To all whom it may concern:

Be it known that I, LOUIS SCHUTTE, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Eductor-Condensers, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

This invention relates to the class of condensers in which steam is condensed by being brought into contact with a moving jet of water, such condensers consisting, essentially, in a suitable casing in which is situated a combining-tube provided with lateral perforations for the entrance of the steam and connecting at bottom with a discharge-tube, the casing being also provided with a water-jet nozzle leading into the end of the combining-tube and all such condensers having at the delivery end of the tube what is known as the "throat," said throat being the portion of the tube made up of the combining and discharge tubes in which the jet attains its highest speed.

The object of this invention is to increase the efficiency of such condensers by removing condensed water, or the largest part thereof, from the exhaust-steam entering the condenser before such steam enters the combining-tube, thereby materially increasing the driving action of the steam and producing, incidentally, a higher vacuum than would be the case if this condensed water was permitted to enter the combining-tube together with the steam, and I accomplish this by providing a collecting-chamber for the water and connecting such chamber with a water-inlet which I form in the throat of the condenser, in which throat by reason of the high speed of the jet there is a tendency to produce a higher vacuum than exists in any part of the casing. In the second place I increase the efficiency of the condenser by making the water-inlet in the throat of an annular or substantially annular form, so that the water entering the throat forms, in effect, an annular fluid-throat, which is beneficial both as diminishing the friction which the jet encounters at this point and as affording a means whereby a certain regulation of the diameter of the effective throat can be effected, and in certain cases I have found it advisable to provide a water-conduit leading to the inlet in the throat independent of the condensed-water supply, so that the supply of condensed water can be supplemented or replaced by the independent water-supply.

Reference is now had to the drawings, in which my invention is illustrated, and in which—

Figure 1 is a central vertical section through a condenser provided with my improvements; Fig. 2, a cross-section on the line 2 2 of Fig. 1; Fig. 3, a sectional elevation of a modified form of condenser, also provided with my improvements; Fig. 4, an elevation of a condenser, showing another modification adapted for use in connection with my improvements; Fig. 5, a sectional elevation showing still another modification in the mode of utilizing my invention; Fig. 6, an enlarged sectional elevation of the throat and parts immediately connected therewith, as shown in Fig. 3, the water-jet being conventionally indicated in this view; and Fig. 7 is a similar sectional elevation of the throat and parts immediately connected therewith in the construction shown in Fig. 5.

A is the condenser-casing, having an outlet A′, whereby it is connected with an exhaust-steam conduit, such as a' in Fig. 4.

A^2 in the different modifications indicates a water-collecting chamber formed at the bottom of the casing, and in Fig. 4 I have indicated the presence of a water-collecting chamber, (marked a^2 in the steam-conduit a',) which chamber could be used to supplement or replace the chamber A^2.

B is the head of the casing, which is formed with a water-jet nozzle B′, and, as shown in Figs. 1 and 3, the head is also provided with an annular extension B^2, the lower part of which is separated by vertical slots B^4 B^4 into two semicylindrical portions B^3.

C is the condenser-tube, having the usual lateral openings C′ for the admission of steam and so placed that the water-jet nozzle B′ is directed into it. As shown in Figs. 1, 2, and 3, the upper end of the condenser-tube is flared to form a conical steam-admission port C^2, and this portion of the condenser is provided with outwardly-extending lugs C^3 C^3, which fit into the slots B^4, as shown in Fig. 2, and prevent rotation of the condensing-tube.

D, Fig. 1, is a cup-like baffle surrounding the lower part of the condensing-tube and in this construction separating the collecting-chamber A^2 from the said lower portion of the tube.

D', Fig. 3, is a baffle-plate placed directly in front of the steam-admission port and acting to prevent any direct flow of the water with the steam to the condensing-tube.

I indicates the discharge-tube of the condenser, and E indicates the portions of the combining-tube which is known as the "throat," the dotted lines X X indicating substantially the effective length of this throat portion of the condenser.

E', Figs. 1, 5, and 7, indicates an annular water-inlet formed in the throat and connected with what I will call a "supplemental" or "second" collecting-chamber, (indicated at E^2.)

In the modification shown in Figs. 3 and 6 what is, in effect, an annular water-inlet is provided in the throat by the provision of the annularly-disposed system of conduits, (indicated at e',) said conduits leading directly from the bottom of the chamber A^3 through the throat E of the condenser, as shown, and being in the special modification illustrated formed in two annular series, one situated above the other.

In the construction indicated in Fig. 1 the chamber A^3 is connected with the chamber E^2 by the conduit F', leading from the chamber A^3 to a port F, which in turn connects with the chamber E^2. In this special construction a non-return check-valve F^2 is provided, and a further port F^3 is connected with a conduit F^4, through which an independent supply of water can be furnished to the chamber E^2 and the inlet E', the valve F^2 closing whenever the pressure of the independent supply of water at the point where the valve is situated exceeds the pressure in the casing. Practically the same arrangement is shown in Fig. 4, the collecting-chamber a^2 being connected by a pipe f'' with the inlet in the throat, a non-return valve f^2 being provided and an independent supply-pipe f^4 being also provided.

In the construction shown in Fig. 3 the angling perforations e' lead directly from the collecting-chamber A^2 to the throat; but I have indicated an independent supply-pipe H, which in this construction leads into the chamber A^2.

In the construction shown in Fig. 5 the annular chamber E^2 is connected with the chamber A^2 by vertical perforations or passages F^5, and in this construction an independent supply of water is provided for through the pipe G, which, as shown, is provided with a regulating and cut-off valve G'.

In the construction of Fig. 1 a cup-like baffle D is formed as a prolongation of a seat-casting J, which supports the lower end of the combining-tube, and is formed with a lip J', which forms the upper edge of the inlet leading to the throat.

In Fig. 3 the lower end of the combining-tube is supported directly on the upper end of the casting or section in which the delivery-tube is formed, and in Fig. 5 the seat-casting, here indicated at j, is not dissimilar to the seat-casting J of Fig. 1, but is here shown as provided with lateral recesses, (indicated at j^3) which receive outwardly-extending lugs C^4 of the combining-tube and act to prevent rotation of said tube.

In operation it will be seen that the condensed water in the steam will for the most part collect in the chamber or chambers provided for its reception—that is, the chamber A^2 or the chamber a^2—and will pass from said chamber or chambers through the conduits described to the annular or substantially annular water-inlet provided in the throat E, the efficiency of the condenser being thereby promoted, both because of the greater dryness of the steam entering the combining-tube and because of the diminution of friction in the throat of the condenser, this last function being further promoted by the independent supply of water to the inlet in the throat by the means indicated and above described.

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

1. In an eduction-condenser having a casing, a condenser-tube situated therein and in communication therewith through perforations, a water-jet nozzle directed into the end of the condenser-tube, and a throat, situated at the delivery end of the tube and wherein the jet attains its maximum speed, the combination therewith, of a chamber adapted to collect condensed water in the steam passing to the condenser, an annular or substantially annular water-inlet entering the throat of the condenser, a connection from the water-chamber to said inlet, and an independent water-supply conduit also connecting to said inlet in the throat.

2. In an eduction-condenser having a casing, a condenser-tube situated therein and in communication therewith through perforations, a water-jet nozzle directed into the end of the condenser-tube, and a throat, situated at the delivery end of the tube and wherein the jet attains its maximum speed, the combination therewith of a baffle arranged in the path of the steam entering the casing, a water-collecting chamber, an inlet entering the throat, and a conduit from the water-collecting chamber to said inlet.

3. In an eduction-condenser having a casing, a condenser-tube situated therein and in communication therewith through perforations, a water-jet nozzle directed into the end of the condenser-tube, and a throat, situated at the delivery end of the tube and wherein the jet attains its maximum speed, the combination therewith, of a water-collecting chamber arranged to receive the condensed water in the steam passing to the condenser,

a second water-collecting chamber having the form of an annulus surrounding the throat, a conduit or conduits connecting said chambers, and an annular water-jet inlet connecting said second chamber with the throat.

4. In an eduction-condenser having a casing, a condenser-tube situated therein and in communication therewith through perforations, a water-jet nozzle directed into the end of the condenser-tube, and a throat, situated at the delivery end of the tube and wherein the jet attains its maximum speed, the combination therewith, of a water-collecting chamber arranged to receive the condensed water in the steam passing to the condenser, a second water-collecting chamber having the form of an annulus surrounding the throat, a conduit or conduits connecting said chambers, an annular water-jet inlet connecting said second chamber with the throat, and an independent water-supply conduit whereby water can be supplied to the inlet to supplement or replace the condensed water in the steam.

LOUIS SCHUTTE.

Witnesses:
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D. STEWART.