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J. F. KIRGAN

JET AUGMENTER OR EJECTOR

Filed July 20, 1922

2 Sheets-Sheet 1

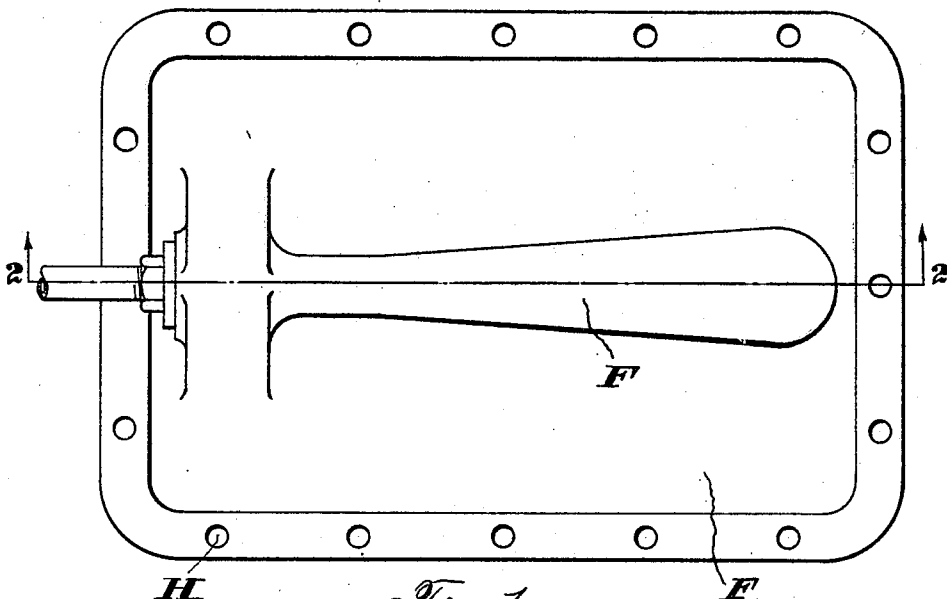


Fig. 1.

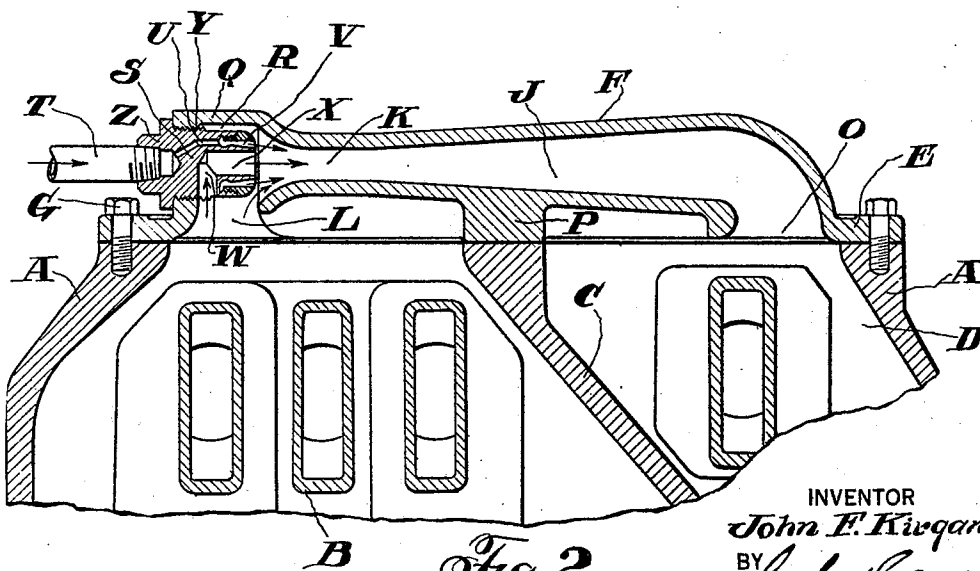


Fig. 2.

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2 Sheets-Sheet 2

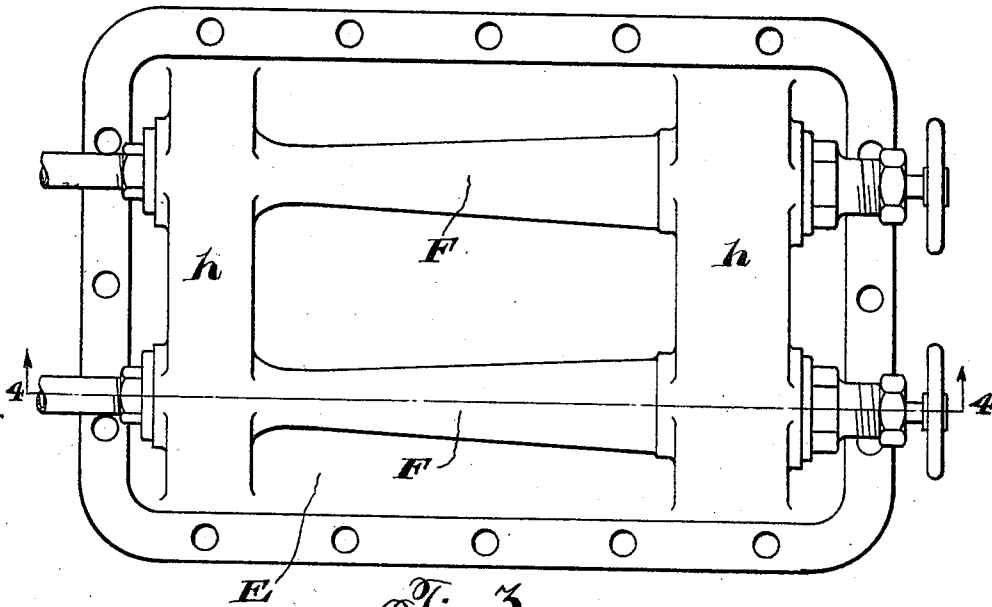


Fig. 3.

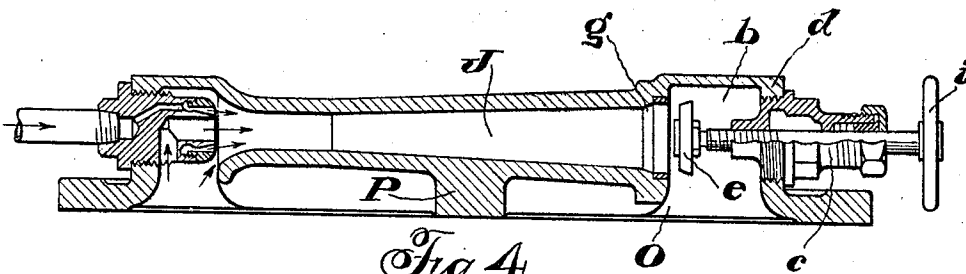


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN F. KIRGAN, OF PHILLIPSBURG, NEW JERSEY, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

JET AUGMENTER OR EJECTOR.

Application filed July 20, 1922. Serial No. 576,302.

To all whom it may concern:

Be it known that I, JOHN F. KIRGAN, a citizen of the United States, and a resident of Phillipsburg, county of Warren, State of New Jersey, have invented certain new and useful Improvements in Jet Augmenters or Ejectors, of which the following is a specification.

This invention relates to jet augmenters or ejectors of the type adapted to augment fluid pressure in any desired apparatus such as a condenser, cooler or similar vessel, by means of steam jets, and more particularly to refinements in the construction of diffuser bodies of such jet augmenters or ejectors.

Jet augmenters or ejectors of the type referred to are ordinarily provided with an elongated diffuser having a contracted throat and a steam jet or nozzle, but usually either the diffuser body portion or the nozzle, or both, have each been formed in a plurality of pieces or sections which are assembled to form the complete ejector. This sectional construction heretofore adopted for constructional reasons and facility in machining operations necessitates an excessive number of joints to be made fluid tight, requires fastening devices to hold the parts together and interferes with the ready adjustment of the nozzle relatively to and in axial alignment with the throat of the diffuser.

The primary object of the present invention is to simplify and cheapen the ejector construction by reducing the number of parts to two main parts, that is, a one-piece body or diffuser and a nozzle adapted to be removably and adjustably connected to the diffuser body. I have found that an ejector may be so constructed without interfering with the machine operations necessary or desirable for finishing, and I avoid the joints and connections heretofore required.

A further object is to reduce the number of packed joints between the diffuser body and the condenser or other vessel by arranging the inlet and outlet passages from and to the casing of the vessel so that the passages through the diffuser terminate in the same plane. A still further object is to enable the diffuser body and cover plate to be constructed integrally with each other as a unitary structure, so that but a single member requires to be connected to the cas-

ing of the condenser or similar vessel, the passages through the diffuser extending through the cover plate and into respective compartments of the vessel. A still further object is to further unify and strengthen the construction so that a plurality of diffusers may be formed integrally with a single cover plate, portions of the adjacent diffusers being joined to each other and portions of the diffuser bodies being connected to the cover plate by integral reinforcing webs. A still further object is to enable the flow of fluid through the diffusers to be controlled by valves conveniently mounted at the outlet ends of the diffusers.

With the above and other objects in view, the invention consists in the several features of construction described in the following specification and illustrated in the drawings accompanying the same, in which—

Figure 1 is a plan view of the integral cover plate and diffuser;

Figure 2 is a sectional view taken on the line 2—2 of Figure 1, looking in the direction of the arrows;

Figure 3 is a plan view of a preferred modification of the invention showing a plurality of diffuser bodies formed integrally with the cover plate; and

Figure 4 is a sectional view on the line 4—4 of Figure 3 looking in the direction of the arrows.

Referring first to Figures 1 and 2 of the drawings, I have shown the augmentor in one of its applications as forming part of the cooler used in conjunction with a surface condenser, but the augmentor is equally adaptable for any similar vessel used as a part of steam condensing apparatus. The cooler shell A is adapted to be mounted on or adjacent to the shell of a main condenser (not shown), so that the steam, after passing through the main condenser, enters the external cooler which usually contains grids, tubes, or other devices B through which cooling water is circulated. A partition C divides the interior of the cooler into a plurality of chambers so that an intercondensing chamber D is formed adjacent to but separate from the cooling chamber B. In ordinary practice heretofore the shell A has been provided with a separate opening or connection for each of the chambers B and

D and the jet augments or ejector has been mounted to communicate, through pipe connections or otherwise, with the respective chambers. According to my present invention, however, the cooler shell A is constructed so that a single flat opening is formed at the ends of the chambers B and D and a single flat cover plate E is adapted to act as a closure for this opening, the plate E thus forming, in effect, a part of the casing of the cooler, condenser or other vessel. A unitary one-piece ejector or augmentor including an elongated diffuser body F is formed integrally with the exterior of the plate E, the diffuser body F and cover plate E being cast or otherwise constructed in one piece. The plate E is adapted to be secured to the shell A by bolts G passed through the holes H. The diffuser body is provided with a longitudinal passage J having a contracted throat K adjacent to the inlet L at one end and an enlarged outlet O at the opposite end. The inlet L and outlet O extend through the cover plate at right angles to the axis of the longitudinal passage J and terminate in the same plane, the inlet L communicating with the cooling chamber B and the outlet O communicating with the intercondenser chamber D. An integral reinforcing web P is formed between the diffuser body F and cover plate E and this web P may be positioned over the partition C in alignment therewith, thereby strengthening the entire structure, as well as facilitating the formation of a fluid tight joint between the partition and cover plate. A straight tubular portion Q extends from the diffuser body F at the inlet end to form a nozzle aperture R for the insertion of a nozzle S in axial alignment with the throat K. It is important that the nozzle aperture R shall be concentric with the throat K for good operation. The nozzle S may be formed in one or more pieces, and is of the ring type, that is to say live steam entering the nozzle S through the steam connection T and passing through the connecting passage U into the annular passage V in the end of the nozzle S is adapted to flow through the throat K and diffuser passage J in the form of an envelope surrounding the air and vapors from the condenser discharge rising from the cooling chamber B and which pass through the transverse passage W and communicating axial longitudinal passage X, and this envelope of steam is itself surrounded by an outer envelope of vapor flowing from the inlet L into the nozzle aperture R and around the end of the nozzle S, so that the mixture flowing through the passage consists of an outer envelope of vapor and air, an inner envelope of steam, and a core of vapor and air from the same source as the vapor and air of the outer envelope. Means are provided for removably and ad-

justably connecting the nozzle S to the body of the diffuser F, and in this instance the nozzle aperture R is internally screw threaded and the body portion of the nozzle is correspondingly threaded, as shown at Y. An adjusting nut Z is preferably formed on the nozzle body to facilitate adjustment, and the nozzle flange α is adapted to bear against the diffuser body F and form a tight joint. The meeting surfaces of the flanges α and body F are preferably machined so as to be true with each other and the parts are preferably constructed and adjusted with the outlet of the nozzle S in proper position relative to the throat K.

In the modification of the invention illustrated in Figures 3 and 4, which constitute one preferred practical unitary form of the invention, a plurality of augmenters or ejectors are adapted to be formed integrally with the cover plate. In this form the diffuser bodies F of the ejectors or augmenters are located in parallel, the individual diffuser and nozzle constructions being in all essential respects similar to the form already described, but with the difference that a chamber b is formed at the outlet end O, this chamber b being at right angles to the axis of the passage J, and a valve casing c is adapted to be threaded into the flat outer end d of the diffuser body, this valve casing carrying a valve e which is adapted to fit into a seat f formed in the wall of the large diameter portion g of the passage J in axial alignment with the passage J. This valve permits the flow of the mixture through the passage J to be cut off from the intercondenser or other part of the apparatus when desired, by manipulation of the hand wheel i . In this form of the invention also, transverse strengthening ribs or webs h integral with the plate E and diffuser bodies F serve to join the adjacent ends of the diffuser bodies to each other and to the cover plate. The diffuser bodies are thus integrally connected to each other and to the cover plate at the inlet and outlet ends and to the cover plate at an additional point by means of the web P.

What I claim is:

1. A unitary augmentor or ejector comprising a plate adapted to act as a closure for an opening in the casing of a condenser or similar vessel, and a diffuser body for the ejector integral with said plate, said diffuser body having openings at opposite ends extending through said plate and terminating in the same plane.
2. A unitary augmentor or ejector comprising a flat plate adapted to act as a closure forming a part of the casing of a condenser or similar vessel, and an elongated one piece diffuser body for the ejector integral with said plate, said diffuser body having inlet and outlet openings at oppo-

site ends extending through said plate and terminating in the same plane.

3. A unitary augments or ejector comprising a plate adapted to act as a closure forming a part of the wall of a condenser or similar vessel, and a diffuser body for the ejector integral with said plate, said diffuser body having inlet and outlet openings at opposite ends extending through said plate at an angle to the longitudinal axis of said diffuser body.

4. A unitary augments or ejector comprising a plate adapted to act as a closure for an opening in the casing of a condenser or similar vessel, a diffuser body for the ejector integral with said plate, said diffuser body having openings at opposite ends extending through said plate and terminating in the same plane, and an integral web between the diffuser body and plate adapted to be aligned with a partition within said condenser or similar vessel.

5. A unitary augments or ejector comprising a flat plate adapted to act as a closure forming a part of the casing of a condenser or similar vessel, an elongated one piece diffuser body for the ejector integral with said plate, said diffuser body having inlet and outlet openings at opposite ends extending through said plate and terminating in the same plane, and an integral web between the diffuser body and plate adapted to be aligned with a partition within said condenser or similar vessel.

6. A unitary augments or ejector apparatus comprising a plate adapted to act as a closure forming a part of the wall of a condenser or similar vessel, a diffuser body for one ejector integral with said plate, said diffuser body having inlet and outlet openings at opposite ends extending through said plate at an angle to the longitudinal axis of said diffuser body, a second diffuser body of another ejector integral with said plate and parallel to said first named diffuser body, and webs integral with said plate joining the opposite ends of said diffuser bodies.

7. A unitary augments or ejector apparatus comprising a flat plate adapted to act as a closure forming a part of the casing of a condenser or similar vessel, an elongated one piece diffuser body for one ejector integral with said plate, said diffuser body having inlet and outlet openings at opposite ends extending through said plate, an integral web between the diffuser body and plate adapted to be aligned with a partition

within said condenser or similar vessel, a second diffuser body for another ejector integral with said plate and parallel to said first named diffuser body, and webs integral with said plate joining the opposite ends of said diffuser bodies.

8. A unitary augments or ejector comprising a flat plate adapted to act as a closure forming a part of the casing of a condenser or similar vessel, an elongated one piece diffuser body for one ejector integral with said plate, said diffuser body having inlet and outlet openings at opposite ends extending through said plate, an integral web between the diffuser body and plate adapted to be aligned with a partition within said condenser or similar vessel, a second diffuser body for another ejector integral with said plate and parallel to said first named diffuser body, transverse webs integral with said plate joining the opposite ends of said diffuser bodies, a nozzle at one end of each of said diffuser bodies, said nozzles having a fluid inlet passage exterior to said condenser or similar vessel and separate from said first mentioned inlet opening, and a valve at the opposite end of each of said diffusers adapted to regulate the flow through said diffusers.

9. A unitary augments or ejector comprising a plate adapted to act as a closure for an opening in the casing of a condenser or similar vessel, a diffuser body for the ejector integral with said plate, said diffuser body having openings at opposite ends extending through said plates, an integral web between the diffuser body and plate, and a valve at one end of said diffuser body adapted to regulate the flow through said diffuser.

10. A unitary augments or ejector comprising a flat plate adapted to act as a closure forming a part of the casing of a condenser or similar vessel, an elongated one piece diffuser body for the ejector integral with said plate, said diffuser body having inlet and outlet openings at opposite ends extending through said plate and terminating in the same plane, and an integral web between the diffuser body and plate adapted to be aligned with a partition within said condenser or similar vessel, and a valve at the outlet end of said diffuser body adapted to regulate the flow through the diffuser.

In testimony whereof I have signed this specification.

JOHN F. KIRGAN.