Dec. 2, 1924.

1,517,467

H. F. SCHMIDT

STEAM ACTUATED EJECTOR

Filed Sept. 29, 1920

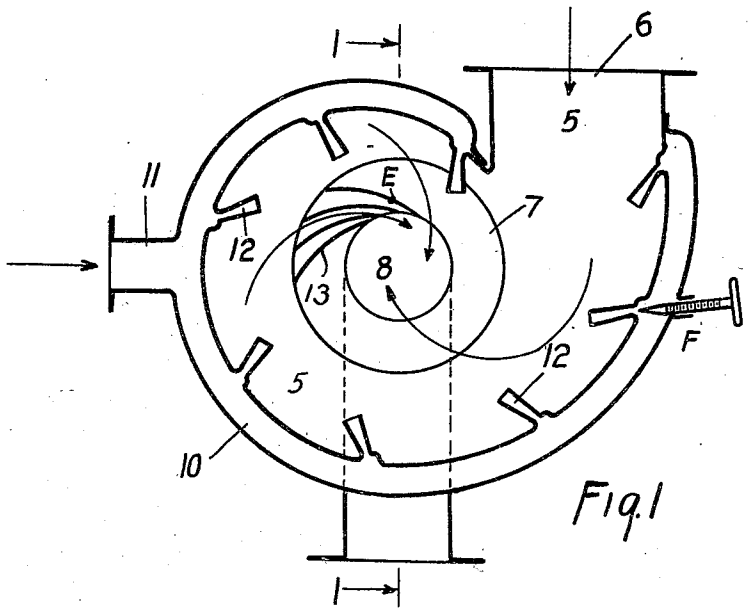

Fig. 1

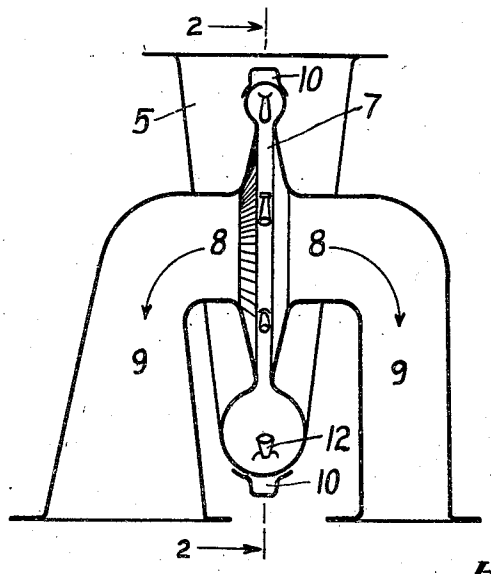

Fig. 2

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INVENTOR.

BY D C Davis

ATTORNEY

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UNITED STATES PATENT OFFICE.

HENRY F. SCHMIDT, OF SWARTHMORE, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

STEAM-ACTUATED EJECTOR.

Application filed September 29, 1920. Serial No. 413,638.

To all whom it may concern:

Be it known that I, HENRY F. SCHMIDT, a citizen of the United States, and a resident of Swarthmore, in the county of Delaware and State of Pennsylvania, have invented a new and useful Improvement in Steam-Actuated Ejectors, of which the following is a specification.

This invention relates to fluid translating devices and particularly to devices employing the kinetic or velocity energy of motive fluid in exhausting fluid such as air from a receptacle to be evacuated, or in compressing fluid such as air from a region of lower to a region of higher pressure.

An object of my invention is to produce a fluid translating device of the kinetic type in which means are employed for maintaining the operation of the device substantially constant for practically all varying conditions.

A further obpect is to produce a steam actuated ejector which is more compact and consequently has a greater capacity for a given size and weight than other ejectors now in use and known to me.

A further object is to produce a steam actuated ejector in which the motive fluid or steam delivery nozzles are so arranged and located that the streams of motive fluid issuing from them combine while traveling in substantially the same direction and thereby eliminate shock and eddy losses which are inherent in other ejectors now in use and known to me.

A further object is to produce a new and improved ejector of the radial or vortex type in which, in the latter case, the vortex is artificially created and maintained, and which is more simple and more easily constructed than other ejectors of similar type now in use and known to me.

These and other objects which will be made apparent throughout the further description of my invention are attained by means of apparatus herein described and illustrated in the drawings accompanying and forming a part hereof.

In the drawings, Fig. 1 is a diagrammatic sectional view (along the line 2—2 of Fig. 2) of an ejector embodying my invention.

Fig. 2 is a view along the line 1—1 of Fig. 1.

In Patent No. 1,237,219 issued to the Westinghouse Electric and Manufacturing Company on August 14, 1917 on an application filed by myself, I have disclosed and claimed ejectors of the radial or vortex types in which a centrally located nozzle (or group of nozzles) is adapted to discharge motive fluid either radially or tangentially, substantially in the form of a disc, across an inlet chamber and into a diffuser. In passing through the inlet chamber the disc shaped jet of motive fluid entrains the fluid to be translated and carries it into the diffuser. In the diffuser a part of the velocity energy of the fluids is converted into pressure energy and the fluids are then discharged into an annular or volute collecting chamber with which the diffuser communicates. One or more stages may be provided and in the applications referred to I have illustrated both a single stage ejector and ejectors having two concentric stages. In ejectors of the vortex type the tangential delivery of the motive fluid causes the formation of a free vortex, that is, the fluids pass out through the diffuser with a circumferential swirling motion which tends to eliminate "upsetting," or unsteady operation.

I have found that it is difficult to manufacture and assemble the nozzles in relatively small size ejectors of the type in which the nozzles are centrally located, owing to the small size and the location of the nozzles. My present invention contemplates an ejector of the radial or vortex type in which the manufacturing difficulties above referred to are substantially elmminated.

In Figures 1 and 2 of the drawing I have illustrated an ejector having a volute inlet chamber 5 which is provided with an inlet port 6 at its largest end and which encloses an annular diffuser 7. The walls of the diffuser 7 diverge, as shown, toward centrally located outlet ports 8, one of which I have shown on each side of the ejector. As illustrated, discharge conduits 9 are connected with the outlet ports 8. It will, of course, be understood that the discharge conduits may be of any suitable form. I have shown one of them as provided with diverging walls so as to, in effect, form a continuation of the annular diffuser 7. This construction may be applied to both discharge conduits if desired.

I have illustrated a motive fluid inlet chamber 10 around the outer periphery of the volute inlet chamber 5. Motive fluid,

hereinafter called steam, is delivered to this chamber by means of a conduit 11 and is distributed by the chamber to nozzles 12 which I have shown as extending into the volute inlet chamber in an approximately tangential direction.

The fluid to be translated, hereinafter called air, enters the volute chamber 5 through the inlet port 6 and is entrained by the jets of steam discharged in substantially the direction of air flow by the nozzles 12. The mixture of air and steam then passes into the diffuser 7 with a swirling motion which causes a forced vortex to be formed. It will, of course, be understood that the vortex method of operation tends to eliminate upsetting and unsteady operation of the ejector.

A part of the velocity is converted into pressure energy in the diffuser 7 and the fluids are then discharged through the outlet ports 8 into the discharge conduits 9. A further velocity pressure conversion occurs in the conduits if they are of the diverging type.

In Fig. 1, I have illustrated guide vanes 13 in the diffuser 5 for preventing cross currents in the fluids passing through the ejector and for assisting in the formation of the forced vortex. The guide vanes may be of any suitable shape or number. Furthermore, the vanes may be hinged, as at E, so that each is capable of swinging about its hinge and to thereby vary the cross sectional area of the passage to correspond to the quantity of fluid passing through it.

Although I have illustrated an ejector of the forced vortex type I desire it to be understood that the same general construction may be employed in building inward flow radial ejectors. Furthermore, valves may be provided for the nozzles as indicated at F so that the number of nozzles in operation or the amount of steam discharged by them may be proportioned to the quantity of air passing through the ejector.

The ejector illustrated is of unusually large capacity for its size, and is simple in construction. It may be built with any number of stages or may be combined with other types of ejectors in any suitable manner.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In an apparatus of the character described, an inlet chamber communicating with a source of fluid to be compressed, an annular diffuser enclosed thereby, a centrally located discharge passage communicating with the diffuser, and means for delivering motive fluid across the inlet chamber inwardly into and through the diffuser.

2. In an apparatus of the character described, an inlet chamber communicating with a source of fluid to be compressed, an annular diffuser enclosed thereby, a centrally located discharge passage communicating with the diffuser, and means for delivering motive fluid with an inward whirling motion across the inlet chamber and into and through the diffuser.

3. In an apparatus of the character described, an inlet chamber communicating with a source of fluid to be compressed, an annular diffuser enclosed thereby, a centrally located discharge passage communicating with the diffuser, and means for delivering motive fluid in an approximately tangential direction across the inlet chamber and into and through the diffuser.

4. An ejector having a volute inlet chamber, a diffuser enclosed thereby and having a centrally located discharge port, and means for causing an inward flow of fluids to be translated through said diffuser.

5. A fluid translating device comprising a centrally located annular diffuser having a centrally located discharge port, an inlet chamber from which medium is to be expelled communicating with said diffuser around the outer periphery thereof, and means for delivering motive fluid inwardly across the inlet chamber into the diffuser, said fluid being directed so as to form a vortex in the diffuser.

6. An inward flow ejector comprising an inlet chamber, a diffuser enclosed thereby and having a centrally located discharge port, means for delivering entraining fluid across the inlet chamber inwardly into the diffuser, and means for guiding the fluids through the diffuser.

7. An inward flow ejector comprising an inlet chamber, a diffuser enclosed thereby and having a centrally located discharge port, means for delivering entraining fluid across the inlet chamber inwardly into the diffuser, and adjustable means for guiding the fluids through the diffuser.

8. An inward-flow ejector having an inlet chamber, a diffuser communicating therewith and having a centrally located discharge port, and inwardly directed nozzles having their axes disposed in substantially the same plane for delivering motive fluid across the inlet chamber into the diffuser, said plane being normal to the axis of the diffuser.

9. An inward flow ejector having an inlet chamber, a diffuser communicating therewith and having a centrally located discharge port, and inwardly directed nozzles for delivering motive fluid across the inlet

chamber and into the diffuser in the form of a whirling disc shaped jet.

10. An inward flow ejector having an inlet chamber, a diffuser communicating therewith and having a centrally located discharge port, and inwardly directed nozzles for delivering motive fluid across the inlet chamber and into the diffuser in such a direction as to form a vortex in the diffuser.

In testimony whereof, I have hereunto subscribed my name this 23 day of September, 1920.

HENRY F. SCHMIDT.