

June 30, 1925.

R. N. EHRHART

1,543,834

EJECTOR

Filed March 2, 1922

Fig. 1.

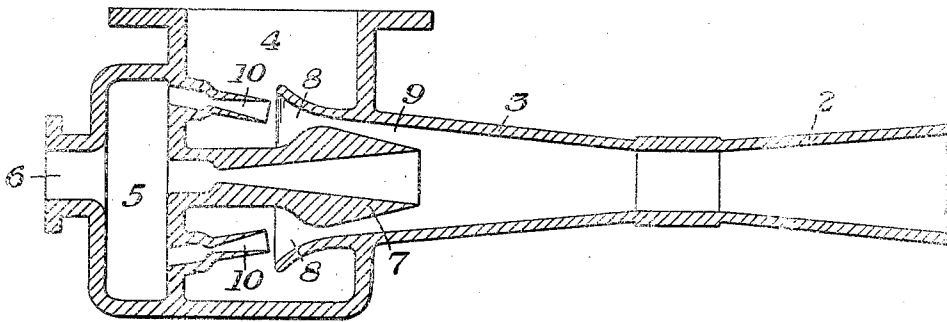


Fig. 2.

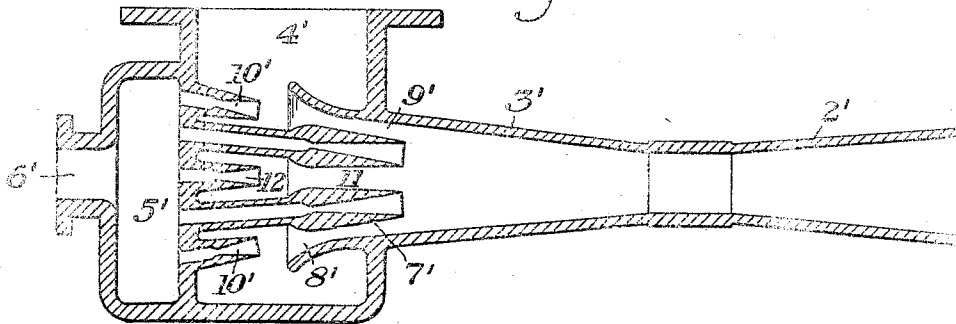
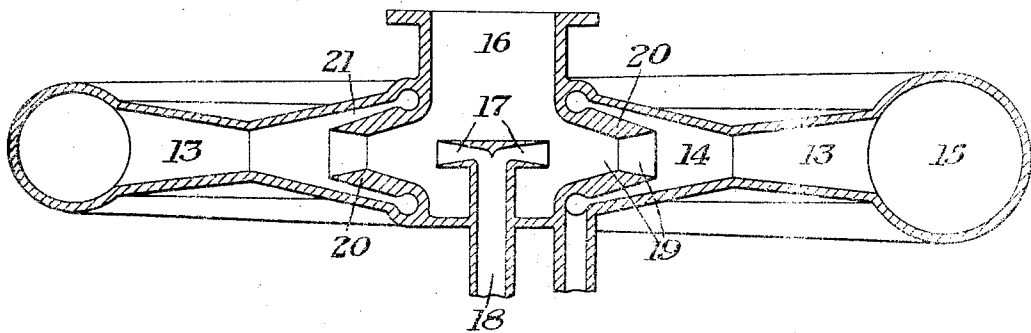


Fig. 3.



INVENTOR

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EJECTOR.

Application filed March 2, 1922. Serial No. 540,434.

To all whom it may concern:

Be it known that I, RAYMOND N. EHRHART, a citizen of the United States, residing at Edgewood, Allegheny County, Pennsylvania, have invented a new and useful Improvement in Ejectors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal sectional view through one form of ejector constructed in accordance with the present invention,

Figure 2 is a similar view through a slightly modified form of my invention, and

Figure 3 is a transverse sectional view through an ejector of the radial type embodying the present invention.

The present invention relates broadly to apparatus for compressing elastic fluids, and more particularly to an ejector of the type adapted to utilize an elastic impelling medium.

At the present time it is customary to construct ejectors of the single stage type, and also ejectors of the multi-stage type. Both of these types of ejectors are now well recognized in the art and each embodies certain characteristics when properly proportioned and constructed, adapting the same for use in steam power plants and similar installations.

This application relates to improvements in fluid compressing apparatus of this general type, and embodies certain characteristic features of a single stage ejector and certain other features of a two stage ejector, without actually falling within the strict definition of either of these types.

As illustrated in Figure 1, an ejector embodying the present invention may comprise a diffuser structure having a diverging portion 2 and a converging portion 3, the converging portion being adapted to communicate with a chamber 4 into which the fluid to be compressed is drawn through a suitable connection, not shown, from any desired apparatus.

Cooperating with the chamber 4 is a second chamber 5 having an inlet 6 for the impelling medium, which may be steam. Communicating with the chamber 6 is a long nozzle structure 7 adapted to serve as a propelling nozzle. This nozzle structure is so shaped as to form within the converg-

ing portion 3 of the diffuser structure an annular passage comprising a converging portion 8 and a diverging portion 9. Any desired type of short nozzle structure, comprising a suitable number and arrangement of short nozzles 10, serving as compressing nozzles may be operatively connected to receive the impelling medium from the chamber 5 and discharge the same, together with the fluid entrained thereby, into the converging-diverging passageway formed within the converging portion of the diffuser.

In Figure 2 there is illustrated a slightly modified form of apparatus in which parts corresponding to parts already referred to are designated by the same reference characters having a prime affixed thereto. In this construction, the long nozzle structure may comprise a plurality of nozzles 7' adapted to form a passageway having a converging portion 8' and a diverging portion 9' and also a substantially centrally located passageway 11 having similar characteristics. Where more than two of the long nozzles are provided, it will be apparent that the passageway between adjacent nozzles and the passageway between the nozzles and the converging portion of the diffuser will all have similar characteristics. The short nozzle structure may comprise any desired number of short nozzles 10' adapted to discharge into the passageway around the central nozzle structure as well as the short nozzle or nozzles 12 adapted to discharge into the passageway 11.

In Figure 3 there is illustrated somewhat diagrammatically an ejector having all of the nozzles radially arranged. In this form of my invention the diffuser structure may comprise substantially annular members forming an annular diverging passage 13 and a converging passage 14. The diverging passage may discharge into a pressure chamber 15 as is customary in constructions of this general nature. The fluid to be evacuated may be drawn into the inlet 16 by the action of a central nozzle structure comprising any desired number of radially arranged short nozzles 17 having a suitable connection 18 for the impelling medium. These short nozzles discharge the entrained and entraining fluid into the converging-diverging passageway 19 formed within the converging passage 14 of the ejector by the walls 20 of the long nozzle structure. This

long nozzle structure may in turn comprise any desired number and arrangement of propelling nozzles 21 adapted to act on the fluid delivered thereto by the short nozzle structure.

Throughout the specification and claims the expressions "short nozzle structure" and "long nozzle structure" are definitive of a nozzle or nozzles in each case which discharge respectively at a lesser and a greater distance into the diffuser structure, irrespective of the length, from a constructional standpoint, of the nozzles themselves. In all of the forms of my invention there is provided within the converging portion of the diffuser one or more passageways, each having the essential characteristics of a diffuser structure, viz: a converging portion and a diverging portion. In these passageways there will be a relatively complete change of the velocity of the fluid, as delivered by the short nozzle structure, to pressure, so that by the time the fluid reaches the long nozzle structure the velocity will be considerably less than that at which fluid is ordinarily delivered to the long nozzle structure in ejectors of the single stage type.

In all of the forms of my invention, the parts will preferably be so proportioned that the pressure in that part of the diffuser in proximity to the outlet of the long nozzle structure will be within a range of from 4 to 10" of mercury when the pressure of the fluid to be compressed is within a range of from 1 to 3½" of mercury. Such a pressure of the fluid to be compressed is ordinarily desirable when exhausting or compressing gas or air in connection with condensing systems. It will be understood that the drawings are illustrative only of preferred features of my invention, and that changes may be made in the construction, arrangement and operation of the parts without departing from the spirit of the invention or scope of my broader claims.

The advantages of the present invention arise from the provision of a passageway having certain characteristics of a diffuser structure, entirely within the converging portion of the diffuser by suitably shaping the long nozzle structure. Still further ad-

vantages arise from a construction of this character in which the parts are proportioned to produce pressures as set forth herein.

I claim:

1. In an ejector, a converging-diverging diffuser structure, a long nozzle structure forming within the converging portion of the diffuser structure a converging-diverging passageway, and a short nozzle structure discharging into said passageway, substantially as described.

2. In an ejector, a converging-diverging diffuser structure, a long nozzle structure forming within the converging portion of the diffuser structure a converging-diverging passageway, and a short nozzle structure discharging into said passageway, said ejector being proportioned to produce a pressure of from 4 to 10" of mercury in that portion of the diffuser structure in proximity to the outlet of the long nozzle structure when the pressure of the fluid to be compressed is within a range of from 1 to 3½" of mercury, substantially as described.

3. In an ejector, a converging-diverging diffuser structure, a long nozzle structure forming within the converging portion of the diffuser structure a converging-diverging passageway, and a short nozzle structure comprising a plurality of nozzles adapted to deliver fluid to said passageway, substantially as described.

4. An ejector having a diffuser structure, a long nozzle structure and a short nozzle structure, said diffuser having a converging-diverging passageway formed entirely within the converging portion of the diffuser by said long nozzle structure, substantially as described.

5. An ejector having a diffuser structure, a long nozzle structure and a short nozzle structure, said diffuser having a converging-diverging passageway formed entirely within the converging portion of the diffuser by said long nozzle structure, said short nozzle structure being constructed and arranged to deliver fluid to said passageway, substantially as described.

In testimony whereof I have hereunto set my hand.

RAYMOND N. EHRHART.