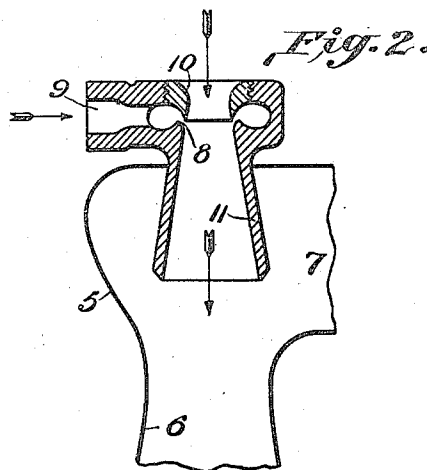
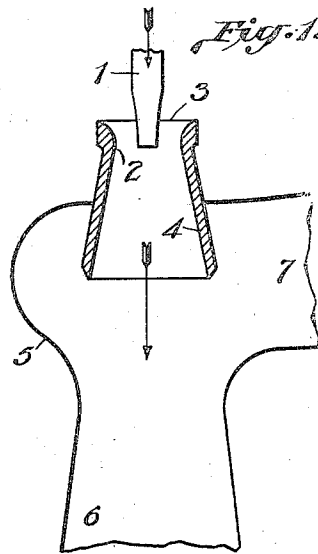


A. E. L. SCANES.
 FLUID OPERATED EJECTOR.
 APPLICATION FILED JULY 14, 1915.

1,228,608.

Patented June 5, 1917.



INVENTOR.

WITNESSES.

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UNITED STATES PATENT OFFICE.

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FLUID-OPERATED EJECTOR.

1,228,608.

Specification of Letters Patent.

Patented June 5, 1917.

Application filed July 14, 1915. Serial No. 39,783.

To all whom it may concern:

Be it known that I, ARTHUR EDWIN LEIGH SCANES, a subject of the King of Great Britain, residing at Ashton-upon-Mersey, England, have invented a new and useful Fluid-Operated Ejector, of which the following is a specification.

This invention relates to fluid operated ejectors and especially to devices of this kind in which steam is employed as the operating fluid.

The ordinary steam ejector is designed to remove fluid from an inclosed space and compress it to a higher pressure by utilizing the kinetic energy of steam expanded approximately adiabatically in a converging and diverging nozzle. When, however, the ratio of compression is high, as for example when exhausting the air from a steam condenser with a high vacuum and compressing to atmospheric pressure, a steam ejector takes a relatively large amount of steam to operate it, which of course is very objectionable. To utilize the energy of the steam to the greatest advantage it is necessary to expand it down to the highest vacuum existing in the ejector and when this is done its velocity is very great and since the gases to be removed are practically stationary or have a very low velocity there is a considerable loss in entraining these gases to remove the same.

According to the present invention in order to reduce this loss what is hereinafter termed an "air nozzle" is employed combined with a steam nozzle. An air nozzle consists of a convergent-divergent tube one end of which opens into the divergent passage or diffuser of the ejector while the other end opens into the atmosphere or a space in which the air is at a higher pressure than that existing in the diffuser at the other end of the nozzle. By this means a mixture of air and steam is obtained which is expanded adiabatically in a diverging passage to the pressure in the ejector, the resulting velocity being lower than the velocity which the steam alone would attain but higher than that which would be obtained by air alone. By suitably proportioning the quantity of air and steam the most efficient final velocity for use in the ejector can be obtained. The steam nozzle is introduced in any convenient manner into the throat of the air nozzle, the position of its orifice being preferably so

arranged that the velocity of the steam issuing therefrom and entering the air nozzle varies by a minimum amount from the velocity of the air at that point in the air nozzle. The loss in velocity due to the mixing of the air and steam will then be very small.

The accompanying drawings are sectional views, somewhat diagrammatic, illustrating by way of example two forms of ejector constructed in accordance with the invention.

In Figure 1 the steam nozzle 1 is introduced centrally into the throat 2 of the air nozzle into which air from the atmosphere enters by the opening 3. The mixed fluids expand adiabatically along the diverging nozzle 4 which opens at the entrance of a converging-diverging nozzle 5, 6. The air and gases to be exhausted from a condenser or other closed receptacle enter at the opening 7 and are entrained by the combined air and steam and forced through the expanding passage or diffuser 6.

In the form illustrated in Fig. 2, the steam nozzle 8 is annular, being connected to the steam supply through the inlet pipe 9, and surrounds the air nozzle 10 opening thereinto at a point a little beyond the throat. The combined fluids expand through the diverging portion 11 and act on the air and gases to be exhausted in a manner similar to that hereinbefore described with reference to Fig. 1. The dimensions and design of the nozzles and the position of the annular steam nozzles 8 are preferably so chosen that the steam issues at a point in the air nozzle where the velocity of the air is as nearly as possible equal to its own as hereinbefore mentioned.

It will be understood that the constructions illustrated in the drawings are merely shown by way of example and that other methods of carrying out the invention may be adopted. Furthermore, the air or steam may be arranged to be admitted by a multiplicity of nozzles without transgressing the limits of the invention.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that which I claim is:—

1. In a fluid ejector for exhausting gases from an inclosed space in which the pressure is below atmospheric pressure, a diffuser adapted to be connected to said in-

- closed space and having its outlet in communication with a space of greater pressure than that in said inclosed space, a convergent divergent air nozzle discharging into
5 said diffuser and a steam nozzle combined with said air nozzle in such manner that a mixture of steam and air acts on the gases to be exhausted and causes them to pass through said diffuser.
- 10 2. In a fluid ejector for exhausting gases from an inclosed space in which the pressure is below atmospheric pressure, a diffuser the inlet end of which is connected to said space and the outlet of which connects with
15 a space of greater pressure than that in said inclosed space, means including a divergent nozzle for delivering high and low pressure motive fluid to said diffuser, arranged so that the point of admission of high pressure
20 motive fluid is located at a point within said divergent nozzle where the velocity of the low pressure motive fluid is substantially equal to the velocity of the high pressure motive fluid as it enters said nozzle.
- 25 3. In a fluid ejector, a diffuser, a divergent nozzle for delivering low pressure motive fluid to said diffuser and means for delivering high pressure motive fluid to said divergent nozzle, arranged so that the high
30 pressure motive fluid and the low pressure

motive fluid intermingle within said divergent nozzle at a point at which their velocities are substantially equal.

4. In a fluid ejector, a combining tube adapted to be connected with an inclosed 35 space in which the pressure is below atmospheric pressure, a diffuser connected to said combining tube, a divergent nozzle at its inlet end connected with the atmosphere and arranged to deliver into said combining tube 40 and means for delivering high pressure steam to said divergent nozzle at a point intermediate its inlet and outlet ends.

5. In a fluid ejector, a combining tube adapted to be connected to the device to be 45 exhausted, a convergent divergent nozzle communicating at its inlet end with a source of low pressure motive fluid and at its delivery end with said combining tube and means for delivering high pressure 50 motive fluid to said nozzle at a point intermediate its inlet and delivery ends.

In testimony whereof I have hereunto subscribed my name this twenty-fifth day of June, 1915.

ARTHUR EDWIN LEIGH SCANES.

Witnesses:

N. W. BOWMAN,

JAS. STEWART PROUDFOOT.