M. LEBLANC.
EJECTOR.
APPLICATION FILED SEPT. 10, 1907.

1,031,722. Patented July 9, 1912.

Fig. 1.

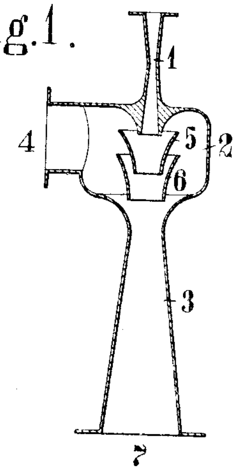


Fig. 2.

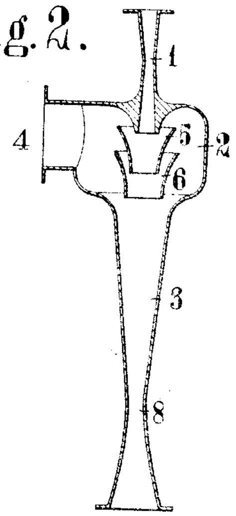


Fig. 3

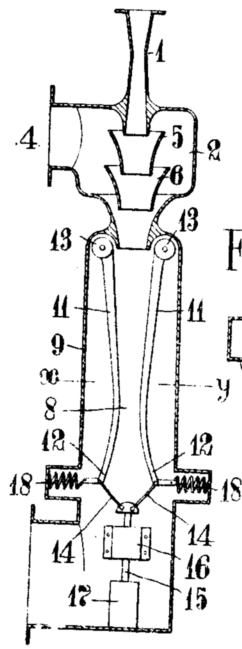
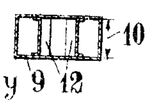


Fig. 4.



WITNESSES:
E. M. McCallister,
Geo. A. Walker

INVENTOR.
Maurice Leblanc
by Jno. S. Green
his attorney in fact.

UNITED STATES PATENT OFFICE.

MAURICE LEBLANC, OF CROISSY, FRANCE, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO SOCIETE ANONYME POUR L'EXPLOITATION DES PROCEDES WESTINGHOUSE-LEBLANC, OF PARIS, FRANCE.

EJECTOR.

1,031,722. Specification of Letters Patent. Patented July 9, 1912.

Application filed September 10, 1907. Serial No. 392,122.

To all whom it may concern:

Be it known that I, MAURICE LEBLANC, a citizen of the French Republic, and a resident of Croissy, Seine et Oise, France, have invented a new and useful Improvement in Ejectors, of which the following is a specification.

This invention relates to ejectors operated by steam or other elastic fluids.

The object of the present invention is to provide an ejector of that type which shall be both self-starting and also capable of maintaining a high vacuum. To this end the cross sectional area of the throat of the mixing cone is automatically varied in accordance with the variation in the vacuum obtained.

In the accompanying drawings Figures 1 and 2 are diagrammatic views indicating in longitudinal section two different forms of construction of an ordinary ejector. Fig. 3 is a similar view indicating by way of example one form of construction for carrying into effect an ejector according to the present invention and Fig. 4 is a cross section on the line X—Y of Fig. 3.

Referring to Fig. 1 indicating an ordinary ejector the motive fluid supplied under pressure passes through a nozzle 1 into a chamber 2 opposite a passage 3, called a mixing cone, in which the velocity energy is transformed into work of compression. This motive fluid entrains by friction the fluids which fill the chamber 2 and flow into it by the inlet 4. These fluids before coming into contact with the stream of motive fluid must pass annular directing nozzles 5 and 6. The mixing cone 3 exhausts into a space 7 in which there is a constant pressure P. Designating the working pressure which it is desired to maintain in the chamber 2 by p the form of the mixing cone should vary as the ratio $\frac{\phi}{P}$. When the ratio $\frac{\phi}{P}$ is greater than a certain number which varies with the nature of the fluid or mixture of fluids passing through the mixing cone and which is 0.58 for steam and 0.51 for air, the mixing cone should be divergent, as shown in Fig. 1. When the ratio $\frac{\phi}{P}$ is smaller than this number the mixing cone should be at first convergent and then divergent, as shown in Fig. 2. The junction 8 of the convergent and divergent portions of the mixing cone is called the "throat". This throat should be made smaller with respect to the inlet end of the convergent portion of the mixing cone as the ratio $\frac{\phi}{P}$ diminishes. Assuming that in order to maintain a high vacuum in the chamber 2 the ejector is constructed as shown in Fig. 2, then on starting the apparatus the pressure p would be equal to P and during the period preceding the establishment of the working condition the ratio $\frac{\phi}{P}$ would pass through all the values comprised between unity and the value corresponding to the desired working conditions. At the moment of starting the ejector should have a form absolutely different from that which is normally most suitable. Further the ejector would refuse to work and the pressure p in the chamber 2 would become greater instead of becoming less than the pressure P. Experience shows that an ejector with a convergent mixing cone followed or not by a divergent mixing cone cannot be started unless the convergence is slight—that is to say—unless the ratio of the throat section to the inlet section of the mixing cone is nearly 1. It follows therefore that an ejector proportioned as it should be for maintaining a high vacuum as soon as working conditions have been established, cannot be started. Conversely an ejector in which all the parts are incapable of variation but which is adapted to be self-starting will be unable to produce a high vacuum. Therefore in order that an ejector shall be able to produce a high vacuum it is necessary that during the starting period the section of the throat shall gradually diminish in accordance with the increase in the vacuum obtained. It is also necessary, in order that the effect produced by the apparatus may be constant, and in order that the apparatus may be self-starting after an accidental derangement that the variations in the throat section shall be automatically determined by the variations in the vacuum obtained. The cross-sectional area of the throat of a converging mixing cone may for example be varied by distorting the walls.

In Figs. 3 and 4 this method of varying the cross-sectional area of the throat is illustrated as applied to a mixing cone of rectangular section and constant length, the width being gradually varied from one end to the other of the mixing cone.

Within a casing or receiving chamber 9 having two parallel plane faces at distance 10 the one from the other are arranged two plates having a profile such as that shown from 11 to 12. These plates are equal in width to the distance 10 and are supported against the two plane faces of the casing 9 by means of broad flanges so as to reduce wear. These plates are pivoted at points 13, 13, and it is obvious from the drawing that by causing these plates to oscillate about the points 13, 13, the section of the throat of the mixing cone can be varied at will.

The ends of the plates opposite to the pivoted ends are connected by pivoted links 14—14 to a rod 15 which reciprocates in a guide bearing 16 and which is provided with a piston working in a dashpot 17. By this means the plates 11, 12 are necessarily operated together and the axis of the mixing cone remains unaltered.

In order to render the movement of the two plates 11, 12 automatic it is sufficient to hold them apart by means of springs 18, 18 attached to opposite walls of the casing 9. Thus as a vacuum is created in the chamber 2, the pressure within the mixing cone will fall, while the pressure outside the cone will remain constant and equal to P. The plates will then tend to close together, but since the tension on the springs will thus be increased a state of equilibrium will be established until the vacuum is again increased, when the plates will approach one another still further. The springs will naturally have to be adjusted, so that as the plates approach one another the tension will increase according to the desired law in order that the throat of the mixing cone may at every moment correspond in section to the vacuum obtained. The presence of the dashpot will oppose the setting up of any oscillating movements of the two plates 11, 12.

The starting of this ejector has been found by experience to be perfectly automatic.

What I claim is:

1. In an ejector operated by an elastic fluid, the combination with an admission nozzle for the motive fluid, of a receiver chamber, a mixing cone located within such chamber, means subjected to the pressure within the mixing cone and the pressure within the receiver chamber for symmetrically closing in two walls of the mixing cone, and means for providing an increasing resistance to the force of said pressure.

2. In an ejector operated by an elastic fluid, the combination with an admission nozzle for the motive fluid, of a receiver chamber, a mixing cone located within said chamber and comprising two opposite stationary walls and two opposite movable walls pivoted at the inlet end of the mixing cone and springs providing a predetermined increasing resistance to the movement of the pivoted walls due to the excess of pressure in the receiver chamber over the pressure within the said mixing cone.

3. In an ejector operated by an elastic fluid, the combination with an admission nozzle for the motive fluid, of a receiver chamber, a mixing cone located within the said chamber and comprising two opposite stationary walls and two opposite movable spring-retracted walls pivoted at the inlet end of the mixing cone, means for equalizing the movements of the said two pivoted walls and a dash-pot for regulating the oscillation of said pivoted walls.

4. In combination in an ejector, an admission nozzle for the motive fluid, a mixing cone, means for directing the fluid to be exhausted into the mixing cone, and means dependent upon the pressure within said mixing cone for varying the cross sectional area of the outlet of the mixing cone in accordance with the variation in the vacuum produced by the ejector.

5. In an ejector operated by an elastic fluid, the combination with an admission nozzle for motive fluid of a receiving chamber, a mixing cone located within said receiving chamber, means for directing the fluid to be exhausted into said cone, and means dependent upon the pressure within said receiving chamber and within said mixing cone for varying the cross sectional area of the outlet of the mixing cone in accordance with the variation in the vacuum produced by the ejector.

6. In an ejector operated by an elastic fluid, the combination with an admission nozzle for the motive fluid, of a mixing cone, means for directing the fluid to be exhausted into the mixing cone, and means dependent upon the pressure within said cone for varying the convergence of the mixing cone in accordance with the variations in the amount of fluid exhausted.

7. In an ejector operated by an elastic fluid, the combination with an admission nozzle for the motive fluid, a mixing cone, means for directing the fluid to be exhausted into the cone, and means for varying the position of the walls of the mixing cone so that relative proportions of the mixing cone are varied in accordance with the variations in the vacuum obtained.

8. In an ejector, the combination with an admission nozzle for the motive fluid, a mixing cone provided with two stationary and two movable walls, and means for varying the position of the movable walls in accordance with the variation in the vacuum produced by the ejector.

9. In an ejector operated by an elastic

fluid, the combination with an admission nozzle of a mixing cone, means for directing the fluid to be exhausted into the mixing cone, a receiving chamber in which said mixing cone is located and means responsive to the differential of pressure within the mixing cone and the receiving chamber for varying the cross sectional area of the mixing cone in accordance with the variations in the vacuum produced by the ejector.

10. In an ejector operated by an elastic fluid, the combination with an admission nozzle for the motive fluid of a mixing cone comprising two opposite stationary walls and two opposite movable walls and springs for controlling the movements of said movable walls.

11. In an ejector operated by an elastic fluid, the combination with an admission nozzle for the motive fluid of a mixing cone provided with movable walls and yielding means for controlling the motion of said walls.

12. In an ejector operated by an elastic fluid, the combination with the admission nozzle for the motive fluid of a mixing cone provided with means for varying the cross sectional area of the outlet of the mixing cone and springs for controlling the operation of said means.

13. In an elastic fluid operated ejector device, an admission nozzle for motive fluid, a mixing cone, and means for automatically varying the cross-sectional area of the outlet of the mixing cone in accordance with the varying amounts of fluid exhausted by said device.

14. In an elastic fluid operated ejector device, a motive fluid admission nozzle, a mixing cone, means for directing the fluid to be exhausted into the mixing cone and means for automatically varying the outlet area of the mixing cone in accordance with the variation in the vacuum produced by the device.

In testimony whereof I have hereunto subscribed my name this 22nd day of August 1907.

MAURICE LEBLANC.

Witnesses:

DEAN B. MASON,

ALBERT DELOS.