M. LEBLANC.

FLUID EJECTOR.

APPLICATION FILED MAR. 31, 1910.

1,001,153. Patented Aug. 22, 1911.

Fig. 2.

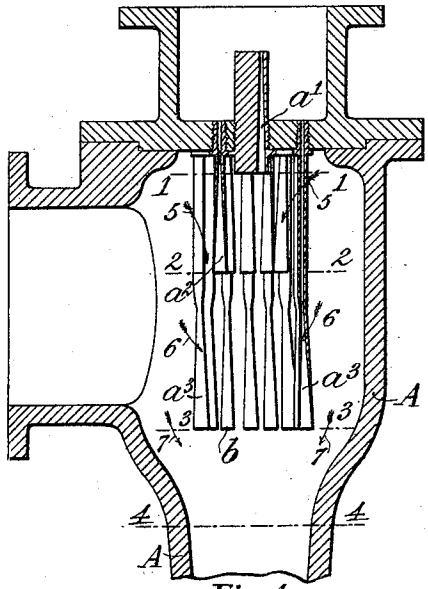
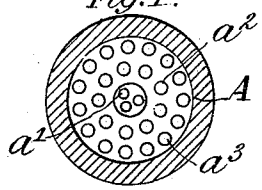


Fig. 1.



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MAURICE LEBLANC, OF PARIS, FRANCE, ASSIGNOR TO SOCIETE ANONYME POUR L'EXPLOITATION DES PROCEDES WESTINGHOUSE-LEBLANC, OF PARIS, FRANCE.

FLUID-EJECTOR.

1,001,153. Specification of Letters Patent. Patented Aug. 22, 1911.

Application filed March 31, 1910. Serial No. 552,581.

To all whom it may concern:

Be it known that I, MAURICE LEBLANC, a citizen of the Republic of France, residing in Paris, France, have invented certain new and useful Improvements in Fluid-Ejectors, of which the following is a specification.

This invention relates to an improvement in fluid ejectors and specially in apparatus of which the purpose is, to entrain a fluid by steam or gas projected at high speed so as to cause the fluid to pass from one receiver into another wherein the pressure is higher than in the first receiver The motive fluid employed by me in the said ejector may be steam or other elastic fluid, gas or vapor. Apparatus of this kind may be regarded as composed of three parts. In the first, consisting of one or several nozzles, a high speed is communicated to the motive elastic fluid, steam or gas. In the second, which may be called the mixer, the motive fluid entrains the second fluid by friction. In the third, which may be called the diffuser, the mixed fluids transform the kinetic energy into the work of compression.

The jet pump according to this invention is characterized by the particular arrangement of its nozzles and its mixer and this arrangement will be described with reference to the accompanying drawings.

Figure 1 is a cross section of the apparatus on line 4—4 of Fig. 2 which is a longitudinal section of the apparatus.

Since the entraining of one fluid by the other can only be due to friction, the motive elastic fluid is projected through a considerable number of nozzles a^1 a^2 a^3, of which the delivery orifices b are situated at the entrance of the diffuser A as shown in Fig. 1. This arrangement admits of developing as much as may be desired the surface of the motive stream, the friction with which is to serve the purpose in question. These nozzles a^1, a^2, a^3 are arranged so that their delivery orifices are uniformly distributed over the cross section of the entrance to the diffuser A (Fig. 1), in order that the fluid stream entering the diffuser may be as homogeneous as possible. But if the orifices of these motive nozzles were all on one plane the stream issuing from the nozzles of the outside zone would expand during the entraining of the other fluid in proportion as the speed of the motive fluid is reduced by the friction; they would thus form a screen which would prevent the surrounding fluid from penetrating into the central portion of the mixer. Experience has shown that in such an arrangement all of the motive streams behaves as a single stream the surface of which is channeled. The central streams have practically no entraining effect. In order to avoid this objection the nozzles are arranged in concentric zones in successive planes as represented in Fig. 2. In this figure it is supposed by way of example that there are 27 nozzles uniformly distributed on the circumferences of three concentric circles, namely, a circle of three nozzles a^1, a circle of 9 nozzles a^2 and a circle of 15 nozzles a^3. The apertures of such nozzles are situated in the planes 1—1, 2—2, 3—3 at different distances from the entrance to the diffuser, the plane 1—1, which contains the orifices of the central nozzles a^1, is the farthest from the entrance to the diffuser. The plane 2—2, containing the orifices of the nozzles of the intermediate zone a^2, is at an intermediate distance; while the plane 3—3, containing the orifices of the outside zone of nozzles a^3, is the nearest to the entrance of the diffuser proper A which entrance may be situated in the plane 4—4.

The fluid which is to be entrained by the motive streams issuing from the three central nozzles a^1 comes in contact with said streams by passing through the spaces between the other nozzles a^2, a^3, or the tubes carrying the nozzles as is indicated by arrows 5. The cross section of these spaces remains constant and cannot be obstructed by the spreading of the streams issuing from the nozzles of the two surrounding zones a^2, a^3. If the section of the spaces is sufficiently large for a fluid drawn in to traverse them at a low speed, this fluid comes into contact with the streams issuing from the central nozzles as if they alone existed.

The distance between planes 1—1 and 2—2 should be such that these central streams on arriving at the plane 2 have entrained that mass of fluid which they are capable of entraining; and their operation is not impaired by the fact that the streams issuing from the intermediate zone of nozzles forms a screen around the first-named streams.

The fluid to be entrained by the streams issuing from the nozzles a^2 of the inter-

mediate zone comes in contact with these streams after having passed through only the spaces of invariable section between the nozzles of the outside zone, following the course indicated by the arrows 6. When the motive fluid issuing from the nozzles of the intermediate zone arrives at plane 3—3 it has also entrained all the mass of fluid which it is capable of entraining and will not be affected by the fact that the surrounding fluid at the plane 3—3 is prevented from flowing toward these streams. Finally the fluid to be entrained by the streams issuing from the nozzles of the outside zone comes into contact with these streams by flowing along paths, such as those represented by the arrows 7. Owing, therefore, to this particular arrangement of the mixer the fluid to be entrained comes into contact with the streams of the central zone as easily as with those of the outside zone. In this manner not only is the available surface for friction thoroughly used, but there is forwarded into the diffuser the resultant stream which is homogeneous and has very approximately the same speed at all points. This is an essential of good output of the diffuser.

In Figs. 1 and 2 there are twenty seven nozzles distributed in three concentric zones. It will be understood that this number has been selected merely as an example and that the number of nozzles and of zones may be varied as desired.

In Fig. 2 it has been assumed that the pressure of the motive fluid requires nozzles of the converging-diverging type. The same arrangement applies to a case where the pressure of the motive fluid only requires the use of simple converging nozzles.

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 what I claim is:—

1. A jet apparatus provided with numerous separated motive fluid tubes arranged in a plurality of concentric stepped groups, and wherein the discharge orifices of the tubes nearest the axis of the apparatus are farthest from the entrance of the diffuser, and so disposed that as the distance between such discharge orifices and the axis of the apparatus increases, the distance between such discharge orifices and the entrance to the diffuser increases, whereby the fluid comes as easily into contact with the jets of the central group as with the jets of the exterior group and all the friction surface available is utilized, and there is projected into the diffuser a homogeneous stream having practically the same velocity at all points.

2. A jet apparatus having numerous motive fluid tubes, the orifices of which are of various distances from the entrance to the diffuser, the orifice of the innermost tubes being farthest therefrom, and the distances between the orifices of the remaining tubes and said diffuser entrance diminishing toward the outermost tubes which have their orifices nearest said diffuser entrance.

In witness whereof I have hereunto signed my name this 16th day of March 1910, in the presence of two subscribing witnesses.

MAURICE LEBLANC.

Witnesses:
D. KUBLANY,
H. C. COXE.