May 19, 1931. J. H. FORREST 1,806,287

EJECTOR

Filed March 13, 1929

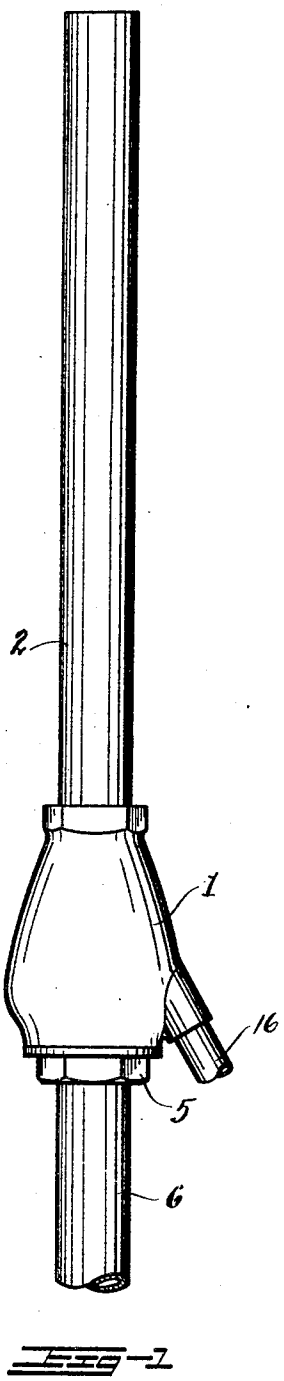


Fig-1

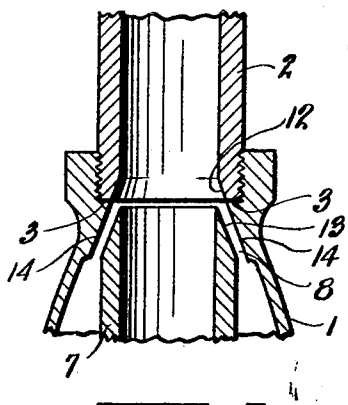


Fig-3

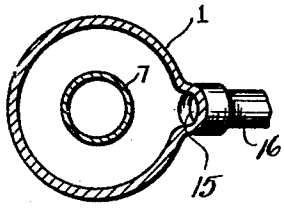


Fig-4

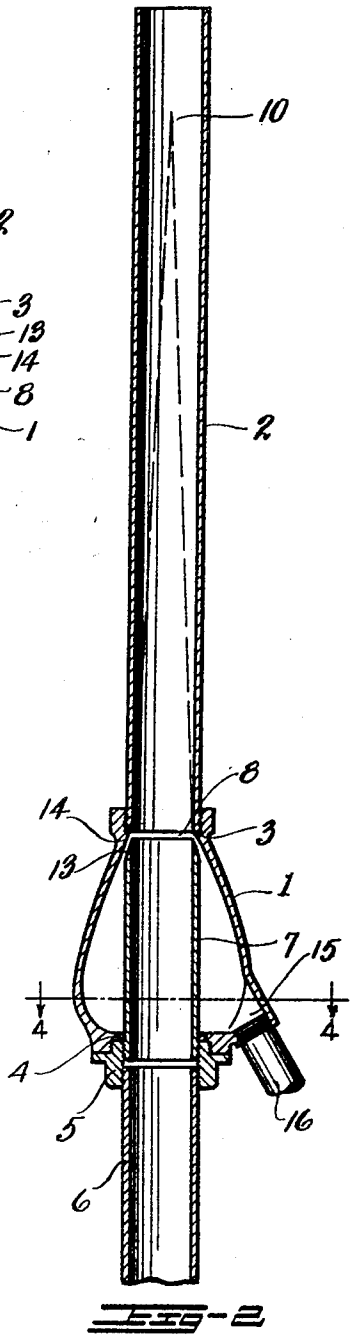


Fig-2

INVENTOR
JOHN HADDOW FORREST
BY
Cook & Robinson
ATTORNEY

Patented May 19, 1931 1,806,287

UNITED STATES PATENT OFFICE

JOHN HADDOW FORREST, OF SEATTLE, WASHINGTON, ASSIGNOR TO THE UNIVERSAL LIFTING APPLIANCE CO., OF SEATTLE, WASHINGTON, A CORPORATION OF WASHINGTON

EJECTOR

Application filed March 13, 1929. Serial No. 346,719.

This invention relates to improvements in ejectors, and has particular reference to apparatus of that character designed for the lifting, propulsion or conveyance of materials by use of a fluid pressure medium such as steam, air or water.

It is the principal object of the present invention to provide an ejector embodying certain novel features of construction whereby all fluid materials may be handled with greater ease and mechanical efficiency than by use of ejectors of types heretofore used and which is especially applicable to the transfer of such materials as grain, hogged fuel, coal and like materials not ordinarily capable of being conveyed by ejector apparatus.

More specifically stated, the present invention resides in providing an ejector in which the ejector tube or passage is straight, smooth and of uniform diameter throughout its length and wherein the pressure medium used for the ejecting operation is delivered into the ejector tube through an encircling annular slot directed thereinto in a manner designed to cause the pressure medium to form an elongated conical jet that comes to an apex just within the discharge end of the ejector passage at a distance designed to obtain the greatest possible efficiency in the ejector.

Other objects of the invention reside in the various details of construction and relationship of parts as will hereinafter be described.

In accomplishing these and other objects, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein—

Figure 1 is a side view of an ejector constructed in accordance with the present invention.

Figure 2 is a central, longitudinal section of the same.

Figure 3 is an enlarged sectional detail, showing the design of the annular inlet for delivery of the pressure medium into the ejector tube.

Figure 4 is a cross section taken on the line 4—4 in Figure 2.

Referring more in detail to the drawings—

1 designates the ejector housing, or casing, which, as here shown, is circular in cross section and is tapered from a rounded base end toward the opposite end to provide a substantially conical nozzle into the end of which is threaded a coaxially extending discharge tube 2. The tube 2 is limited in its inward adjustment by its inner end being seated against an annular shoulder, or abutment, 3 within the nozzle outlet.

At the larger, or base end of the housing 1 is a coaxially arranged opening 4 into which a nipple 5 is threaded. A tube, pipe or hose, designated at 6, is connected with the nipple to supply material to the ejector and threaded into the nipple and extending coaxially within the housing 1 and also in coaxial alinement with the tube 2, is a section of tubing 7 of the same internal diameter of tube 2 and terminating at its end in slightly spaced relation to the inner end of tube 2, so as to provide an annular passage 8 for the injection of a fluid pressure medium from the housing into the ejector passage provided by the tubes 2 and 7.

A feature of the present invention resides in the character of the passage 8 which is provided between the spaced ends of pipes 2 and 7. By reference to Figure 3, it will be observed that the ends of these pipes are beveled to a considerable degree so that the fluid pressure medium delivered therethrough will form a conical jet, as designated in dotted lines in Figure 2, which comes to an apex or point, as at 10, just within the outer end of the discharge pipe 2 and in the axial line of the ejector. The inner end surface 10 of the tube 2 is beveled with the same slope as the adjacent end surface 13 of tube 7 and this latter surface is substantially parallel to the adjacent inner wall surface, as at 14, of the housing 1, so that the flow of pressure medium will be unrestrained and no counter acting currents produced by deflection, and providing a conical jet of sufficient length to give maximum efficiency in the device.

The pressure medium used in the ejector is delivered into the lower or larger end of the housing through an inlet 15 into which a supply pipe 16 is threaded. The pressure medium used may be water, steam or air and the

pressure at which it is delivered is dependent on the particular use to which the device is to be put or material being ejected.

The axial line of the inlet 15 enters the housing 1 at an angle of approximately 60 degrees and is directed toward the discharge outlet in a line intersecting the axis of the tube 7 so that there will be no tendency to create a whirl within the housing and there will be no tendency to create an unevenness of pressures against the sides of the tube 7.

It is also intended that the cross sectional area of the inlet pipe 16 be somewhat greater than the area of the annular passage 8 so as to build up a pressure in the housing to maintain an equalization of pressure at all points through the passage.

The size of the annular passage 8 should vary for different pressure mediums used and this adjustment is provided for by threading the tube 7 farther from or into the nipple 5 so as to get an outlet of the desired size suitable for the pressure medium used.

With the device so constructed, it is used by extending the tubular connection 6 into the supply of material to be moved and attaching the housing to the source of pressure medium. The pressure medium delivered into the housing 1 passes with great force through the passage 8 and forms the elongated, conical jet within the tube 2 which, for all practical purposes, should be approximately 24 inches long and terminating about 2 inches beyond the apex of the jet. The injection of the pressure medium creates suction in one passage and draws material into the tube 7 and it is discharged by the pressure medium from the tube 2.

Ejectors of this type, due to the unrestricted and straight passage, are especially useful in the ejection of material of a semi-fluid character, such as sawdust, grain, coal, etc., not ordinarily movable through devices of this character. They have been found to be very efficient in handling fluids of a gritty character which cannot be moved by the ordinary pump without damage to the latter. The present device provides for creation of a vacuum of great efficiency, in an unrestricted passage. It is thereby differentiated from devices wherein there is a nozzle disposed within the passage and the material is caused to flow through an annular passage about the nozzle. Furthermore, the vacuum is created in the discharge pipe instead of in the ejector housing and the material handled, at no time touches the ejector housing. The angle at which the housing walls are tapered is such that a stronger suction is created in the ejector passage than is possible with devices of ordinary construction, and with less pressure. Also, the formation of the pressure chamber entirely about the tube 7 and the slight increase in area of the inlet over the discharge passage 8 insures an equality of pressure on all sides of pipe 7 so that it remains centered regardless of pressure used. The entire device is of simple construction and easily adjusted.

Such ejectors may be made in various sizes to suit various uses and different pressure mediums can be used.

Having thus described my invention, what I claim as new therein and desire to secure by Letters-Patent, is:

1. An ejector comprising a conically tapered housing with openings at opposite ends and having an inlet for connection with a source of fluid pressure medium at its larger end, the axial line of said inlet intersecting the axial line of the housing near its smaller end, said housing having a coaxially extending discharge pipe mounted in the opening at the smaller end, a supply conduit connected with the housing through the opening at its larger end, a tube mounted in the housing as a continuation of the supply conduit and terminating in spaced relation to the inner end of the discharge tube and producing, with the discharge tube, an ejector passage that is straight and of uniform diameter; the spaced ends of the said tubes being beveled to form an annular, intermediate passage whereby the fluid pressure medium will be delivered in an elongated, conical jet into the discharge tube toward its outer end.

2. An ejector comprising a conically tapered housing with openings at opposite ends and having an inlet at its larger end for a fluid pressure medium supply pipe; the axial line of said inlet intersecting the axial line of the housing near its smaller end, a discharge pipe mounted in the smaller end of the housing and extending coaxially therefrom, a nipple mounted in the opening of the larger end of the housing, a supply conduit connected with the housing through said nipple, a tube mounted in the nipple coaxially within the housing with its inner end terminating in spaced relation from the inner end of the discharge tube, the adjacent ends of the tube and the discharge pipe being beveled to form an annular, intermediate passage whereby the fluid pressure medium will be delivered in an elongated, conical jet within the discharge pipe; said tube being threaded into the nipple and adjustable therein to increase or decrease the area of the annular passage.

Signed at Seattle, Washington, this 27 day of February, 1929.

JOHN HADDOW FORREST.