

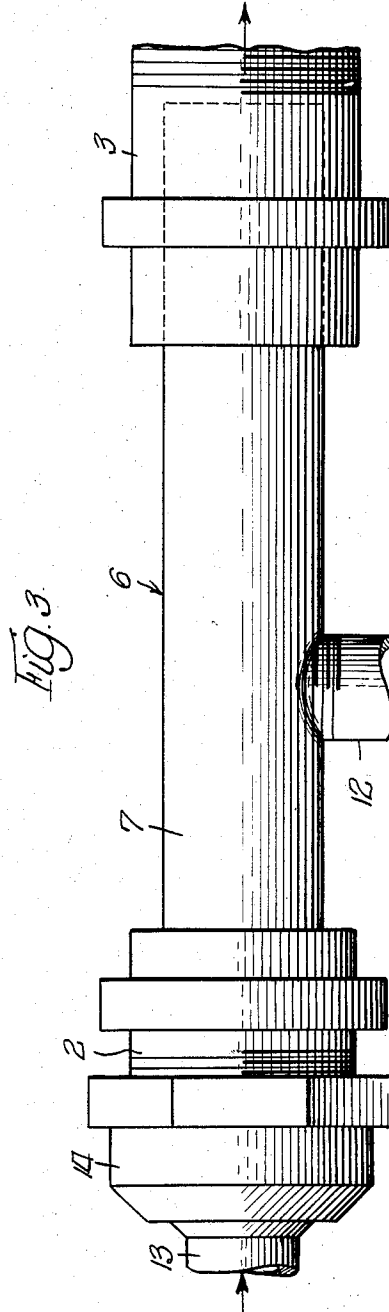
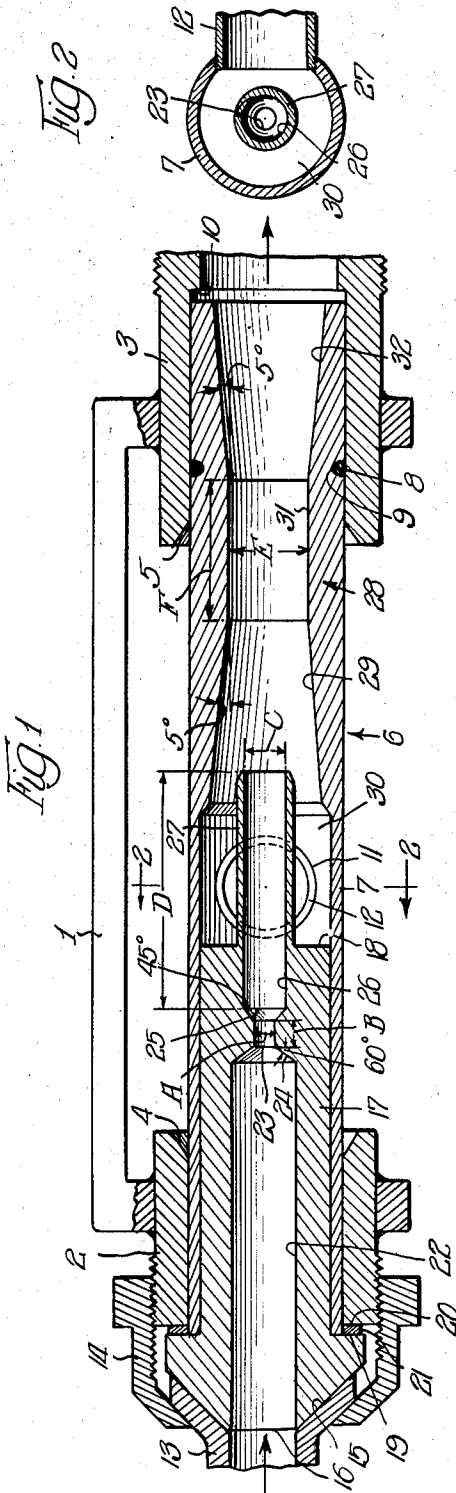
Nov. 11, 1958

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2,859,703

COMBINED JET PUMP AND REGULATOR

Filed June 1, 1955



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2,859,703

## COMBINED JET PUMP AND REGULATOR

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Application June 1, 1955, Serial No. 512,387

21 Claims. (Cl. 103—262)

This invention pertains to a combined jet type pump and flow regulator. Such pumps are also sometimes referred to as injectors. More specifically stated, this invention relates to improvements in a combined, readily demountable injector or jet type pump and flow restrictor or regulator and support arrangement therefor, wherein the entire jet pump or injector may be easily, quickly and readily removed from its support so that it may be interchanged with another pump of the same outer size but of different capacity or operating characteristics and/or wherein certain essential elements of the pump or injector, such as the regulator or restrictor and jet nozzle assembly are adapted to be readily removed and interchanged with other similar elements of the same general structure for varying the capacity and structure or performance characteristics of the improved injector or jet type pump.

Jet pumps embodying the present invention are particularly well adapted for use in the circulation of volatile refrigerants. An adaptation of the improved pump in a refrigeration system is disclosed and claimed in a companion, co-pending application entitled "Refrigeration System." The present invention will be described primarily as an improvement in a jet pump or injector particularly well adapted for use on refrigerants, even though the invention is also well adapted for other uses, and accordingly such description is not intended as a limitation of the invention.

In many instances, jet type pumps or injectors, adapted particularly for use in connection with the handling or pumping of volatile refrigerants in devices wherein it may from time to time be desirable to vary the refrigeration capacity of the device or wherein it may be desirable to vary the operating characteristics of the pump, are so constructed and arranged that adjustments may be made during the operation of the device or the pump. Invariably such adjustable arrangements contemplate the use of adjusting devices which must be protected by seals or gaskets to guard against the escape of refrigerants or vapors, thereby rendering such adjustable pumps relatively complicated and difficult to maintain in satisfactory operating condition.

In certain types of jet pumps adjustments in operating characteristics may be made by the interchange of associated devices or parts. In such instances, however, the task of making such interchange of associated devices or parts and the following essential readjustment of such prior art pumps is a cumbersome operation.

It is also commonplace to find that jet type pumps employed in the recirculation of refrigerants, unless properly protected, are frequently caused to operate improperly due to the objectionable effects of refrigerant entrained lubricating oils and scale and other foreign matter which tend to obstruct the operating parts of the jet pumps.

In the use of jet pumps for the circulation of refrigerants the capacity of such pumps and operating characteristics thereof frequently do not have a critical relation to the performance characteristics and capacity

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of the compressor or source of supply of the high pressure refrigerant or working substance. In many arrangements wherein jet pumps are utilized for the circulation of refrigerant to an evaporator, variations in refrigeration load result in abnormal variations in the pressure on the refrigerant or working substance delivered by the compressor to the jet pump, thereby adversely affecting the performance characteristics of the pump.

It is therefore one of the objectives of this invention to provide an improved jet type pump or injector of novel construction and design having a working fluid flow and pressure control orifice embodied therein ahead of the jet nozzle, wherein the flow and pressure control orifice and jet nozzle are integrally formed in a readily removable and interchangeable unit whereby to enable the adjustment of the capacity and performance characteristics of the pump to the existing needs, particularly when used for the pumping of volatile refrigerants, by the simple expedient of the substitution, in the pump, of a suitably selected orifice and nozzle assembly in replacement of an assembly having less desirable capacity and performance characteristics for the quantity and pressure of the working fluid supplied to the pump.

Another objective of this invention is to provide a controllable jet pump or injector adapted particularly well for the handling of volatile refrigerants and being so designed and constructed as to facilitate the smooth, instantaneous and continuous flow of refrigerant from the compressor-condenser means to the evaporator, variation in flow being automatic and dependent to an appreciable extent upon temperature and pressure condition in the low pressure side of the refrigeration system.

An additional objective of this invention is to so form and locate the refrigerant pressure regulating orifice or restrictor and the associated jet nozzle of the improved pump within the pump housing, and to provide a housing capable of readily transferring appreciable heat, whereby the heat of the pump casing and casing support and the heat of the high pressure refrigerant will be conducted to the orifice and jet nozzle, and whereby, upon the partial expansion of the refrigerant, upon flowing through the orifice, to prevent the collection and freezing within the pump of any moisture which may be present in the system.

A further objective of this invention is to provide an injector or jet pump of unitary, compact, novel tubular construction and design so as to adapt it to be easily and quickly assembled and operatively connected in readily releasable fashion to adjacent ends of aligned cylindrical pipe sections, whereby to adapt it for easy and quick partial or complete disassembly for the purpose of interchanging complete pump assemblies or interchanging elements embodying a pressure regulating orifice and expansion nozzle whereby to adjust the operating characteristics and capacity of the pump.

A still further objective of the invention is to provide a Venturi or suction device which is so designed that it will accomplish highly satisfactory suction results when used in a jet type pump having an appropriately selected and positioned jet nozzle operating on a working fluid such as a volatile conventional cycle or liquid refrigerant, or a refrigerant in the liquid, gaseous or vapor gas form, supplied through a pressure regulating orifice of fixed opening and critical capacity with respect to the capacity of the source of supply of the working fluid.

An additional objective is to provide, in a refrigerant flow regulator, an orifice of substantially cylindrical cross section with outwardly chamfered openings at both ends thereof for easy entry of the refrigerant into the orifice and for controlled partial expansion and easy flow of the refrigerant into a jet nozzle passage upon discharge from the pressure control orifice.

A still further objective of the invention is the provision of a novel device of the character described which is simple in construction and arrangement of operating parts, reliable and efficient in operation, readily and easily adjusted, inexpensively manufactured, and easy to assemble and disassemble in a refrigerating or other pumping system.

The foregoing and other objectives, important novel features and advantages of this invention will become more apparent and may be more easily understood upon consideration of the features of construction, combinations and arrangements of parts as set forth in the following description thereof and upon examination of the accompanying drawings and consideration of the appended claims. It should, however, be understood that, without desire of limitation, this invention will be described as an improvement in a jet type pump particularly adapted for the handling of volatile refrigerants. Certain changes and variations may suggest themselves to those skilled in the pertinent arts, which changes may not, however, depart from the spirit of this invention, and may come within the scope of the appended claims.

In the accompanying drawings:

Figure 1 is a horizontal, longitudinal, central, sectional view of the improved jet pump or injector and supporting arrangement;

Figure 2 is a vertical cross sectional view taken along line 2—2 of Figure 1 of the drawings; and

Figure 3 is a longitudinal, elevational view of the improved jet pump shown in section in Figure 1 of the drawings.

Referring to the drawings, wherein like elements are identified by like numerals, 1 represents generally a bracket or support element having respectively, as viewed in Figures 1 and 3 of the drawings, left hand and right hand coaxial, spaced, cylindrical end portions or hangers 2 and 3 of equal inner and of equal outer diameters. The hangers or end portions 2 and 3 have outwardly flared inner edges 4 and 5 respectively at their adjacent ends.

The improved jet type pump or injector which is generally identified by the numeral 6 is provided with a straight, cylindrical housing or body portion 7 which is snugly telescoped into and is coaxial with the cylindrical hanger elements 2 and 3 of the support bracket 1. The end of the housing 7 telescoped into the hanger element 3 may be releasably sealed thereto by an elastic O ring type seal 8 which sealingly engages the inner cylindrical surface of hanger 3 and is sealingly seated in the seal ring groove 9 in the outer periphery of the right hand end of the housing 7.

The assembly and disassembly of the pump 6 into and out of the hanger elements 2 and 3 of bracket 1, particularly in those instances where the pump 6 is equipped with the seal 8, is facilitated by the undercut or outwardly chamfered inner edges 4 and 5 of the elements 2 and 3. In certain instances the hangers 2 and 3 may be mounted in the side walls of a tank or the like to which convenient access may be had to the pump 6 only through one hanger element as for example the outer end of hanger element 2. In such instance the shoulder 10 provided on the interior of hanger element 3 spaced slightly from the adjacent end of the housing 7 will limit the possible motion of the housing 7 toward the right as viewed in Figure 1 of the drawings, should the pump 6 be partially disassembled in the removal operation, or should only part of the pump be removed for the purposes hereinafter mentioned.

The pump or injector 6 may be provided with a plurality of aspiration or suction ports. The illustrated embodiment of the invention includes one downwardly directed aspiration or suction port 11 into which has been threaded the end of a suction pipe 12. Obviously, in the event that the pump 6 is to be operated in a submerged condition, the suction pipe 12 would not be required,

and a number of circumferentially arranged ports 11 could be used as required by the particular operating conditions.

In the operation of the improved jet pump 6, as for example in the supplying of high pressure volatile refrigerant and the recirculation of low pressure refrigerant to an evaporator (not shown), the high pressure refrigerant or working substance is supplied through pipe 13 which is suitably clamped in a sealed manner by nut 14 to a nipple 15 surrounding the circular inlet port 16 formed coaxially in the cylindrical plug-like ported closure or flow passage element 17 snugly telescoped coaxially into the left hand end of the cylindrical housing 7 as viewed in Figure 1 of the drawings. The forward end 18 of flow passage element 17 extends into close proximity to the left hand edge of suction or aspiration port 11 and lies in a plane perpendicular to the common axis of the ported closure or plug 17 and housing 7. The laterally extending peripheral shoulder 19 on the plug 17 overlies and abuts against the left end of housing 7 and also partially overlies the adjacent end face 20 of hanger element 2. The annular sealing gasket 21 interposed between the juxtaposed surfaces of the shoulder 19 and end face 20, upon the tightening of the nut 14 which is threaded to the hanger 2, is sealingly compressed against shoulder 19 and end face 20 and against the outer periphery of the body or housing 7. The tightening of the single nut 14 also couples the supply pipe 13 to the pump 6 and securely locks the pump in position in the hangers 2 and 3 with the suction or aspiration port 11 between the spaced adjacent ends of the hangers 2 and 3. As thus assembled the pump is demountably supported in and releasably sealed to the hanger elements 2 and 3 from which assembly the entire pump 6 or if desired only the flow passage element 17 may be withdrawn by the uncoupling of the single nut 14.

The plug or ported closure element 17 is of relatively heavy construction and is fitted snugly into housing 7 which in turn is fitted snugly into hanger elements 2 and 3 so as to provide good heat transfer for the purposes hereinafter to be explained.

The working fluid or substance, such as compressed or high pressure volatile refrigerant either in liquid, gaseous, or vapor gas form, enters the pump 6 through inlet port 16 and flows through the cylindrical bore or central passage or port 22 which is coaxial with the hollow closure or plug 17 over to the coaxial and cylindrical pressure and flow regulating orifice or restrictor chamber 23 located at the right hand end of the bore or refrigerant supply chamber 22 in the ported closure or plug 17. Orifice 23 has a sixty degree chamfered inlet 24 and a forty-five degree chamfered outlet 25 emptying into the coaxial and cylindrical inspirator jet nozzle passage 26 in the coaxial and cylindrical inspirator nozzle element 27 projecting from the right hand end face 18 of the flow passage element or plug 17.

The diameter A of the orifice chamber or restrictor 23 is always less than the length B thereof. The diameter C of the inspirator or jet nozzle passage or chamber 26 is never less than the diameter A nor the length B of orifice 23 and is always appreciably less than the length D of the passage or chamber 26.

In the use of the improved jet pump 6 for the pumping of volatile refrigerants, such for example as Freon, the selection of the size of the pressure regulating restrictor or orifice 23 in the insert member or plug 17 is based on and has a critical relation to the capacity and operating characteristics of the refrigerant compressor used for compressing the refrigerant supplied to pump 6. Obviously, one of the great advantages offered by this invention is the ease and readiness with which, upon the loosening of one nut, the interchangeable insert member or plug 17 in pump 6 may be interchanged with different insert or closure members 17 so as to secure the desired size of orifice chamber 23 adapted to function to permit the desired quantitative flow of refrigerant at the desired pres-

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sure through the inspirator jet nozzle passage or chamber 26. Such resulting flow of refrigerant is based upon the critical relationship established by such selection between the size of the orifice and the operating characteristics and capacity of the refrigerant compressor (not shown), and the suction pressure to which the evaporator (not shown) is subjected.

The location of the pressure and flow regulation orifice 23, which is positioned in the heavy shank portion of the plug or insert member 17 immediately ahead of the jet nozzle passage 26, the intake end of which is also located in the heavy shank portion of the plug or closure 17, provides for the partial expansion of the refrigerant as it enters the jet nozzle passage 26 from the orifice 23. That arrangement, due to the heat conductivity of plug 17, housing 7, and bracket element 2 and 3, prevents any objectionable "freezing-on" at orifice 23 and nozzle 27 of condensate which may be present in the refrigerant and also thereby prevents the entry of hot gas into the Venturi section 28. That arrangement also assures increased speed in the discharge of refrigerant from the end of the nozzle 27 into the coaxially arranged Venturi element or discharge passage generally identified by the numeral 28, formed integrally with the housing 7 in the right hand end thereof as viewed in Figure 1 of the drawings.

The length of the jet nozzle 27 is such as to extend from the end face 18 of plug element 17 centrally through the housing 7 into the intake or suction or combining or contracting end 29 of the Venturi element 28. The nozzle 27 overlies the aspiration port 11 opening through housing 7 into the aspiration chamber 30 through which the nozzle 27 extends longitudinally. The aspiration chamber is formed coaxially in housing 7 between the end face 18 of plug 17 and the confining, or inspirator or receiving end 29 of the Venturi element 28.

The rapidly flowing jet of working fluid being projected from the inwardly chamfered end of the nozzle 27 through the contracting or combining entrance or intake section or chamber 29 and cylindrical throat or chamber 31 of the Venturi element 28 produces the suction which draws the material to be pumped through the pipe 12 and port 11 into the aspiration chamber 30 from whence it is drawn into and through the contracting or combining section or portion 29 and throat chamber 31 of the Venturi element 28. During such flow the pumped material blends with the jet of working substance or fluid supplied by nozzle 27 and is forced together with the working substance or fluid from the pump 6 through the expander or discharge or delivery section or end 32 of the Venturi element 28.

The entrance section or portion 29 and the expirator or forcer tube portion or section 32 of the Venturi element 28 are both frusto conical in shape and have their respective truncated apex ends joined to the adjacent ends of the throat portion 31. The contracting or combining or inspirator portion 29 and expanding or expirator or forcer portion or chamber 32 and the throat portion 31 of the Venturi element 28 are all coaxial with the orifice 23 and the inspirator or jet nozzle passage 26 and housing 7. The length F of the throat 31 of Venturi element 28 is never less than the diameter E thereof, and the diameter E of the throat 31 is always in excess of and generally at least twice the diameter C of the jet nozzle passage 26. It has been found that desirable results can be obtained if the frusto conical wall of the contracting entrance or blending chamber 29 as well as the frusto conical wall of the expanding discharge chamber 32 of the Venturi element 28 extend at an included angle of five degrees to the central axis of the Venturi element 28.

From the foregoing description of this invention and from the accompanying drawings, it will be apparent that this invention realizes the inductorily enumerated objectives respecting the improved jet type pump, which pump possesses the hereinbefore listed advantages and

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provides a new, unique and useful arrangement in a readily adjustable jet type pump.

Having thus described and illustrated an embodiment of this invention in a jet type pump, the invention is not to be interpreted as being restricted to the specifically illustrated embodiment as set forth in the drawings and as hereinbefore specifically described except insofar as is necessitated by the disclosure of the prior art and the appended claims.

The invention is claimed as follows:

1. A device of the class described comprising, in combination, jet pump support means comprised of spaced and cylindrical and equal diameter lengths of tubing fixed in coaxial arrangement, a jet pump having a cylindrical housing wall and having its opposite ends snugly telescoped into the adjacent ends of said lengths of tubing, a lateral aspiration port in the cylindrical wall of said jet pump intermediate the adjacent ends of said tubing, seal means releasably sealing the respective ends of said jet pump to the associated one of said lengths of tubing, and a unitary locking means releasably engaging one of said lengths of tubing for securing said jet pump to such one of said lengths of tubing.

2. A device according to claim 1, wherein said locking means also comprises seal compression means, whereby to sealingly compress the seal means against both said pump and the one of said lengths of tubing engaged by said locking means.

3. An improved jet pump comprising, in combination, cylindrical and axially aligned and equal diameter tubular support elements, a cylindrical and substantially tubular jet pump housing telescoped into and snugly fitted into said support elements, a cylindrical and hollow flow passage and closure means in the inlet end of said housing and including centrally thereof a supply chamber for fluid under pressure and an orifice chamber and a nozzle chamber, a laterally ported aspiration chamber in the medial portion of said housing, a converging blending chamber and a throat chamber and a diverging delivery chamber in the discharge end of said housing, all said chambers having a common longitudinal axis and being arranged coaxially with said housing and in series in the order mentioned, said throat chamber being of greater diameter than said nozzle chamber and said nozzle chamber being of greater diameter than said orifice chamber, the included angle of the walls of both the said blending chamber and the said delivery chamber being five degrees to the common longitudinal axis, seal means releasably sealing said flow passage means to said pump housing and to the adjacent one of said support elements, and a single pump retaining and seal compression element secured to said adjacent one of said support elements for compressing said seal means into the mentioned sealing engagement and for releasably locking the pump housing and flow passage means in operative position and to said adjacent one of said support elements.

4. A jet pump comprising, in combination, spaced support means, cylindrical housing means of unitary construction secured at one end thereof to said support means, port means in said housing means communicating with the space outwardly of said housing means intermediate the adjacent ends of said spaced support means, a cylindrical and tubular flow passage means axially aligned with and snugly telescoped into one end of said housing means and releasably sealed to said housing means adjacent one end of said flow passage means, said housing means having in the other end thereof a coaxial Venturi element including a cylindrical throat coaxial with said housing means and an outlet flared outwardly in one direction to a discharge station and an inlet flared outwardly in the opposite direction, a cylindrical jet nozzle element coaxial with said flow passage means, said jet nozzle means being tubular and having a fluid passage of a diameter substantially less than the inner diameter of said throat and extending toward the outwardly flared inlet

end of said throat, said jet nozzle extending axially over said port means in said housing means, and an aspiration chamber within said housing means intermediate the inner end of said flow passage means and said Venturi element, said port means opening into said aspiration chamber.

5. In an injector of the class described, the combination of, an elongated hollow cylindrical housing having a lateral aspiration port, a Venturi element formed in one end of said housing longitudinally of and coaxial therewith, said Venturi element having a frusto conical outwardly flaring receiving end and a frusto conical outwardly flaring discharge end and a cylindrical throat portion coaxial with said housing and intermediate the concentric adjacent apex portion terminals of said receiving end and said discharge end of said Venturi element, an elongated and cylindrical hollow plug type closure for the end of said housing snugly telescoped slidably into said housing and engaging the housing throughout substantially the entire length of said closure in the portion of said housing opposite said Venturi element and having a coaxial and cylindrical and longitudinal passage extending inwardly from the outer end thereof and supporting a cylindrical inspirator jet nozzle element which is formed integrally with said closure and which jet nozzle element extends coaxially with said housing and with said closure from the inner end of said closure toward the receiving end of said Venturi element, said inspirator jet nozzle element overlying said aspiration port and communicating with the aspiration chamber formed in said housing intermediate the inner ends of said closure and the Venturi element and said housing and said closure being releasably secured together in predetermined relative axial and transverse position with respect to one another, and orifice means formed within said closure and defining the entrance into said jet nozzle element and defining the discharge end of the passage in said closure.

6. An injector comprising, in combination, a cylindrical housing, a pressure inlet passage means for conducting an actuating stream of fluid into said housing, a lateral aspiration passage in the wall of said housing for the entrance of material to be entrained by said actuating stream of fluid, and a discharge passage means comprising a Venturi element formed in said housing for the discharge from said housing of the combined actuating stream and entrained material, said pressure inlet passage means including a jet nozzle means and a fluid flow and pressure controlling orifice means, said orifice means being positioned ahead of said jet nozzle means and defining the entrance to said jet nozzle means, said jet nozzle means being an integral part of said pressure inlet passage means and formed at one end of and coaxially with the longitudinal axis of said pressure inlet passage means, said inlet passage means being in the general form of a hollow cylindrical plug, said plug being snugly telescoped slidably into the end of said housing opposite said Venturi element and being provided with a peripheral flange at its one end engaging the adjacent end of said housing whereby to accurately position said jet nozzle with respect to said Venturi element, and securing means for maintaining said flange in engagement with the adjacent end of said housing.

7. An injector comprising, in combination, a housing, a cylindrical aspiration chamber formed in said housing and having a lateral aspiration opening, a delivery passage formed integrally in the discharge end of said housing and extending longitudinally from said aspiration chamber and axially aligned therewith, said delivery passage having a restricted throat portion and an outwardly flared receiving end communicating with the aspiration chamber and an outwardly flared discharge end, a cylindrical and ported closure for the inlet end of said housing, a cylindrical jet nozzle element integrally formed with said ported closure and of lesser outer diam-

eter than said ported closure and axially aligned with said aspiration chamber and said ported closure and extending into said aspiration chamber from the inner end of said ported closure and overlying said lateral aspiration opening, said jet nozzle element having an inwardly tapered free end spaced from and opposite the outwardly flared receiving end of said delivery tube, and a pressure and flow restricting orifice formed in said ported closure and defining the inlet end of said jet nozzle.

8. In a device of the character described, the combination of, a cylindrical and tubular body portion, a lateral suction port intermediate the ends of said body portion, a Venturi member comprising an integral part of said body portion and positioned in one end of said body portion to one side of said port, and a cylindrical and centrally ported closure element slidably telescoped into and fitted to the end of said body portion opposite said Venturi member and having a projecting cylindrical nozzle element overlying said port adjacent said Venturi member and forming with said body portion and with said Venturi member a cylindrical aspiration chamber intermediate said closure element and said Venturi member, said closure element including a restricted orifice portion defining the entrance into the opening of said cylindrical nozzle element.

9. A jet pump comprising, in combination, a pump housing having two ends, a Venturi element in one end of said housing, a ported closure element for the other end of said housing for receiving working fluid, an aspiration chamber within said housing intermediate said ported closure and said Venturi element, an aspiration port opening laterally from said aspiration chamber through said housing, a jet nozzle means communicating with the port in said closure and comprising part of said closure and extending from said closure toward said Venturi element through said aspiration chamber, and orifice means within said ported closure element and defining the entrance to said jet nozzle means for restricting the pressure and controlling the flow of working fluid flowing from the port in said closure element into said jet nozzle means.

10. A jet pump according to claim 9, wherein said housing, and said ported closure, and the port in said closure, and said jet nozzle means, and said orifice means are all cylindrical and coaxial.

11. A jet pump according to claim 9, having a hanger element provided with a cylindrical bore into which the end of said housing which is provided with said ported closure element is snugly telescoped said housing having a cylindrical outer surface and the bore in said hanger element being cylindrical and being coaxial with the outer surface of said housing, a laterally extending annular flange on the outer end of said closure element overlapping the adjacent end of said housing and partially overlapping the adjacent end of said hanger element, a compressible annular seal element intermediate and sealingly engaging the juxtaposed faces of said flange and said hanger element and sealingly engaging the outer periphery of said housing, and a single nut threaded to the outer periphery of said hanger element, said nut having an inwardly extending flange overlapping the outer end of said closure, whereby upon the tightening of said nut said seal element will be sealingly compressed against said hanger element and against said housing and against the flange on said closure and said pump will be locked in position in said hanger element.

12. A jet pump according to claim 9, having a cylindrical jet nozzle passage extending from within said ported closure element partially through said closure and through said jet nozzle means, and wherein the length of the throat of said Venturi element is greater than the diameter of said throat and said diameter of said throat is greater than the diameter of said jet nozzle passage and the length of said jet nozzle passage is greater than the said diameter of said jet nozzle passage

and said diameter of said jet nozzle passage is greater than the diameter of the orifice in said orifice means, and the diameter of the orifice in said orifice means is less than the length of the orifice in said orifice means.

13. An injector device of the class described comprising, in combination, an inlet element having an inlet passage for receiving actuating fluid, a suction chamber element axially aligned with and communicating with said inlet element and having an inlet passage for receiving the material to be entrained, and an outlet element axially aligned with and communicating with said suction chamber element and having a Venturi type outlet passage for receiving from said inlet element and from said suction chamber the actuating fluid and entrained material, said inlet element including at the end thereof adjacent said suction chamber a ported jet nozzle adapted to discharge actuating fluid and also including a restricted orifice portion defining the entrance to the port in said jet nozzle, the transverse cross-sectional area of the opening in said restricted orifice portion being of lesser dimension than the transverse cross-sectional area of the port in said jet nozzle.

14. A jet pump comprising, in combination, a pump housing having two ends, a Venturi element in one end of said housing, a ported closure element for the other end of said housing for receiving working fluid, an aspiration chamber within said housing intermediate said ported closure and said Venturi element, an aspiration port opening laterally from said aspiration chamber through said housing, a jet nozzle means communicating with the port in said closure and comprising part of said closure and extending from said closure toward said Venturi element through said aspiration chamber, and orifice means within said ported closure element and defining the entrance to said jet nozzle means for restricting the pressure and controlling the flow of working fluid flowing from the port in said closure element into said jet nozzle means, said closure element includes said orifice means and is of relatively heavy construction immediately surrounding said orifice means and adjacent to the end of said jet nozzle means, and wherein said closure element is snugly telescoped into said housing in good heat conductivity arrangement, whereby heat may be readily transferred from said housing and from all portions of said closure element to the locus of said orifice means.

15. A jet pump comprising, in combination, a pump housing having two ends, a Venturi element in one end of said housing, a ported closure element for the other end of said housing for receiving working fluid, an aspiration chamber within said housing intermediate said ported closure and said Venturi element, an aspiration port opening laterally from said aspiration chamber through said housing, a jet nozzle means communicating with the port in said closure and comprising part of said closure and extending from said closure toward said Venturi element through said aspiration chamber, and orifice means within said ported closure element and defining the entrance to said jet nozzle means for restricting the pressure and controlling the flow of working fluid flowing from the port in said closure element into said jet nozzle means, spaced hanger elements with ad-

acent ends, said hanger elements being provided with coaxial and cylindrical bores and having the opposite ends of said housing snugly telescoped into said coaxial and cylindrical bores of said spaced hanger elements.

16. A jet pump according to claim 15, wherein said spaced hanger elements have adjacent ends and wherein the inner adjacent ends of the bores in said spaced hanger elements are chamfered outwardly.

17. A jet pump according to claim 15, wherein the ends of said housing are each releasably sealed to the adjacent end of said spaced hanger elements.

18. A jet pump according to claim 15, wherein one end of said housing is releasably locked to the adjacent one of said spaced hanger elements.

19. A jet pump according to claim 18, wherein the one of the spaced hanger elements opposite to the one of the spaced hanger elements to which the housing is releasably locked is provided in its bore with shoulder means extending inwardly beyond the outer adjacent periphery of said housing.

20. A jet pump according to claim 19, having an annular circumferential groove in the outer periphery of said housing, and an annular and elastic seal element sealingly seated in said groove and sealingly engaging the periphery of the bore of the adjacent one of said spaced hanger elements.

21. A jet pump comprising, in combination, a pump housing having two ends, a Venturi element in one end of said housing, a ported closure element for the other end of said housing for receiving working fluid, an aspiration chamber within said housing intermediate said ported closure and said Venturi element, an aspiration port opening laterally from said aspiration chamber through said housing, a jet nozzle means communicating with the port in said closure and comprising part of said closure and extending from said closure toward said Venturi element through said aspiration chamber, and orifice means within said ported closure element and defining the entrance to said jet nozzle means for restricting the pressure and controlling the flow of working fluid flowing from the port in said closure element into said jet nozzle means, said Venturi element comprises a frusto conical intake or combining portion joined at its apex or discharge end to a coaxial cylindrical throat portion and a coaxial frusto conical discharge or expirator portion joined at its apex or receiving end to the opposite end of said coaxial throat, and wherein the coaxial walls of said frusto conical intake portion and said frusto conical discharge portion extend at an included angle of five degrees to the longitudinal common axis of said throat and said frusto conical intake portion and said frusto conical discharge portion.

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