March 30, 1965 B. L. CHEELY 3,175,515

JET SUCTION DEVICE

Filed March 22, 1963

Fig. 1

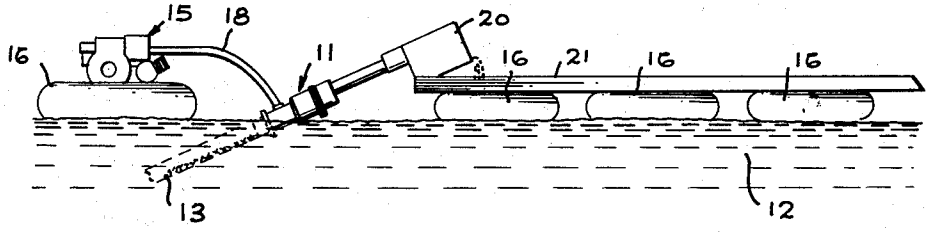


Fig. 2

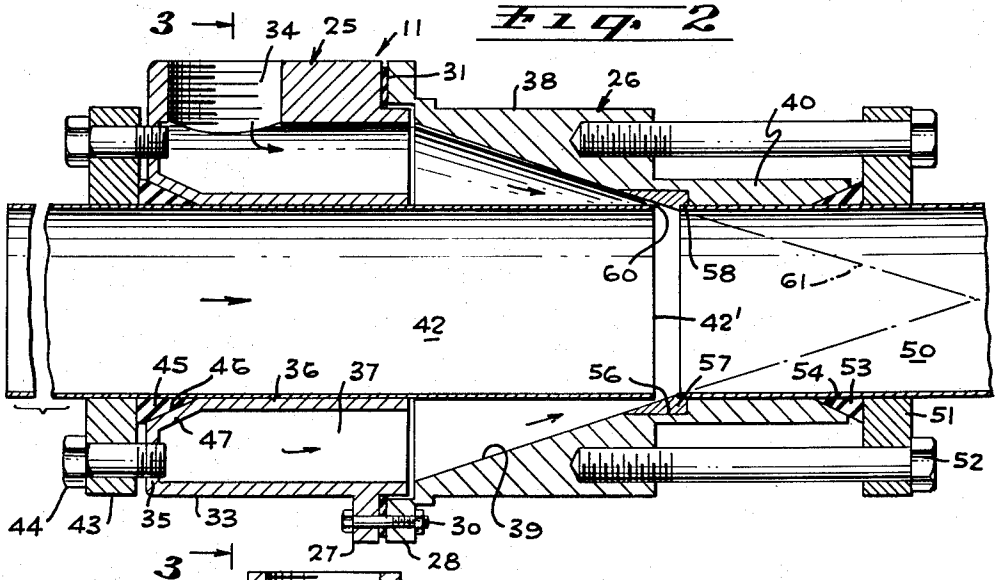
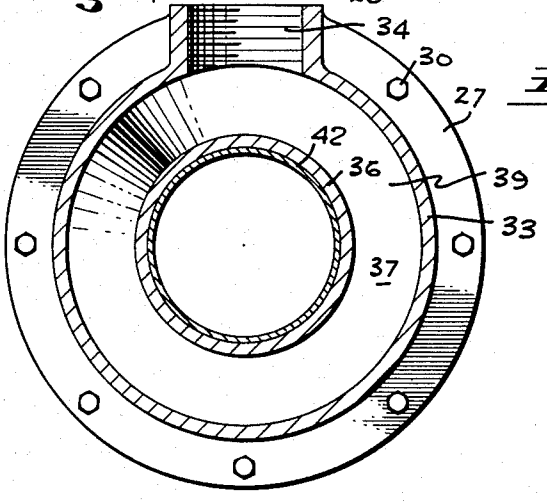


Fig. 3



BURL L. CHEELY
INVENTOR.

BY

Mason & Graham

ATTORNEYS

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JET SUCTION DEVICE

Burl L. Cheely, 3534 W. Rosecrans, Hawthorne, Calif.

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This invention has to do generally with jet suction devices and particularly with such devices as are useful for moving a mixture of rocks, sand and gravel using water as the fluid medium, such as in stripping such materials from a stream bed in placer mining operations.

An object of the invention is to provide a new and improved, jet or injection type suction device designed for use in moving solids such as sand and gravel entrained in a liquid medium such as water.

Another object is to provide a highly efficient device of the type indicated which produces a relatively high vacuum in the suction tube portion of the device capable of flowing a mixture of liquid and solids with a very high percentage of solids.

A further object is to provide a novel construction in which the parts can be easily assembled or readily removed for replacement, and to provide a construction wherein the jet orifice can be adjusted in several different ways.

Another object is to provide a durable, efficient and relatively light-weight device.

These and other objects will be apparent from the drawing and the following description.

Referring to the drawings:

FIG. 1 is a side elevational view, somewhat diagrammatic, of apparatus embodying the invention shown in a typical environment;

FIG. 2 is a central longitudinal sectional view through a device embodying the invention; and

FIG. 3 is a cross-sectional view on line 3—3 of FIG. 2.

More particularly describing the invention, as previously indicated, the jet suction device, designated **11**, is designed particularly for raising sand and gravel from a stream bed in placer mining operations, although it may be used for other purposes. Thus, as shown in FIG. 1, the device **11** is normally located relatively close to the surface of the water **12** of a stream and is provided with a suction hose **13** of desired length leading to the stream bed. A motor-driven pump unit **15** is shown on a float **16** and this supplies water under pressure to the unit **11** through a hose **18**. The device **11** discharges the material picked up from the stream bed and the water into a flow control box **20** at the head of a sluice **21**, the latter two elements being supported upon a series of floats **16**.

Referring more particularly to the details of construction as shown in FIGS. 2 and 3, the unit **11** includes a housing consisting of two main housing members, namely an upstream housing member **25** and a downstream housing member **26**. These members are provided with flanges **27** and **28** respectively and the parts are secured together by bolts **30** passing through the flanges, a suitable gasket **31** being provided.

The upstream housing member **25** is annular in shape and is provided with an outer wall **33** having an inlet opening or port **34**. The member has an end wall **35** and an inner or re-entrant wall **36** which is cylindrical and which, together with the outer wall **33**, defines an annular chamber **37** which is open at its downstream end.

The downstream housing member **26** comprises an upstream section **38** which is characterized by frusto-conical or conoidal inner surface **39** which diverges in the direction upstream to a diameter substantially equal to the inner diameter of the wall **33** of housing member **25**. The member **26** has a downstream cylindrical section or end portion **40** having an internal diameter substantially the same as the internal diameter of wall **36** of the other housing member.

A suction tube **42** is mounted in the upstream housing member **25** and projects into the downstream housing member nearly to the small diameter end of the conoidal face **39**. The suction tube is held in place by an annular ring **43** which is secured to the housing **25** by screws **44**. The ring serves to compress a seal ring **45** of neoprene or other suitable material between it, tube **42** and housing member **25**, the seal ring being partially received within a recess **46** defined by the suction tube and a flared section **47** of the inner wall **36** of the housing member.

A discharge tube **50** is mounted in the end portion **40** of housing member **26** and is secured there by an annular ring **51**, bolts **52** passing through the ring and threaded into the housing member, and by a seal ring **53** provided between ring **51**, tube **50** and section **40** of housing member **26**. The wall or section **40** is provided with an outwardly beveled end wall **54** to accommodate the ring. It is desirable to provide a recess **56** in the housing member **26** at the small diameter end of the conoidal section or face **39** to receive a wear-resistant ring **57**. The latter has an annular groove **58** to receive the inner end of the discharge tube so that the latter is positioned outside a projection of the face **39** inside the tube.

It will be apparent that with the suction tube **42** adjusted so that its inner end **42'** is spaced from the surface or face **39**, an annular orifice **60** is formed furnishing an outlet for pressure fluid introduced through port **34** into chamber **37**. The pressure fluid passing through the orifice tends to form a cone **61** within the discharge tube and forms in effect a perfect aqueous seal which moves out the discharge tube thereby inducing a relatively high vacuum in the suction tube **42**. The size of orifice **60** can be adjusted by moving the suction tube **42** axially within the housing member **25** or by means of various sized gaskets placed between the flanges **27** and **28** of the two housing members. In actual practice I have found that as high as 80% solids can be moved in a stream of water through the device. In operation, the device can be used as shown in FIG. 1 and previously described; however it is also effective for other uses and can be used at any angle.

The parts of the housing may be cast of any suitable metal, such as steel, bronze, aluminum or the like and it will be apparent that the device is easily assembled and disassembled, enabling easy replacement of parts.

Although I have shown and described preferred forms of my invention, I contemplate that various changes and modifications can be made therein without departing from the invention, the scope of which is indicated by the following claims.

I claim:

1. A jet suction device comprising an annular, open-ended housing having an intermediate section with a conoidal inner face, a suction tube mounted in said housing and extending therein from the upstream end of the housing beyond the large-diameter upstream end of said inner face through said intermediate section substantially to the small-diameter downstream end of said inner face, said housing having an annular inner wall extending for a substantial distance inwardly of the housing from the upstream end thereof and closely receiving and supporting said suction tube, said housing and suction tube together defining a high pressure liquid chamber, said housing having an inlet to said chamber, and a discharge tube mounted in said housing beyond and in axial alignment with said suction tube, said suction tube and said conoidal inner face of said intermediate section of said housing

defining an annular orifice for escape of pressure liquid from said chamber into said discharge tube, said suction tube being adjustable axially in said housing to vary the size of said orifice.

2. A jet suction device, comprising an annular upstream housing member having spaced inner and outer walls defining an annular chamber open at the downstream end of the member, an annular downstream housing member attached to the downstream end of said upstream housing member, said downstream housing member having a downstream end portion in axial alignment with the inner wall of said upstream housing member and having an upstream end portion provided with a conoidal face diverging in a direction upstream, a suction tube mounted in the inner wall of said upstream housing member and extending into the upstream end portion of the downstream housing member, said suction tube together with said upstream end of said downstream housing member forming a continuation of said annular chamber and defining an annular orifice at the small-diameter end of said conoidal face, a discharge tube mounted in the downstream end of said downstream housing member, said housing members having annular recesses in their opposite ends adjacent the tubes therein, a seal ring in each recess, a seal ring compressing ring on each tube against the seal ring of the end of the adjacent housing, and bolts securing said rings to the housings.

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LAURENCE V. EFNER, *Primary Examiner.*

WARREN E. COLEMAN, *Examiner.*