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SAND SUCTION APPARATUS

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Fig. 1

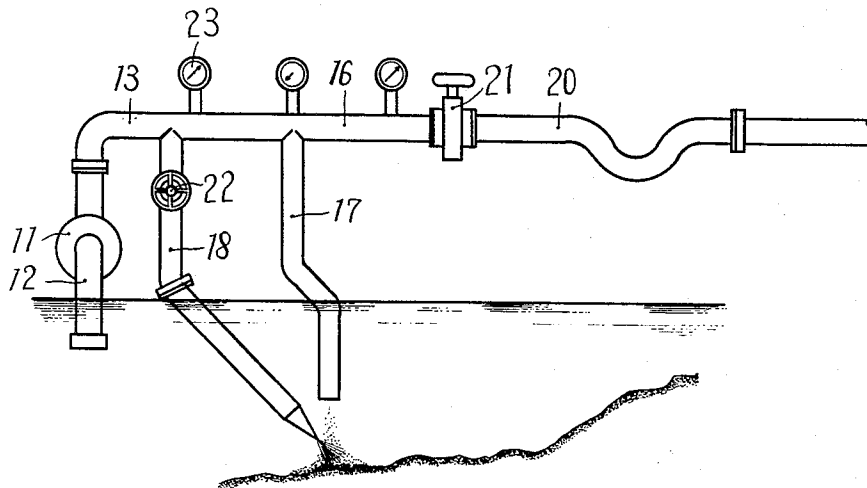
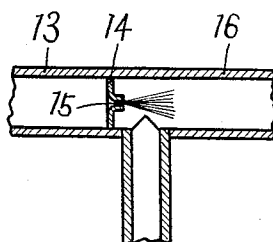


Fig. 2



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SAND SUCTION APPARATUS

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2 Claims. (Cl. 302—14)

This invention relates to a sand suction apparatus, more particularly to a sand suction apparatus of the type employing jet action, and has for an object the improvement of such apparatus.

With this object in view, the present invention provides a sand suction apparatus in which a partition plate having an orifice is fitted in a delivery pipe of a water pump so as to form a vacuum pipe, which is provided with a sand suction pipe close by the orifice, and the delivery pipe is provided with an injection pipe having a nozzle at the end thereof to agitate earth or sand by spurting out water. A discharge pipe is connected with the vacuum pipe, and fitted with a cut-off valve exemplified as a sluice or gate valve, beyond the junction of the vacuum pipe.

According to the present invention, pumping water being spurting out from the orifice so as to produce a vacuum in the vacuum pipe, earth or sand at the bottom of the water is sucked up into the sand suction pipe and then discharged from the discharge pipe. Furthermore, water is spurting out from the nozzle of the injection pipe at the earth or sand close by the end of the sand suction pipe so as to agitate it. Also, when the sand suction pipe is clogged with earth or sand it can be put in order by closing the sluice valve so as to cause flow of pumping water into the sand suction pipe.

It will be understood that the pressure head due to the pumping action produces flow of water into the delivery pipe, and this water is spurting from the orifice to produce a vacuum which gives suction head in the sand suction pipe. Therefore, the height of the vacuum pipe should be lower than the effective head in the sand suction head, i.e., the difference in the suction head and the friction and velocity heads. When the water velocity in the sand suction pipe is larger than the minimum necessary for sucking sand, the sand sucking action will be automatically effected. Also, since the pump is employed in the present invention only to move water for producing the pressure heads for operating the suction jet and the agitating jet, and when necessary for clearing obstructions from the sand suction pipe, it may be of lower capacity and cheaper construction than would be required if it sucked sand directly.

Other and further objects of the present invention will become apparent from the following specification and claims taken together with the accompanying drawings, in which is shown the preferred embodiment of the sand suction apparatus of the present invention, and in which

Fig. 1 is a general elevation view of a sand suction apparatus embodying the present invention and

Fig. 2 is a sectional view showing an orifice.

In these drawings, reference numeral 11 indicates a pump provided with a suction pipe 12 and a delivery pipe 13 respectively. In the delivery pipe 13 is fitted a partition plate 14 having an orifice 15 at the center thereof to form a vacuum pipe 16, which is provided with a sand suction pipe 17 near to the orifice 15. The delivery pipe 13 is provided with an injection pipe 18 having a nozzle 19 at the end thereof to agitate earth or sand near by the end of the sand suction pipe 17 by spurting out water. A discharge pipe 20 is connected with the vacuum pipe, and fitted with a sluice valve 21

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at the junction with the vacuum pipe. 22 and 23 indicate a valve and a pressure gauge respectively.

In operation, the stream from nozzle 19 produces a sand slurry adjacent the inlet of suction pipe 17, through which the slurry is sucked by the reduced pressure in the vacuum pipe 16. In the event of clogging of the suction pipe 17 or its inlet, closing of the gate valve 21 will cause reverse flow of water downwardly through pipe 17. If valve 22 is open, the stream from nozzle 19 will dissipate the detritus dislodged from pipe 17, and closing of valve 22 along with valve 21 will apply the entire pump pressure to cause reverse flow through pipe 17 to dislodge stubborn obstructions. As will be apparent to those skilled in the art, the sand suction apparatus according to the present invention may also be applied to a pipe driver of concrete hollow piles.

While the preferred form of this invention has been described herein more or less in detail, it will be understood that changes therein may be made without departing from the spirit of the invention or the scope of the appended claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. A sand suction apparatus comprising, in combination, a water line, a water pump connected in said line and dividing it into suction and delivery portions, said delivery portion being branched, orificed means in one branch of said delivery portion for producing a water jet to produce an area of reduced pressure in said one branch therebeyond, said orificed means also producing a back pressure in advance thereof and in said other branch, an open ended suction pipe connected to said one branch at said area of reduced pressure, a jet pipe connected to said other branch and having a discharge nozzle located proximate to the open end of said suction pipe, and a cut off valve in said one branch beyond said reduced pressure area the closing of which produces back pressure at the region where said suction pipe is connected to said one branch for reversing the flow of water through said suction pipe for clearing the same while maintaining the flow of water through said discharge nozzle.

2. A sand suction apparatus comprising, in combination, a water line, a water pump connected in said line and dividing it into suction and delivery portions, said delivery portion being branched, orificed means in one branch of said delivery portion for producing a water jet to produce an area of reduced pressure in said one branch therebeyond, said orificed means also producing a back pressure in advance thereof and in said other branch, an open ended suction pipe connected to said one branch at said area of reduced pressure, a jet pipe connected to said other branch and having a discharge nozzle located proximate to the open end of said suction pipe, a cut off valve in said one branch beyond said reduced pressure area the closing of which produces back pressure at the region where said suction pipe is connected to said one branch for reversing the flow of water through said suction pipe for clearing the same while maintaining the flow of water through said discharge nozzle, and a second cut off valve in said other branch, the closing of both said valves applying the entire pump pressure to reverse flow through said suction pipe for clearing an obstruction therefrom.

References Cited in the file of this patent

UNITED STATES PATENTS

634,119	Moore	Oct. 3, 1899
2,044,088	Lord	June 16, 1936
2,076,823	Newell	Apr. 13, 1937
2,234,788	Williams	Mar. 11, 1941
2,262,943	Kalbaugh	Nov. 18, 1941