June 16, 1936. M. C. LORD 2,044,088

HYDRAULIC MATERIAL ELEVATOR

Filed Dec. 11, 1933

FIG. 1

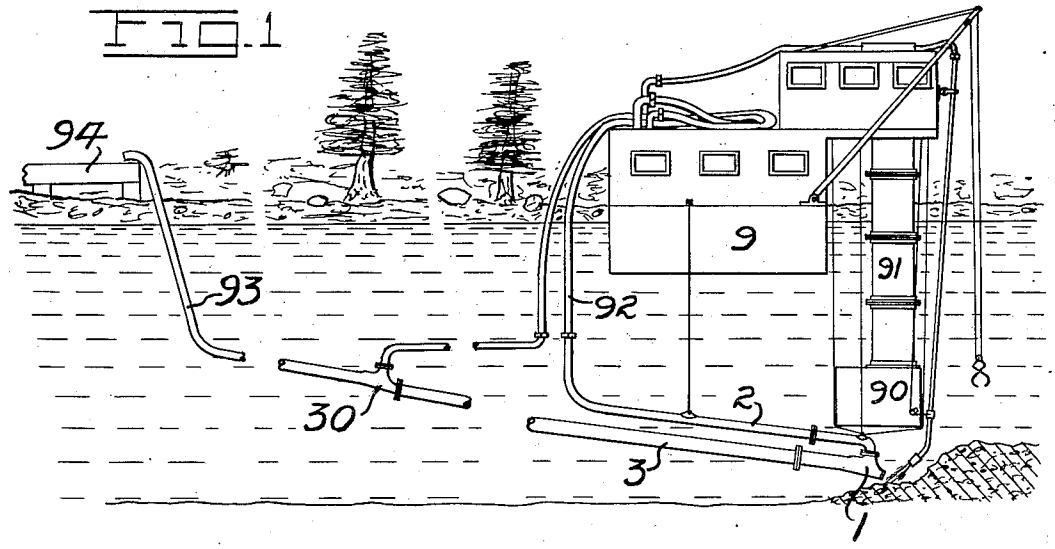
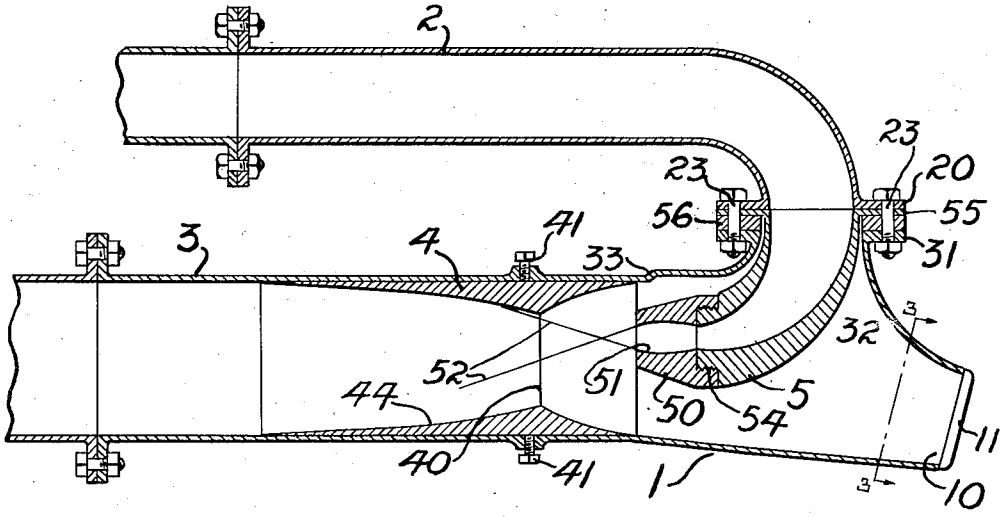


FIG. 2



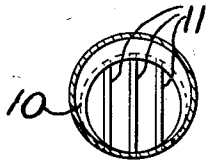


FIG. 3

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HYDRAULIC MATERIAL ELEVATOR

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Application December 11, 1933, Serial No. 701,778

6 Claims. (Cl. 103—262)

My invention relates to a dredging device, for instance such as might be used in gold dredging, and in particular is directed to a nozzle, whereby sand, gravel and values may be lifted from the bed of a stream, at a considerable depth, and elevated or conveyed through a discharge pipe to a point where the values can be collected.

It is a general object of my invention to improve devices of this general character, and in particular to improve the efficiency and increase the amount of material which can be elevated through such means.

It is a further object to provide a nozzle tip for use in such an elevating device which shall be so formed and so located with respect to a Venturi throat as to produce a minimum of resistance in the pipe, and therefore the highest efficiency, to the end of producing a stronger suction on the materials to be elevated.

It is a further object to provide a nozzle tip discharging through a Venturi throat, with the nozzle tip and the Venturi throat so related that eddy currents are eliminated, and the efficiency of the device is improved.

It is a still further object to provide a device of this general character, wherein essential adjustments are provided for.

My invention comprises the novel nozzle and conveying device of the character indicated, such as is shown in the accompanying drawing and as will be described and claimed in this specification.

In the accompanying drawing I have shown an illustrative form of my nozzle, and have shown the same in conjunction with mechanism whereby dredging operations may be carried out.

Figure 1 is a general elevation of the apparatus, showing the method of operation of the complete system.

Figure 2 is an axial section through the nozzle system, and Figure 3 is a section on the line 3—3 in Figure 2.

Referring to Figure 1, it will be observed that a float or barge 9 has associated with it a submersible working chamber 90, to which access is had by an entrance tube 91 extending above the surface, and beneath the float and the working chamber is disposed a suction nozzle, generally indicated by the numeral 1, to which is connected a pressure pipe 2 and a discharge pipe 3. The pressure pipe is connected by a hose 92 or other suitable means to a pump (not shown) on the barge, and the discharge pipe has also connected to it a hose, such as 93, whereby the material is elevated above the surface and may be discharged into such a device as is typified by the riffle 94 on the shore. The barge 9 and associated parts may be such as are disclosed in my copending application Serial No. 701,779, filed December 11, 1933. Thus gravel is picked up from the bed of the stream by the nozzle 1 and conveyed through the discharge pipe 3 to a device such as 94, whereby the values may be saved.

Within the discharge pipe 3 is a Venturi member 4. The throat 40 is located adjacent to the inlet opening 10, and adjacent to the throat of the venturi is the tip 50 of a pressure nozzle 5. This is located within the discharge pipe 3 with the nozzle directed toward and through the throat 40 of the venturi. The nozzle 5 is connected to the pressure pipe 2, whereby water from the pressure pipe discharges through the nozzle tip 50. Thus as is evident, water under heavy pressure passing through the nozzle tip 50 is discharged through the Venturi throat 40, and induces a current through the discharge pipe and picks up material which enters through the inlet opening 10, and this material is conveyed up the discharge pipe 3, a booster or boosters being employed at intervals, as indicated at 30. The entrance opening 10 may be closed by bars 11 to prevent the entrance of boulders which might otherwise become jammed in the pipe.

The nozzle tip should be adjustable relative to the Venturi throat, and preferably the inner surfaces of the tip 50 are concavely curved, as indicated at 51. So also are the surfaces 44 of the Venturi member, in such a way as to cause impinging water particles to be deflected substantially axially. The nozzle tip is so designed and located, with respect to the Venturi throat 40, that all water particles issue substantially tangentially to the curvature of the tip, as indicated by the lines 52, and pass through the Venturi throat, for if they were to encounter the venturi on the near side of the throat, eddy currents would be formed. Thus a stream at high pressure and high velocity passes through the Venturi throat, entraining the water, sand, gravel and values by the suction produced at the inlet opening 10. Striking the surface at 44, the water is deflected substantially axially, to lessen turbulence and resistance; the surface 44 is curved in a manner to accomplish this result.

The nozzle tip is adjustable relative to the main body of the nozzle, as is indicated by the threaded connection at 54, and the venturi itself is adjustable axially toward and from the nozzle, as is indicated by the set screws 41 which secure the separate Venturi sleeve 4 in any adjusted position. These set screws are typical of any

suitable means which may be employed for the purpose.

Further adjustment of the nozzle is permitted by its support within the pipe, and as a convenient means of permitting this adjustment I provide the pipe **2** with a flange **20**, and a similar flange **31** is provided on the discharge pipe, whereby the two may be coupled together by bolts **23**. However, the nozzle is also provided with a flange **55** which is included between the flanges **20** and **31**, and I provide also a spacer member **56**, which is included in the coupling, and which may be removed and a thinner or thicker spacer substituted, thus to vary the axis of the nozzle tip transversely with respect to the axis of the Venturi throat. Normally, however, the axis of the nozzle tip would be somewhat displaced with respect to the axis of the Venturi throat, thereby to allow a sufficient opening for the passage of boulders and the like. The coupling just described permits convenient access to the nozzle to clear any jams that may develop.

It will be observed that there is a break in the surface of the pipe at **33** adjacent to the nozzle tip. The chamber at **32** forms in effect a back water area, and this water is drawn by the discharge through the nozzle into the Venturi throat, but if it were permitted to move directly into the Venturi throat it would affect the stream issuing from the nozzle tip **50** at this point, which is closest to one side of the Venturi throat, and the stream might then contact with the Venturi member. To prevent this the break is provided at **33**, which causes an eddy current rather than a direct movement of the water from the back chamber **32** into the Venturi throat, and the eddy thus created directs the water into the main stream, rather than into the stream indicated by the lines **52**, and thus these lines are preserved and not deflected in such a manner as to contact directly with the Venturi throat.

What I claim as my invention is:

1. In combination with a pressure pipe and a discharge pipe having an intake opening, a Venturi throat within the discharge pipe having a constricted portion, a nozzle connected to the pressure pipe and discharging within the Venturi throat, the bore of the tip of the nozzle being curved concavely, and the nozzle being so located, with respect to the Venturi throat, that any tangent to such curvature of the nozzle's tip will pass through the constricted portion of the Venturi throat.

2. In combination with a pressure pipe and a discharge pipe having an intake opening, a Venturi throat converging from both ends to form a constricted portion disposed coaxially within the discharge pipe, and a single nozzle connected to and receiving the entire flow from the pressure pipe, and having its tip disposed eccentrically of the Venturi throat axis and discharging within the constricted portion of the Venturi throat.

3. In combination with a pressure pipe and a discharge pipe having an intake opening, a Venturi throat forming a constriction within the discharge pipe, and formed with a concave surface diverging away from the constriction of the Venturi throat, and a nozzle connected to the pressure pipe and discharging within the Venturi throat.

4. In combination with a pressure pipe and a discharge pipe having an intake opening, a Venturi throat within the discharge pipe forming a peaked, annular constricted portion and having two concave surfaces diverging in opposite directions from such constricted portion toward the walls of the discharge pipe, and a nozzle connected to the pressure pipe and discharging within the Venturi throat.

5. In combination with a pressure pipe and a discharge pipe having an intake opening, a Venturi throat within the discharge pipe forming a constriction, and having two concave surfaces of substantially parabolic form diverging in opposite directions from the constriction of the Ventri throat, and a nozzle connected to the pressure pipe and discharging within the Venturi throat.

6. In combination with a pressure pipe and a discharge pipe having an intake opening, a Venturi throat within the discharge pipe including a restricted portion and a section of concave hyperbolic form at the side of the restricted portion remote from the intake opening, and a nozzle connected to said pressure pipe, and formed to discharge a jet of conical shape, and positioned to discharge such jet without contact with a near side of the Venturi throat beyond the restricted portion of said Venturi throat into the concave hyperbolic section.

MOUNT C. LORD.