

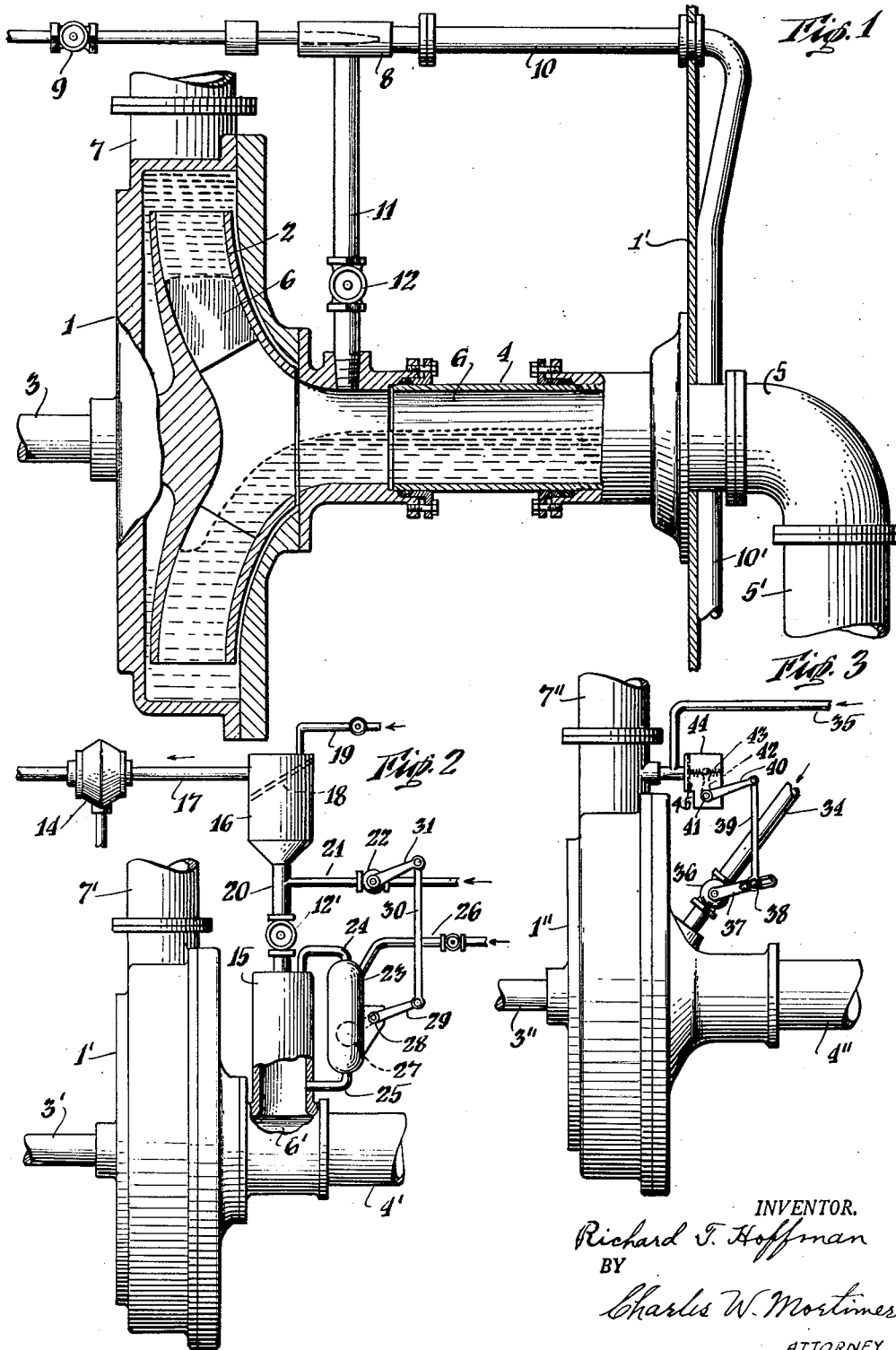
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METHOD OF HYDRAULIC DREDGING

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1

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METHOD OF HYDRAULIC DREDGING

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5 Claims. (Cl. 37—195)

This invention relates to a hydraulic dredge that is particularly useful where the dredged material is of such character that gases form or escape when suction is applied to the material. Collection of these gases hinders the dredging operation. The object of this invention is to obviate this hindrance to the dredging operation. The invention may be understood from the description in connection with the accompanying drawing, in which:

Fig. 1 is a side view partly in section showing an illustrative embodiment of the invention;

Fig. 2 is a side view partly broken away showing a modification; and

Fig. 3 is a similar view showing another modification.

In the drawing, reference character 1 indicates a rotary type of dredge pump that may be installed on a dredge, a portion of the wall of the hull of which is shown at 1'. The impeller 2 of this pump is driven by a shaft 3 from any convenient source of power. The suction pipe 4 of the dredge has a curved portion 5 extending into a portion 5' which is adapted in the usual way to reach the material that is to be dredged. As is shown in Figure 1, the curved portion 5 may be rotated to twist the suction pipe 4 so that the end of portion 5' will be elevated or lowered. Dredged material is discharged through a discharge pipe 7. A hydraulic dredge, as is well known, is a dredging machine, usually floating, using a centrifugal pump and a suction pipe to draw mud or saturated sand from a channel, or the like, and to discharge it on the shore, or elsewhere.

When dredging material of high gaseous content, gas which forms due to the reduced pressure produced by the dredge pump 1, ordinarily collects in a space 6 in the suction pipe 4 and the pump impeller 2, causing failure of the dredging operation.

An ejector 8, which may be operated by steam or air, is regulated by an inlet valve 9. An outlet 10 from the ejector 8 is provided so that it may extend downwardly to any desired extent as indicated at 10'. A suction pipe 11 extends from the ejector 8 to the space 6 where gas collects, and removes the gas, thus returning the dredge pump 1 to proper operating condition. A cut-off valve 12 is provided in the suction pipe 11.

In Fig. 2 reference characters that are provided with a prime indicate parts that correspond to those in Fig. 1. A rotary type of vacuum pump 14 is provided to produce a vacuum in a gas chamber 15. The gas chamber 15 is connected to the space 6' where gas collects as it escapes from the pumped material due to the decreased pressure on the material.

A chamber 16 is provided, to the upper portion of which the vacuum pump 14 is connected by a suction pipe 17. An inlet pipe 19 carries water for flushing a screen 18 in the chamber 16. A suction pipe 20 leads from the lower end of the chamber 16 to the gas chamber 15. An inlet pipe 21 is provided for air and is connected to the suction pipe 20. A valve 22 is provided in the inlet pipe 21.

A float chamber 23 containing a float 27 has its upper

2

and lower ends connected to upper and lower portions of the gas chamber 15 by two pipes 24 and 25. An inlet pipe 26 for flushing water is connected to the float chamber 23.

5 A connecting rod 30 has one end connected to an arm 31 which operates the valve 22, and its other end connected to an arm 29 pivoted at 28 which is operated by the float 27. A valve 12' corresponds to the valve 12 of Fig. 1. The suction pipes 17 and 20 correspond to the suction pipe 11 of Fig. 1.

In the modification shown in Fig. 2 the operation is similar to that of Fig. 1. When the valves in the water and air inlet pipes 19, 21 and 26 are closed, the rotary vacuum pump 14 is used instead of the ejector 8.

15 Means are provided to prevent damage to the vacuum pump 14. These means comprise the float 27 operating the valve 22, and the chamber 16 containing the screen 18. When the gas which escapes from the material is insufficient in volume to satisfy the requirements of the vacuum pump 14, material will rise in the gas chamber 15. Material which rises in the gas chamber 15 causes operation of the float 27, thereby opening the valve 22 to permit air to enter through the inlet pipe 21 in sufficient quantity to satisfy the requirements of the vacuum pump 14, thus preventing further rise of material in the suction system of the vacuum pump. Water is continually introduced through the inlet pipe 26 to keep the pipe 25 clear and permit the float 27 to operate without interference by the material. The chamber 16 is provided with the screen 18 to prevent passage of particles that might damage the vacuum pump 14.

In the modification shown in Fig. 3, a water pipe 34 is connected to the suction pipe 4' near where it enters the dredge pump 1' so as to introduce water near the entrance of the pump impeller. Water entering through the water pipe 34 forces collected gas through the dredge pump and also mixes with the material being pumped and reduces its viscosity. A valve 36 is provided in the water pipe 34. The valve 36 is operated by an arm 37 provided with a slot 38. A connecting rod 39 extends from the slot 38 to an arm 40 pivoted at 41. An extension 42 on the arm 40 at pivot 41 is attached to a diaphragm 45 to regulate the quantity of water entering through the water pipe 34 in accordance with the pressure in the discharge pipe 7' which varies with the viscosity of the material in the discharge pipe 7'. A spring 43, in a chamber 44 which contains the diaphragm 45, presses the diaphragm 45 against the pressure in the discharge pipe 7'. An inlet pipe 35 is provided for introducing flushing water to keep the diaphragm 45 free of interference by the material.

In the modification shown in Fig. 3, since the pressure in the discharge pipe 7' increases with increase of the viscosity of the material being discharged, the increased pressure against the diaphragm 45 operates the lever 40 which operates the lever 37 to admit a greater quantity of water through the water pipe 34 which mixes with the dredged material entering the dredge pump from the suction pipe 4' and reduces its viscosity.

60 What I claim is:

1. The method of dredging gas-containing material which comprises placing a suction pipe into said material, pumping said material through said suction pipe by a centrifugal pump and withdrawing gas from said material at the entrance side of said pump to feed material to the pump with gas removed.

2. The method of dredging gas-containing material which comprises placing a suction pipe into said material, pumping said material through said suction pipe by a centrifugal pump, accumulating gas from said material in said pipe at the entrance side of said pump, and eject-

3

ing said gas from said pipe to prevent passage of gas into said pump.

3. The method of dredging gas-containing material which comprises placing a suction pipe into said material, pumping said material through said suction pipe by a centrifugal pump, accumulating gas from said material in said pipe at the entrance side of said pump, and applying suction to said gas to withdraw said gas from said pipe separately from the remaining material.

4. The method of dredging gas-containing material which comprises placing a suction pipe into said material, pumping said material through said suction pipe by a centrifugal pump, accumulating gas from said material in said pipe at the entrance side of said pump, and continuously applying suction to said gas to withdraw said gas from said pipe separately from the remaining material.

5. A method of dredging gas-containing material which comprises hydraulically dredging said material by a cen-

4

trifugal pump, and removing gas derived from said material from the suction pipe before reacting the pump.

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