No. 661,609. Patented Nov. 13, 1900.

# F. K. HOOVER & A. J. MASON.

## DREDGING MACHINE.

(Application filed Mar. 5, 1897.)

(No Model.) 2 Sheets—Sheet 1.

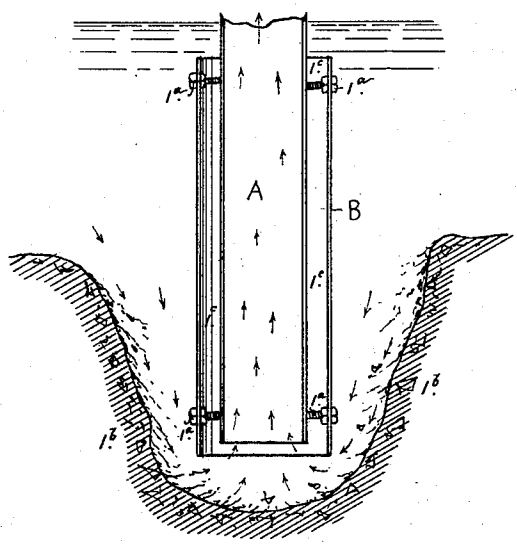


Fig 1.

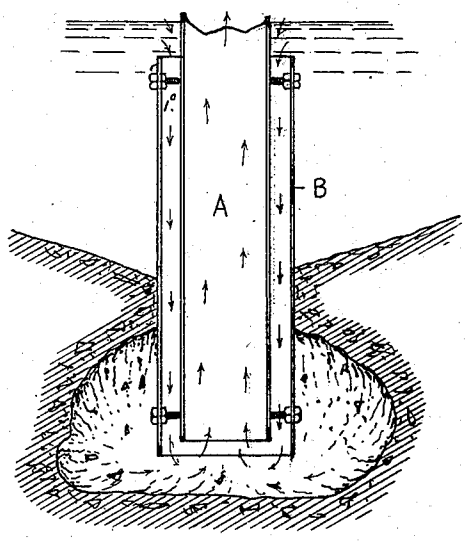


Fig 2.

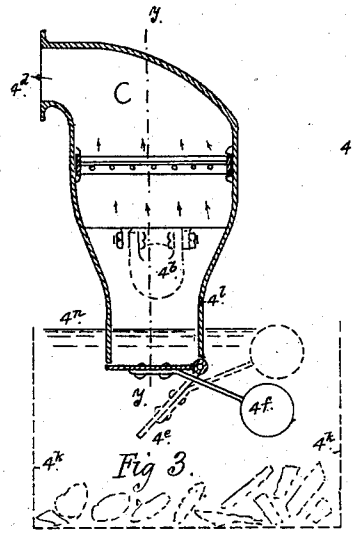


Fig 3.

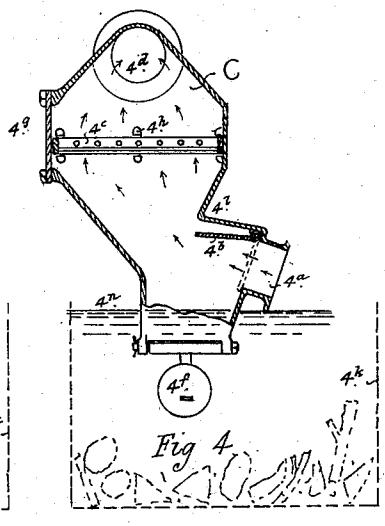


Fig 4.

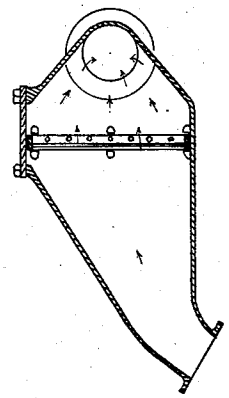

Fig 5.

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## DREDGING MACHINE.

(Application filed Mar. 5, 1897.)

(No Model.) 2 Sheets—Sheet 2.

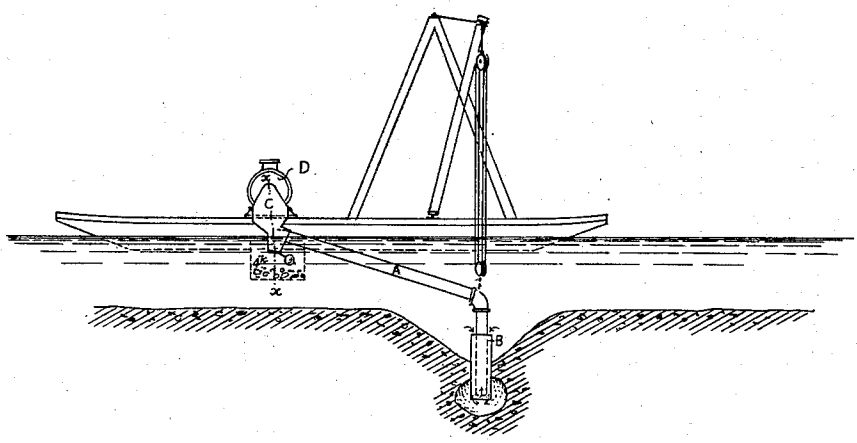


*Fig. 6.*

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# UNITED STATES PATENT OFFICE.

FRANK K. HOOVER AND ARTHUR J. MASON, OF KANSAS CITY, MISSOURI.

## DREDGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 661,609, dated November 13, 1900.

Application filed March 5, 1897. Serial No. 625,924. (No model.)

*To all whom it may concern:*

Be it known that we, FRANK K. HOOVER and ARTHUR J. MASON, citizens of the United States, residing at Kansas City, in the county of Jackson, in the State of Missouri, have invented certain new and useful Improvements in Dredging Apparatus, of which the following is a full, clear, and accurate description, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates to certain new and useful improvements in dredging apparatus, having more particular reference to that class known as "suction-dredges," and is designed to obviate certain difficulties encountered in the use of the usual forms of suction-dredges.

The customary process of pumping sand, gravel, or other material capable of being removed by the method under discussion is this: The inlet of the suction is maintained in such relation to the bottom that the rush of water flowing to the pump loosens and carries with it a proportion of solid material. To do this successfully, great nicety of adjustment is necessary in raising and lowering the suction-inlet. If, on the one hand, the inlet be too high above the bottom, an unprofitably small amount of solid matter is raised. If, on the other hand, the inlet be lowered too near the bottom, owing to the irregular and spasmodic manner in which such material caves, loosens, and moves toward the pump, there is a constant danger of choking—that is, filling the suction and pump with a mixture too solid to flow—hence great annoyance, loss, and delay. This caving is a well-known and frequent occurrence in such operations and is only avoided by an attendant watching the color of the discharge and, guided thereby, raising and lowering the suction as his judgment dictates. When the material is moved to a distance too great for an attendant to so watch the discharge and adjust the suction, it becomes a very difficult matter to avoid the alternate drawbacks described above. Various devices have been used to obviate these difficulties, of which this part of our invention forms one. In our apparatus we furnish an arrangement wherewith the suction may be left resting on the bottom or buried in the material, it having the power without mechanism or attention of any kind to form its own uniform mixture, the percentage of solids being governed by the general character of the material and the proportion of the suction-pipe to its surrounding parts. Various arrangements of jets and streams have been devised to cut or loosen the material and to insure a fair proportion of water with the mixture. Any such arrangement has, however, the primary objection that in proportion to the energy or cutting power of the jets they constitute a force to dispel or drive away the suspended material from the inlet, and the water rising in the suction in a contrary direction must move in the face of this opposing force.

The second part of our invention is designed to meet the difficulties arising from the fact that in nearly all cases embedded in the material are found stones, water-soaked sticks, debris, or rubbish of some kind too large to pass through the pump mechanism and which must be intercepted by some form of grating or strainer. The customary arrangement is to place a grating at the suction-inlet having meshes rather smaller than the openings in the pump. The result is that such debris, being arrested at the grating, accumulates, and the force of the suction holding the pieces against the said grating soon closes up the opening and stops useful results. When work is conducted in a flowing stream, it is the practice to raise the suction and stop or check the engine, whereupon the debris drops from the strainer, and the current sweeps it downstream away from the point of suction. In lakes and still water the only plan is to stop pumping and move the plant to another point. Even then the debris is still present on the bottom to again and again obstruct the inlet on future occasions.

Our device does away with any form of grating at the suction-inlet, substitutes a grating of greatly-increased area near the pump, and provides a simple arrangement whereby the debris is trapped, collected away from the suction-inlet, and periodically removed without raising the suction or stopping operations.

Having described the scope of our invention, we proceed to describe the apparatus.

Figure 1 represents the inlet of a suction-pipe provided with our improvement. Fig.

2 represents the same, the sides of the pit or excavation having caved in and closed around the inlet. Fig. 3 represents a sectional view of our improvement for collecting and removing the debris, taken on the line $x$ $x$ of Fig. 6. Fig. 4 represents a sectional view of the same, taken on the line $y$ $y$ of Fig. 3. Fig. 5 represents an alternative form provided with enlarged chamber for debris-screen and contracted neck for connection with suction. Fig. 6 represents a dredging apparatus provided with our improvements.

Similar characters of reference refer to similar parts throughout the several views.

A represents the suction-pipe.

B represents a casing of larger diameter, surrounding and secured to the suction-pipe by set-screws $1^a$, leaving the annular space $1^c$ around the suction-pipe, forming a conductor to lead water when needed, as hereinafter described, to the inlet of the suction, said casing being of suitable length to be at all times below the water-line and yet permitting an excavation of considerable depth to be made in the bottom before danger that a cave-in will reach and cover the top thereof. It will be seen that as soon as the material in caving shuts off the inlet from the water surrounding the outer casing then a stream follows the annular space between the suction and the casing and in passing or sweeping around the lower edge of the suction-pipe takes up a proportion of solid matter.

Referring to Fig. 1, if it be presumed that the mixture below and surrounding the inlet gets abnormally rich a downward current will set up in the annular space at once, for the water in said annular space being comparatively pure calls for less energy to move it than the heavy mixture below. It follows that whenever the energy required to cause the clear water to follow the circuitous course through the annular space is less than that required to move the heavy mixture below contributions of fresh water will flow through the annular space until the desired consistency is effected, the said consistency being fixed by the relative diameters of the suction-pipe and the outer casing and the distance of the lower edge of the suction-pipe above or below the lower edge of the casing, when the material is coarse or tight the former being lowest and when the material is fine and loose the latter being lowest. In practice we prefer to lower the suction-inlet below the river-bed. In this way we have succeeded in pumping for a long period of time without any attention to the suction whatever, the action of the material being to alternately form the bridge-like caves, (shown in Fig. 2,) thence opening to the form shown in Fig. 1, when a fresh cave repeats the operation.

C represents a debris-trap interposed in the suction-pipe, preferably as near the pump as may be convenient, and having the opening $4^a$, communicating with the suction-pipe, and the opening $4^d$, communicating with the pump. Within said trap is provided the grating or screen $4^c$, supported by the lugs $4^h$ upon the wall of the trap. $4^b$ represents a flap-valve opening inwardly, adapted to close the inlet-opening $4^a$. Below said inlet-opening the chamber of the trap is extended and contracted, as shown at $4^l$, and is open at the bottom, said opening being adapted to be closed by the flap-valve $4^e$, to which is attached the weight $4^f$ to normally retain the valve in closed position. $4^k$ represents a wire basket or like suitable receptacle suspended under the trap and into which the same discharges upon opening the valve $4^e$. $4^g$ represents a manhole in the side of the trap for obtaining access to the interior for the purpose of cleaning or removing the grating or other purposes. The chamber of the trap is enlarged in the immediate vicinity of the grating and is contracted or throttled below the same, the effect being that in the enlarged portion the velocity of the water will be diminished in the same relation as the area of the grating to the area of the contracted portion, so that the debris and rubbish will not be drawn so violently against the grating as to become entangled therein or to do injury thereto, and at the same time the solid matter it is desired to carry through the pump will have no inclination to precipitate against the accelerated current through the contracted or throttled portion. In the operation of this debris-trap when the pump is in operation the valve $4^b$ of the inlet-opening will be opened by the suction and the valve $4^e$ of the debris-discharge opening will be closed, the chamber of the trap being filled with water containing solid matter during the action of the pump. Now as the pumping is continued the debris and rubbish will be caught and held back by the grating, and when accumulated in quantity sufficient to interfere with the working of the pump by simply checking the pump for a few seconds the reflux of the water will close the valve $4^b$ of the suction-pipe opening and open the valve $4^e$ of the discharge-opening, and the debris or rubbish will be carried into the receptacle $4^k$, whence it may be removed as may be necessary. Thus but little time is lost in disposing of the debris and without moving the machine or interfering with the suction-pipe. In practice it is found desirable that the debris-discharge opening be below the water-line, that the valve thereof may be water-sealed. In case it is inconvenient to place the lower end of the debris-trap in the water forming the source of supply for pumping, a tank substantially of the form of the wire receptacle $4^k$ may be provided and sufficient water maintained therein to form a water seal for the valve $4^e$.

The flap-valve $4^b$ may under some conditions be dispensed with, the effect in such case being that it takes a longer time and more water to do the washing out.

In the alternative form shown in Fig. 5 the valves $4^b$ and $4^e$ are omitted and the debris

discharged through the suction-pipe, the enlarged chamber and large grating area, with the contracted portion below the grating, being retained, thus securing all the advantages of such construction. This form may be used with great advantage where the inlet of the suction-pipe is accessible, and the rubbish may be raked away with a rake or other implement by hand.

Having thus fully described our improvements, what we claim as our invention, and desire to secure by Letters Patent, is—

1. In a dredging apparatus the combination with a suction-pipe of a debris-trap arranged therein to intercept and trap debris, and a water-sealed valve for the exit of the debris from said trap; substantially as set forth.

2. In a debris-trap a suitable chamber, a grating in said chamber, a water-sealed discharge-opening directly under said grating, and a contracted waist at a point directly below the grating; substantially as and for the purpose set forth.

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