April 15, 1930. F. EWIG 1,754,746

SUCTION DREDGER

Filed June 6, 1928

Fig. 1.

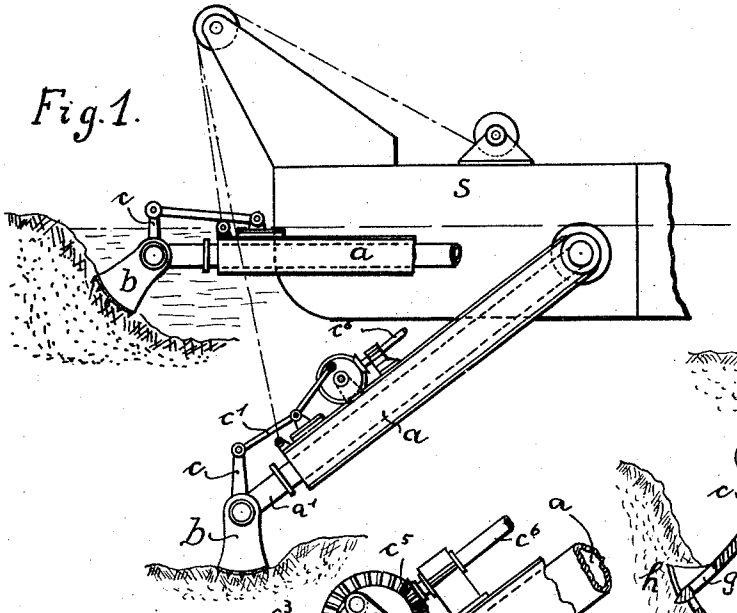


Fig. 5.

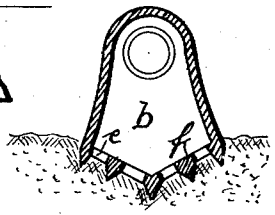


Fig. 6.

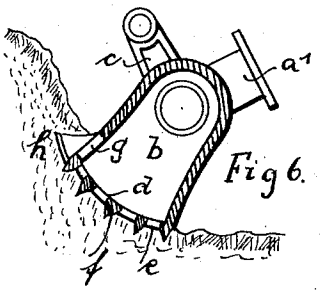


Fig. 2.

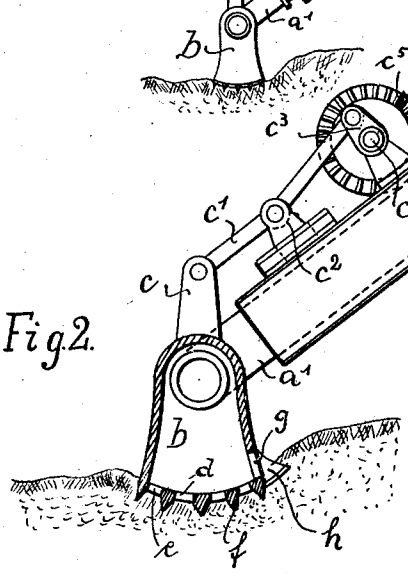


Fig. 4.

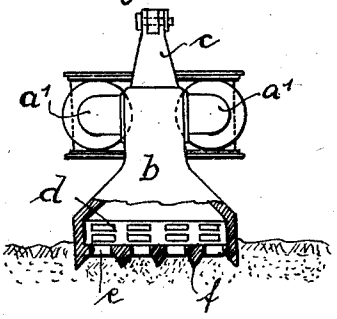
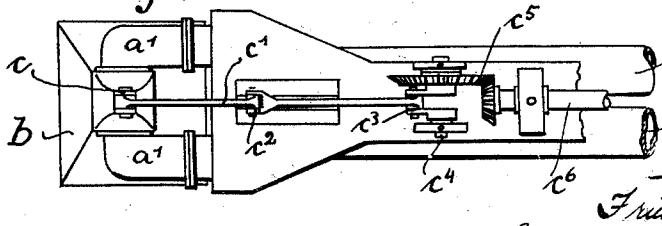


Fig. 3.



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Patented Apr. 15, 1930 1,754,746

UNITED STATES PATENT OFFICE

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SUCTION DREDGER

Application filed June 6, 1928. Serial No. 283,350.

Suction dredgers with a stationary suction nozzle have the disadvantage that they operate with low efficiency in hard material such as firmly deposited fine sand, as the suction nozzle cannot enter such soil to a sufficient extent and consequently draws in at the same time an incomparably high percentage of water. It has already been proposed to improve the efficiency by using streams of water under pressure and it has also been suggested to provide cutter rollers and the like on the suction nozzle adapted to loosen the soil mechanically. In the known proposals the results obtained, however, are considerably behind expectations.

It has already been proposed to pivotally mount the suction nozzle on a shaft at the end of the suction pipe. This was for the purpose of enabling the suction nozzle to be adjusted in various positions relatively to the suction pipe according to the depth of water in which the dredging operation was to be effected, and during which the suction pipe is more or less inclined. It was always desired to be able to obtain the correct operating angle of the suction nozzle in relation to the bottom of the water. The arrangement was therefore also such that an adjusting device was solely provided for the suction nozzle but that the suction nozzle remained stationary during the operation.

The present invention is based on this suction nozzle and on the knowledge that its movable mounting on the suction pipe can be used not only for adjusting purposes but also to obtain a constant to and fro oscillatory movement during the operation whereby considerable advantages can be obtained in connection with the dredging operation itself and that in this manner a much simpler construction of the suction nozzle itself can be obtained. As the outer surface of the nozzle which oscillates to and fro on the soil to be dredged and contains the suction openings, is provided with tooth-like solid projections or prongs, this suction nozzle surface, by reason of its constant movement over the soil to be dredged, acts in a similar manner to a hoe as the prongs remove the soil in layers, whilst the parts it has loosened are immediately drawn through the openings between the prongs by reason of the suction action in the suction nozzle.

In the accompanying drawing are illustrated a few examples of construction of the subject of the invention.

Fig. 1 shows a side elevation in combination with a dredging vessel with two different positions.

Fig. 2 shows a side elevation partly in section to a larger scale.

Fig. 3 shows a plan.

Fig. 4 shows a rear elevation.

Figs. 5 and 6 show sections of modifications.

The suction pipe a which at the same time serves as a support for the suction nozzle is mounted on the dredger in the usual manner. The suction nozzle b, formed as a hollow body is mounted at the two ends a' of the suction pipes by means of hollow trunnions, and by means of an arm c is formed as a kind of double armed lever. To the arms c is connected a connecting rod c' of which the other end is connected to a cross head c^2 reciprocated by crank mechanism c^3. The shaft c^4 of the crank mechanism is driven by the shaft c^6 by gearing c^5, the shaft c^6 being driven by any suitable means. If the point of connection of the crank mechanism c^3 to the cross head c^2 is made adjustable it is possible by these means to cause the suction nozzle b to oscillate in various positions with a determined angular position of the suction pipe a. By known means the amount of oscillation of the suction nozzle may be varied, and if the shaft 6 is not rotated the suction nozzle may if desired, also operate in a fixed position.

According to Figs. 2 and 4 the actual mouth of the nozzle b is closed by an arched plate d in which are provided a plurality of slotted openings e; it is also provided with prong-like projections f distributed in longitudinal and transverse rows. In the form of construction according to Fig. 5 the so called harrow-surface with loosening prongs f is not arched but of angular construction. This is to show that no importance is placed on details such as the shape of a plate which

is provided with prongs or similar loosening members, as it will be understood that such a plate is not actually necessary. The loosening members may be suitably distributed on bars at the mouth of the suction nozzle. When a uniform distribution of the prongs for example in transverse and longitudinal rows, as in Figs. 2 and 4, is used, the rows are preferably arranged inclined to the direction of oscillation so that the entire surface of the soil traversed by the oscillating suction nozzle will be operated upon by the prongs.

According to Fig. 6 the casing of the nozzle *b* is also provided on one side with passages *g*. These passages may naturally be provided on both sides, and they serve to allow dredged material, which may collect on the nozzle, also to be sucked into the interior of the nozzle by the suction action. In Fig. 6 there is also provided a so called breaking head *h* on the under side of the suction nozzle *b*, which effects a preliminary operation in the manner of a shovel for the actual nozzle *b*. Such a device is particularly suitable when dealing with a flat, which under circumstances may be partly dry, land, for example, coast or river banks, as indicated in Figs. 1 and 6. These figures also show that the arm *c* may be applied to the suction nozzle *b* at a different angle than as shown in Fig. 2. Whilst the arrangement shown in Fig. 2 is particularly suitable when dredging a flat bottom the construction according to Fig. 6 is particularly advantageous when dealing with banks and the like.

I claim:—

1. In combination with a suction pipe for a dredger, of hollow trunnions mounted at the end of said suction pipe, a nozzle mounted on said trunnions, prongs mounted in the mouth of said nozzle, an arm secured to said nozzle, a connecting rod connected to said arm, a cross head slidably mounted on said suction pipe, and connected to said connecting rod, crank mechanism connected to said cross head, and actuating mechanism for said crank mechanism.

2. In a suction dredge, the combination with a suction pipe, of a nozzle mounted adjacent the lower end of the pipe, an element carried by said pipe adapted to be continuously rotated in one direction during the dredging operation, and means for transmitting the continuous rotation of said element into a reciprocating movement of the nozzle.

3 In a suction dredge, the combination with a suction pipe, of a nozzle mounted adjacent the lower end of the pipe, a rotatable shaft carried by said pipe, and a crank driven by said shaft and connected to said nozzle for imparting reciprocating movement thereto during the dredging operation.

4. In a suction dredge, the combination with a suction pipe, of a hollow nozzle mounted for independent swinging movement at the lower end of the pipe, the interior of said nozzle being in communication with the pipe, and one face of said nozzle being provided with spaced suction apertures and projecting prongs, and means for imparting continuous to and fro movement to the nozzle, the extent of movement and the contour of the apertured face being such that the suction apertures and prongs remain substantially in contact with the surface to be dredged during the dredging operation.

5. In a suction dredge, the combination with a suction pipe, of a hollow nozzle mounted for independent swinging movement at the lower end of the pipe, the interior of said nozzle being in communication with the pipe, and one face of said nozzle being provided with spaced suction apertures and projecting prongs, means for imparting continuous to and fro movement to the nozzle, the extent of movement and the contour of the apertured face being such that the suction apertures and prongs remain substantially in contact with the surface to be dredged during the dredging operation, and means projecting from the nozzle in the direction of movement thereof for engaging and loosening the surface.

6. In a suction dredge, the combination with a suction pipe, of a hollow nozzle mounted for independent swinging movement at the lower end of the pipe, the interior of said nozzle being in communication with the pipe, and one face of said nozzle being provided with spaced suction apertures and projecting prongs, means for imparting continuous to and fro movement to the nozzle, the extent of movement and the contour of the apertured face being such that the suction apertures and prongs remain substantially in contact with the surface to be dredged during the dredging operation, and means projecting from the nozzle in the direction of movement thereof for engaging and loosening the surface, said nozzle being provided with an additional aperture in one side thereof adjacent said last mentioned means for removing the loosened dirt from the nozzle.

FRIEDRICH EWIG.