

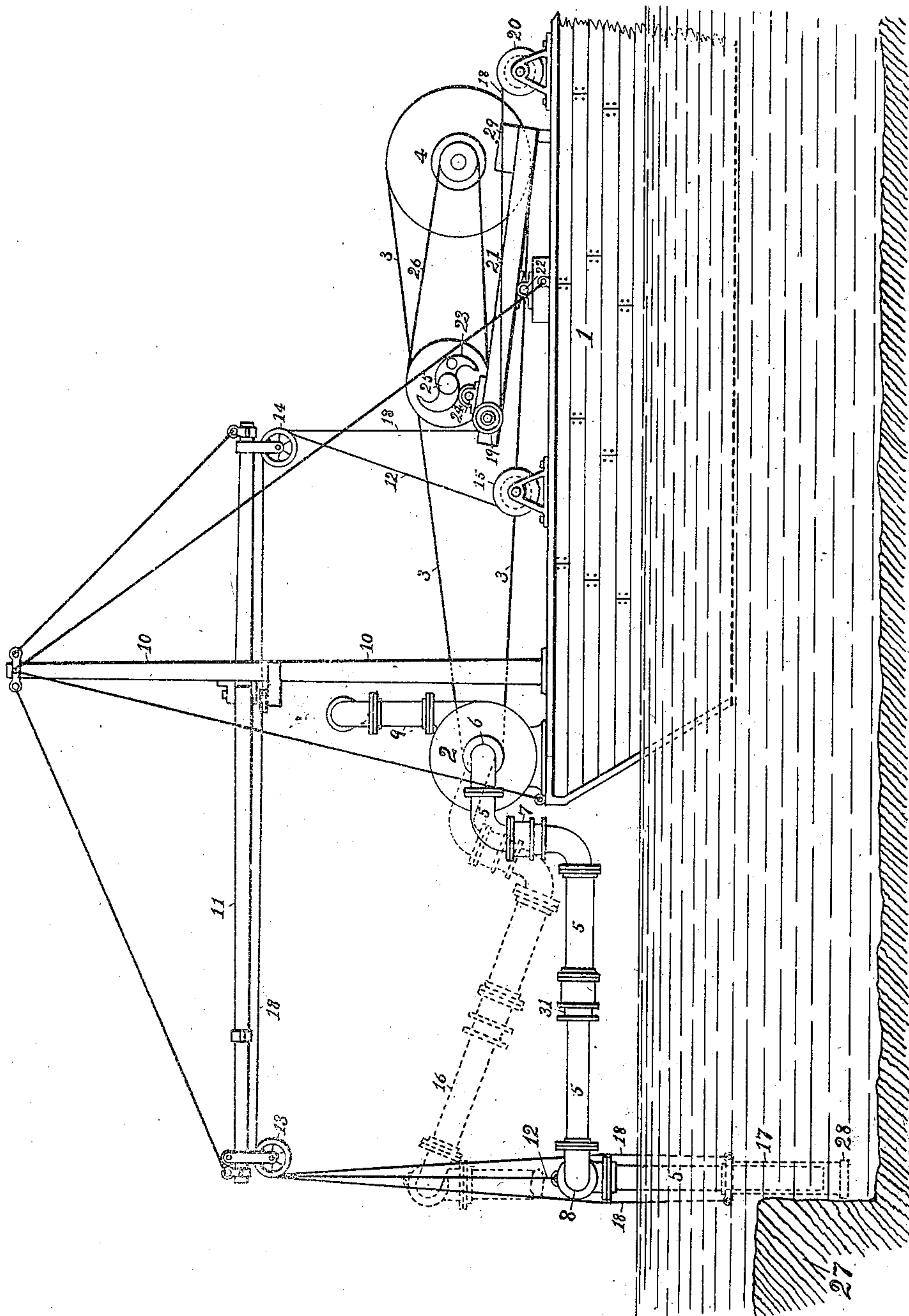
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F. W. KROGH.
SUCTION DREDGING.

(Application filed Jan. 28, 1898.)

(No Model.)



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UNITED STATES PATENT OFFICE.

FERDINAND W. KROGH, OF SAN FRANCISCO, CALIFORNIA.

SUCTION-DREDGING.

SPECIFICATION forming part of Letters Patent No. 617,899, dated January 17, 1899.

Application filed January 28, 1898. Serial No. 668,273. (No model.)

To all whom it may concern:

Be it known that I, FERDINAND W. KROGH, a citizen of the United States, residing at San Francisco, county of San Francisco, and State of California, have invented certain new and useful Improvements in Suction-Dredging; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to what is called "suction-dredging" machinery, whereby silt or spoil is raised from the bottom of rivers, channels, harbors, or any subaqueous source by means of pumps, and relates especially to means of loosening and disintegrating the material to be raised or removed, also applicable to the exploitation and procurement of gold or other metals from subaqueous sources. One of the principal objects of raising subaqueous material by this means, aside from the deepening of channels, is the exploitation and recovery of gold or other valuable metals which may be distributed therein.

My improvements consist in providing a flexible or jointed suction-pipe capable of an angular sweep in any direction, having a vertical terminus jointed thereto and a cutting-cylinder having cutting or disintegrating means on its lower margin sleeved upon said terminus, capable of motion up and down thereon, with means for reciprocating said cylinder up and down, and means for sustaining said suction-pipe and said cylinder, and specific details appertaining to such apparatus.

The principal objects of my invention are, first, to provide in a vertical direction and by gravity the force required to disintegrate the material, so as to avoid disturbing strains laterally or horizontally on the pontoon or barge on which the machinery is mounted; second, to cut off or slice down the spoil in the plane of movement, so as to push it into the suction-pipe, thereby securing direct and free entrance; third, to provide an entering-orifice or intake of the smallest possible area and a consequently high velocity of inflow where the spoil enters the suction-pipe; fourth, to provide spoil-gathering mechanism that will operate as nearly as possible independent of the pontoon or barge on which

the machinery is supported, and thus avoid adjustment of the pontoon or barge as an element in the process of suction-dredging; fifth, to provide disintegrating apparatus that will not involve running machinery, bearings, or other perishable parts below the surface of the water and exposed to destructive wear from sand or grit.

To these ends I provide machinery and apparatus as shown in the drawing, which represents in side elevation the main elements and parts of a suction-dredging plant or apparatus arranged and operating according to my invention.

The machinery is all mounted on a barge or pontoon 1, that can be of any form having the required stability.

2 is the dredging-pump, of the centrifugal style, driven by means of a belt 3 from an engine or any other suitable motive power at 4.

5 is the suction-pipe, pivoted at 6, 7, and 8 to permit its movement in all planes and to swing throughout any required arc, as the nature of the work may demand.

9 is the discharge-pipe, that may lead to any place of deposit for the spoil passing through the pump 2.

The suction-pipe 5 is sustained by means of the derrick 10, swinging boom 11, and a chain or rope 12, extending from the top of the vertical section of the pipe over pulleys at 13 and 14 to a drum-winch 15, so the suction-pipe can be raised or lowered as the depth of the water and position of the spoil may demand, an extreme vertical position being indicated by dotted lines at 16.

Around the bottom and sliding on the vertical terminus of the suction-pipe 5 is a reciprocating cutting or disintegrating cylinder 17, suspended by a branched rope or chain 18, that extends over pulleys at 13 14 and around a pulley or pulleys 19 and then to a drum-winch 20. The pulley or pulleys 19 are placed in the bight of the chain or rope 18 and are mounted on the ends of a vibrating beam 21. This beam 21 is pivoted at 22 and is operated by a cam 23, that bears on the rollers 24. The cam-shaft 25 is driven by a belt 26 from an engine or other motive power at 4 at some predetermined rate of speed to suit the weight of the cutting-cylinder 17 and

the nature of the spoil 27 to be removed. This cutting-cylinder 17 is made heavy enough so that in descending or falling with a churning action it will cut or disintegrate ordinary silt or spoil 27, which as soon as severed or disintegrated passes directly and without change of course into the end of the suction-pipe 5 and the pump 2. The cutting end of the cylinder 17 is provided with renewable cutting implements, which may be a hardened-steel ring 28, with or without cross-knives or provided with a series of teeth, as the nature of the material to be operated upon will demand or render most efficient. The reciprocating or churning action of this cylinder or cutter is provided for by means of the vibrating beam 21 and pulleys 19 in the bight of the rope or chain 18, a weight 29 being provided to cause a quick reaction of the beam 21 when released by the cam 23 and a free drop of the cylinder 17, so that it will cut, slice off, and disintegrate hard material.

The cam 23 can be of any form to give an abrupt release and free fall of the cylinder 17, as shown in the drawing, or any easy reciprocating motion when the material to be acted upon is soft. In the case of hard material and when the weight of the cutting-cylinder 17 is not sufficient to cause disintegration this cylinder and the suction-pipe 5 can be connected together so the weight of the latter can be added to the downward strokes.

The vertical hoist and progressive downward motion or feed movement of the cutting-cylinder 17 are accomplished by winding and unwinding of the chain or rope 18 on the drum-winch 20, giving complete control, as may be seen, the reciprocating or churning motion remaining the same at all positions of the cutting-cylinder 17.

The suction-pipe 5 is adjusted upward or downward, as the depth of the water may require, by means of the rope or chain 12 and the drum-winch 15. This adjustment is less frequent and of course contingent on the position and range of the cutting-cylinder 17.

The intake-orifice at 28 being not much larger in area than the bore of the suction-pipe 5, the velocity of flow into the pipe is such as to collect all the free material that comes within range of the intake, permitting a larger amount of solid matter to be carried up with the water than is possible when the zone of disintegration is larger than the pipe, as in the case of excavating apparatus revolving about the suction-pipe inlet.

The boom 11 and the suction-pipe pendent therefrom can be swung to the right and left by any of the well-known means, such as ropes and tackle or a toothed sector adjusted by hand or to move automatically in stages or spaces as the spoil 27 is removed. I do not illustrate these devices, as they are well understood and may be arranged in a variety of forms to suit the circumstances of construction and use.

The advance movement onto the spoil 27

is within a certain limit provided for by a telescopic joint 31 in the suction-pipe 5, the pulleys at 13 being moved out or in upon the boom 11 accordingly, and when the range of these adjustments is reached the pontoon 1 is then moved forward for a new setting or area to be acted upon. In this manner it will be seen that the pontoon 1 performs no function except as support for the machinery and can be anchored by ordinary moorings and held without any disturbing strain in a horizontal plane, thus dispensing with the usual devices for holding, advancing, or swinging the pontoon while the dredging operation proceeds.

The suction-pipe 5 can be set below the surface of the water to prevent air-leaks through the movable joints therein and may enter the side or end of the pontoon 1 below the water-line, the pump 2 being in that case set within or on the bottom of the pontoon. These movable joints may be flexible, consisting of sections of india-rubber or leather instead of the metallic sleeves.

It will be understood that the arrangement of the machinery of this kind can be and is modified in various ways to suit its size and capacity and for different kinds of subaqueous dredging. I do not, therefore, limit myself to the precise design or arrangement shown in my drawing; but

I claim as my invention—

1. In combination, a jointed or flexible suction-pipe, capable of angular motion in both horizontal and vertical planes, a vertical terminus jointed to said pipe, a cutting-cylinder sleeved upon said terminus, and capable of longitudinal motion thereon, cutting or disintegrating means on the lower margin of said cylinder, and means for reciprocating said cylinder up and down on said vertical terminus, whereby the material is dislodged, substantially as specified.

2. In combination, a suction-pump, a jointed or flexible suction-pipe, capable of angular motion in both horizontal and vertical planes, means for suspending and swinging said pipe at any required angle of lateral or vertical sweep, a vertical terminus jointed to said pipe, a cutting-cylinder sleeved upon said terminus and capable of longitudinal motion thereon, cutting or disintegrating means on the lower margin of said cylinder, and means for reciprocating said cylinder up and down on said vertical terminus, substantially as specified.

3. In combination, a suction-pump mounted on a floating barge or pontoon, a double-jointed suction-pipe having a jointed terminus, a cutting-cylinder sleeved upon said terminus and capable of longitudinal motion thereon, a cutting or disintegrating means on the lower margin of said cylinder, and means for reciprocating said cylinder on said terminus, substantially as specified.

4. In combination, a suction-pump, a double-jointed suction-pipe capable of angular mo-

tion in any direction, means for suspending and swinging said pipe to any required position, a terminus jointed to said pipe, a cutting-cylinder sleeved upon said terminus and
5 capable of longitudinal motion thereon, cutting or disintegrating means on the lower margin of said cylinder, and means for reciprocating said cylinder on said terminus while sustained by independent means, substantially as specified.

10 5. In suction-dredging machinery, a pump and a jointed suction-pipe, a suspended reciprocating cutting-cylinder surrounding and moving on the outer or lower end of the suction-pipe, a rope or chain to suspend and ad-

just the cutting-cylinder, and reciprocating mechanism acting in the bight of the suspending rope or chain by means of which the cylinder is given a reciprocal movement independent of its vertical adjustment and in
20 respect to the suction-pipe on which it moves, substantially as specified.

These features I believe to be novel and useful and ask that Letters Patent be granted therefor.

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