(No Model.) 3 Sheets—Sheet 1.

M. F. BRAINARD.

DREDGING MACHINE.

No. 377,060. Patented Jan. 31, 1888.

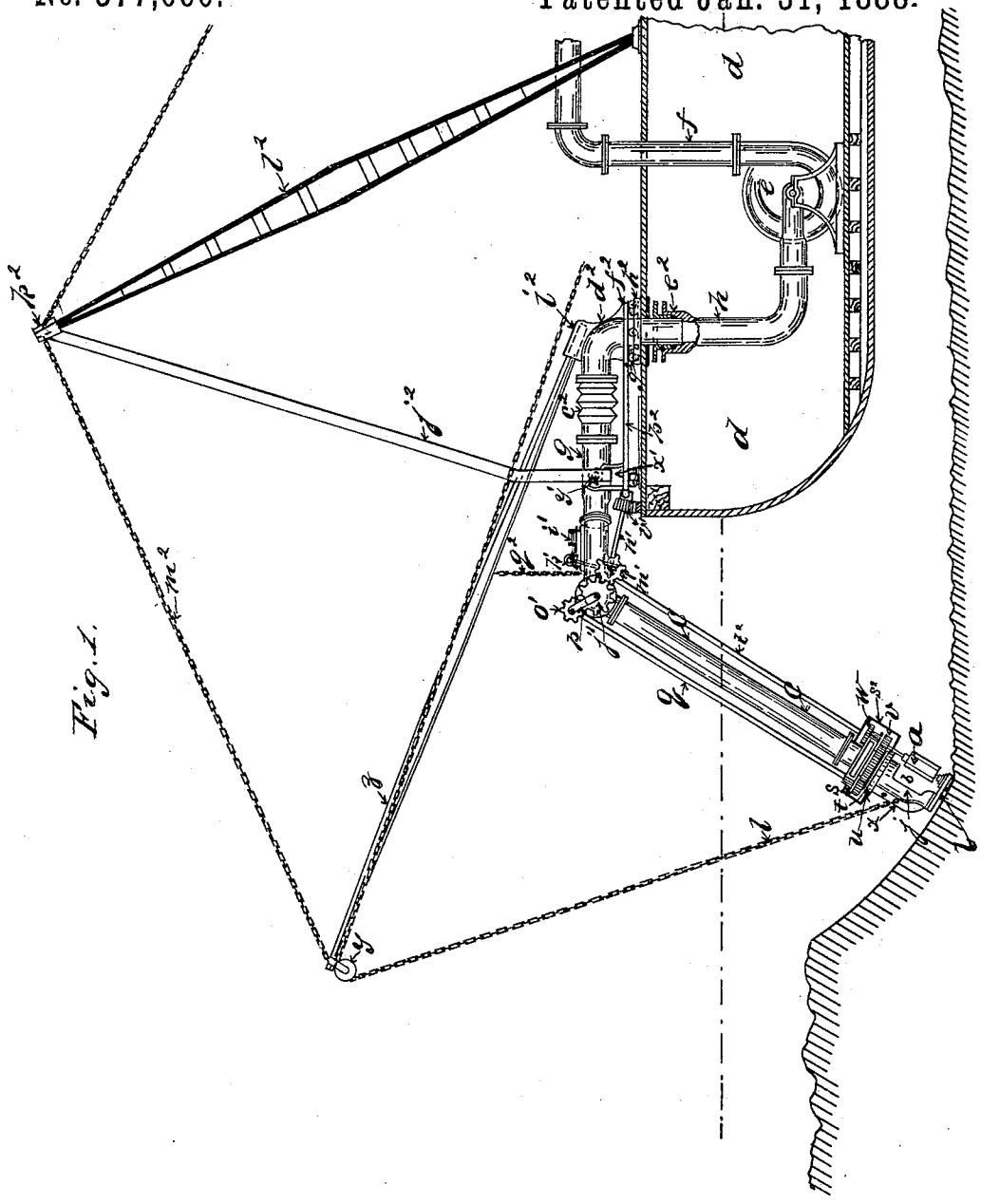


Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

M. F. BRAINARD.

DREDGING MACHINE.

No. 377,060. Patented Jan. 31, 1888.

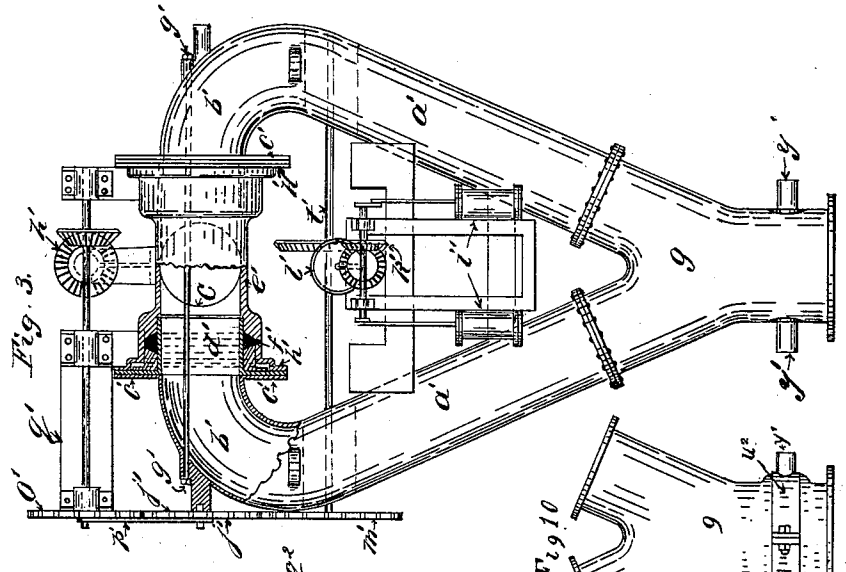
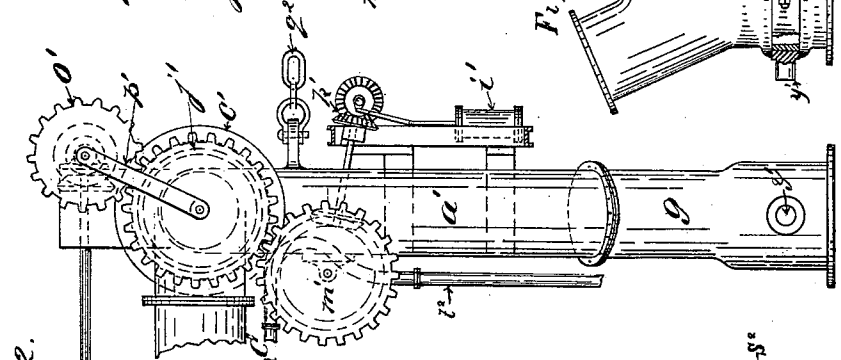


Fig. 3.

Fig. 10



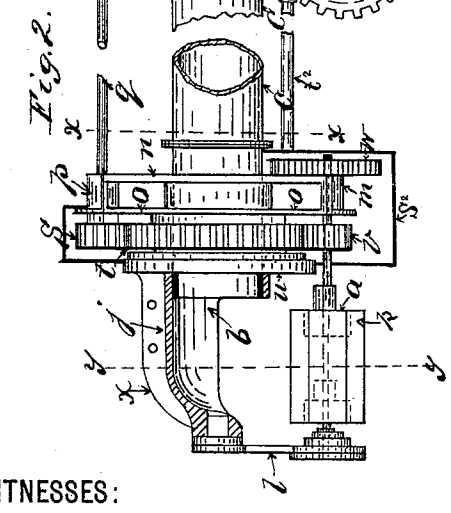


Fig. 2.

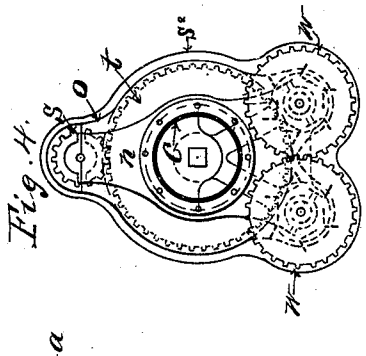


Fig. 4.

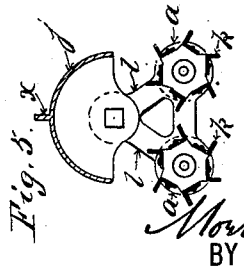


Fig. 5.

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M. F. BRAINARD.

DREDGING MACHINE.

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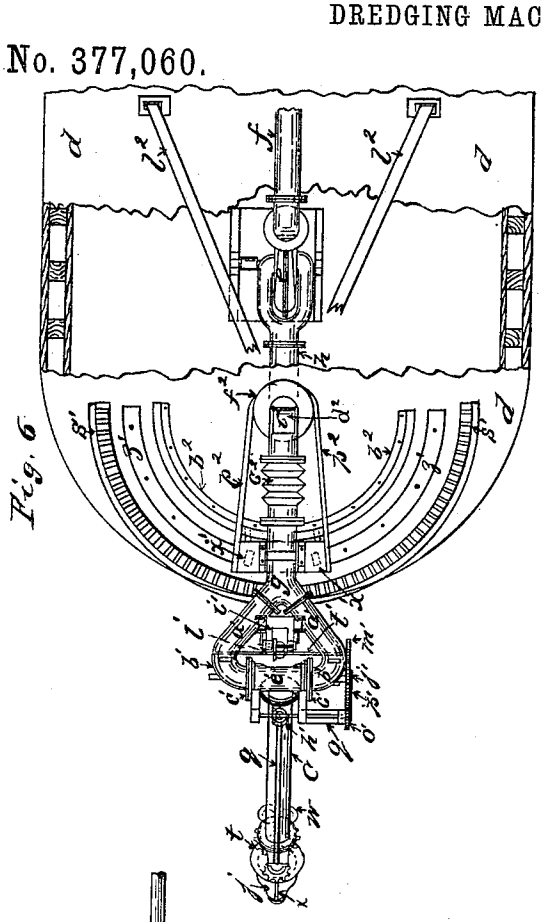


Fig. 6.

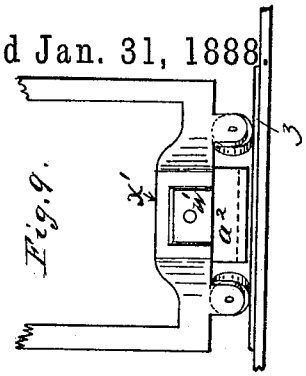


Fig. 9.

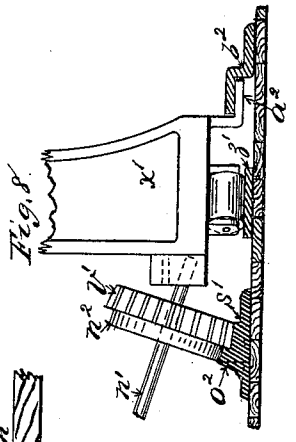


Fig. 8.

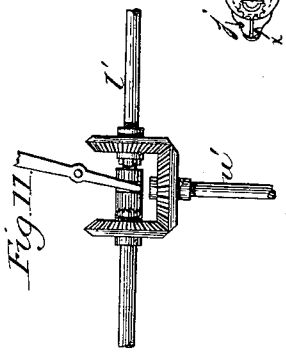


Fig. 11.

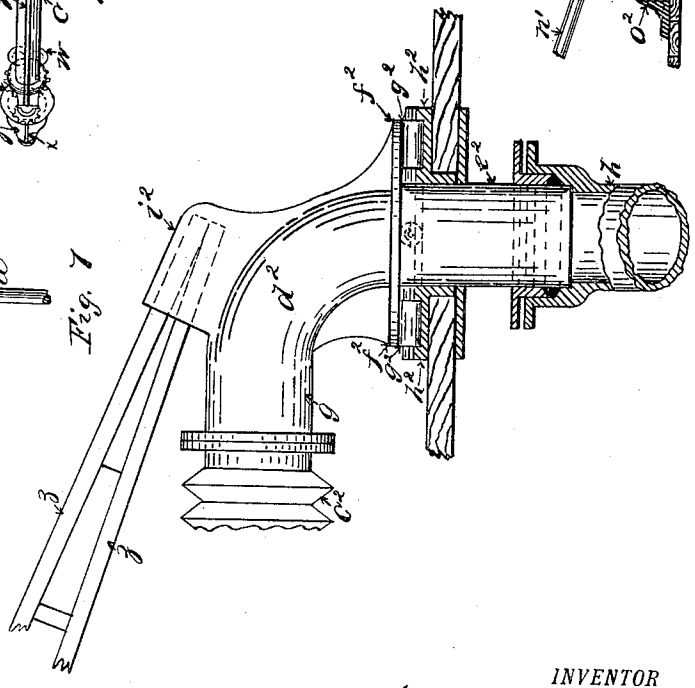


Fig. 7.

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UNITED STATES PATENT OFFICE.

MORRIS F. BRAINARD, OF BROOKLYN, NEW YORK.

DREDGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 377,060, dated January 31, 1888.

Application filed February 21, 1887. Serial No. 228,288. (No model.)

To all whom it may concern:

Be it known that I, MORRIS F. BRAINARD, of Brooklyn, Kings county, New York, have invented a new and useful Improvement in Dredging-Machines, of which the following is a specification.

My invention relates to the kind of dredging-machines in which the sand and other matters are thrown up from the bottom and delivered by a rotary digger or diggers to a suction-pipe suspended from the dredge-boat, whereon it connects with a powerful pump and with a delivery-pipe for the raising and discharging of the same, together with a stream of water impelled by the pump.

The essential feature of the invention is the contrivance of excavators for throwing up the earthy matters into a suction-pipe located over the excavators. The rest comprises the details of the apparatus, all as hereinafter described, reference being made to the accompanying drawings, in which—

Figure 1 represents the apparatus, mainly in side elevation, with a section of part of the dredge-boat. Fig. 2 represents part of the dredging apparatus in side elevation on an enlarged scale. Fig. 3 is a plan view of the apparatus represented in Fig. 1, with a part in horizontal section, and also on the same enlarged scale as Fig. 2. Fig. 4 is a transverse section of Fig. 2 on the line *x x*. Fig. 5 is a transverse section of Fig. 2 on the line *y y*. Fig. 6 is a plan view of the apparatus and part of the dredge-boat, with some portions of the upper works of the apparatus and part of the deck removed. Fig. 7 is a detail of the suction-pipe, partly in side elevation and partly in section. Fig. 8 represents details of the traverse-way and carriage for the traverse of the excavator in its lateral range. Fig. 9 is also a detail of the said carriage, and Fig. 10 is a plan of part of the suction-pipe swiveled in a trunnion-band. Fig. 11 is a detail of the traverse-gearing.

I suspend one, or preferably two, rotary diggers or excavators, *a*, under the open lower end, *b*, of section *c* of a suction-pipe suspended from the dredge-boat *d* and connected through other sections, *g* and *h*, with a pump, *e*, and discharge-spout *f*, arranging said excavators so that, being rotated while bearing at their lower sides or ends, or both in part, on the bottom with more or less pressure, regulated by the suspending-chain *i*, they will dig up and throw the earthy matters upward within the influence of the suction under the hood *j*, projecting along over the excavators from the open end of the suction-pipe, said excavators consisting of a cylinder or drum with blades *k* suitably projecting from the cylinder or drum, to dig up the material to the best advantage, and where two are used they are placed side by side on the same level or plane and made to rotate in opposite directions, to throw the material upward in one stream between them; but the form of the digging-blades may be varied, and they may be rotated reversely to throw up two streams outside, instead of one between them; but in such case the sides of the hood *j* would be extended both laterally and downwardly a little more than as represented in the present instance, notably in Fig. 5.

If only one excavator is used, that side of the hood up which the excavator delivers may be extended somewhat lower than is necessary. When two are employed and arranged to deliver from between them, the single excavator may be located in the vertical plane of the axis of the hood and suction-pipe; but it will probably be preferable to set it laterally thereto, so that the stream thrown up will be nearer the center. For mounting and operating these excavators, the hood *j* carries the arms *l* pendent from its outer extremity, in which arms the outer or lower journals of the excavators are fitted with bearings, and the inner or upper journals have bearings at *m* suspended from the tube *c* by the plates *n* and *o*, which also extend above the tube and support the lower bearing, *p*, of the driving-shaft *q*, extending down alongside of section *c* of the suction-tube from the driving-power above to operate the excavators, said shaft carrying the pinion *s*, which drives the transmitting-wheel *t*, mounted on the tube *c* between collar *w* and plate *o*, for its pivot, and gearing with one of the excavator's shafts by a pinion, *v*, the two excavators are geared together by the wheels *w*, so that both are operated by this train; but it is obvious that other contrivances for the driving train of gears may be employed, and I do not limit myself to any special arrangement of this part of the apparatus. These

gears are inclosed in a tight case, s^2, in which a pressure of water is maintained from a pump or other device on the dredge-boat through pipe t^2, to exclude the sand and avoid the wear they would be subject to if not protected. The hood b has a strong rib, x, along its back, to which the suspending-chain i is connected for swinging the excavators and tube c vertically, according as the water is shoal or deep, and as it is deepened in the progress of the work. This chain passes over the pulley y at the end of the boom z, and thence to any approved apparatus on the boat for working it, as a capstan or engine, in any of the common and well-known contrivances, which it is unnecessary to represent in the drawings. To enable section c of the suction-pipe to be thus raised and lowered and at the same time to be connected to section g by air-tight joints enabling suction to be maintained, section g is constructed with diverging branches a', which terminate in elbows b', that converge in a line at right angles to the main portion of said section, and have a broad substantial flange, c', on the end, to each of which a tubular trunnion, d', is attached, for reception of the T e' of the upper end of section c between the ends of said elbows, which are located a suitable distance apart for the purpose, said T being fitted with stuffing-boxes f' and suitable packing for making the necessary working air-tight joints when drawn up tight by the bolt g', said joints being also contrived for great lateral rigidity for swinging the excavators laterally by the broad flange c' and the correspondingly broad flanges h' of the T e'.

The power for driving the excavators may be transmitted to the shaft q in any approved way; but that which I have adopted consists of one or more small steam-engines, i', mounted on section g of the suction-pipe at the forks and driving the transmitting-wheel j', located in the axis of the T e' by any suitable train, as the bevel-wheels k' and i' and spur-wheel m', to which wheel j' the shaft q is connected by the bevel-wheels n' and spur-wheel o', which are carried in bearings mounted on the T, so that as the T swings on its trunnions wheel o' will traverse wheel j', while at the same time maintaining its due relation therewith for being driven by it. The link-bar p' is employed as a stay for preventing the springing of the overhanging bearing q' for the shaft of wheel o'. The traverse of the excavators forward and backward across the bows of the boat is also effected by the motors i' through the segmental toothed rack s', with which connection is made from the shaft t' by the shaft u' and bevel-wheel v', said shaft being "stepped" at its lower end in a box, w', carried on the traversing carriage x', upon which section g of the suction-pipe is mounted by trunnions y', and which runs on the circular track z' and has a guard projection, a^2, which runs under the overhanging rim of the guard-rail b^2, attached to the deck, for preventing the lifting of the carriage by any upward thrusts to which the suction-pipe may be subject by the rocking of the boat or other cause.

I will in some cases mount pipe g in a trunnion-band, n^2, wherein and by the flexible joint of said pipe, hereinafter described, the sections c and g may oscillate slightly to relieve the stress of the rocking of the boat.

Thus it will be seen that the excavators may be shifted to the work as it progresses in the vertical plane by swinging section c on its pivot with section g by the chain i, or laterally by the carriage, either device being used according as the nature of the work requires. The shaft u' is geared with one or the other of the bevel-drivers on shaft t' by the clutch, Fig. 11, according as the carriage is to be shifted.

The section g of the suction-pipe has a flexible section of circumferentially-grooved rubber at c^2 to relieve these vertical thrusts to some extent, and at d^2 it has an elbow turning down through the deck of the boat and connecting with section h below the deck by a stuffing-joint, e^2, which is the pivot around which the excavator swings in its lateral traverse over the bows. Above the deck the pipe has a flange, f^2, resting on rollers g^2 in a circular track, h^2, forming a turn-table that is a substantial connection and one adapted for working with but little friction.

The boom z is stepped at i^2 in a socket on elbow d^2, so as to traverse with the excavator, and stanchions j^2, extending upward from the carriage, converge in a pivot-socket at k^2 in the upper end of the main shears l^2, directly over the joint-pivot of the suction-pipe, to traverse with the carriage and at the same time stay the shears over which the boom-supporting chain m^2 is rigged.

The bearing-box w', connecting the shaft u' with the carriage x', is fitted loosely in a socket of the carriage, for allowing such vertical play as may be necessary to enable wheel v' to keep its due relation with the rack s' when the pipe-section g may vibrate on its trunnions y' by the rocking of the boat on the water. Wheel v' has a plain rim, n^2, and the rack has a rail, o^2, on which the wheel rolls for this purpose.

The carriage x' and the turn-table flange f^2 are firmly tied with the yoke p^2, for staying them together to resist the thrusts of the suction-pipe on the carriage. To limit the downward play of the outer end of pipe g and to hold the excavators positively at the lower limit of vibration, said pipe is connected to the boom by a stop-chain, q^2, which mainly suspends the excavators and section c of the suction-pipe and allows of free vibration in any direction.

What I claim, and desire to secure by Letters Patent, is—

1. The combination, with a suction-pipe jointed and suspended for swinging vertically fore and aftward of the boat, and having a hood-extension in prolongation of the lower end, of a rotary excavator located under the hood parallel with but lower than the axis of the tube, and adapted to dig and throw the earthy mat-

ters laterally to itself into the hood, substantially as described.

2. The combination, with a suction-pipe jointed and suspended for swinging vertically fore and aftward of the boat, and having a hood-extension in prolongation of the lower end, of a pair of rotary cutters located under the hood and parallel with but lower than the axis of the tube, and adapted to dig and throw upward laterally to them a stream between them into the hood, substantially as described.

3. The combination of the suction-pipe having a hood-extension of the lower end, rotary excavators located under the hood and adapted to dig and throw up the earthy matters into the hood, the T on the upper end of the suction-pipe, and the convergent branches a' b' of pipe g, and trunnion-bearings thereof connected with the T, substantially as described.

4. The combination of the suction-pipe c, having the hood-extension of the lower end and a rotary excavator located under the hood, the T-head of the upper end of said pipe, and the branched pipe g, having the hollow trunnion-bearings connected with the T, substantially as described.

5. The combination, in a dredging-machine, of rotary excavators with a suction-pipe having a joint, c, adapted to swing the excavators vertically fore and aftward of the boat for following up the work, and also having a joint, g, adapted to swing said excavators laterally to the work, said excavators being located under a hood-extension of the lower end of the suction-pipe to throw up the earthy matters into the hood above them, substantially as described.

6. The combination of the suction-pipe c, having the hood-extension of the lower end and a rotary excavator located under the hood, the T-head of the upper end of said pipe, the branched pipe g, having hollow trunnion-bearings connected with the T, the carriage-supporting pipe g, and the vertical stationary pipe h, jointed to the elbow of pipe g, substantially as described.

7. The combination of the suction-pipe c, having the hood-extension of the lower end and a rotary excavator located under the hood, the T-head of the upper end of said pipe, the branched pipe g, having hollow trunnion-bearings connected with the T, and the flexible sections c^2 of said pipe g, substantially as described.

8. The combination of the branched pipe g, jointed with the vertical pipe h, and having the flexible section and hollow trunnion-bearings, with the pipe c, having the T-head at the upper end pivoted on said trunnion-bearings, and also having the hood-extension of the lower end and a rotary excavator located under the hood, substantially as described.

9. The combination of the branched pipe g, jointed to the vertical pipe h, pivoted on the traversing carriage, and having the flexible section c^2 and the hollow trunnion-bearings, with the pipe c, having the T-head at the upper end and the hood-extension and excavator at the lower end, substantially as described.

10. The combination of the branched pipe g, pivoted to the vertical stationary pipe h on the boat, pipe c, pivoted to the branches of pipe h, excavators mounted on the lower end of pipe c, boom z, stepped on the pipe g, traversing carriage x' for the suction-pipes, stanchions j^2, supported on the carriage, shears l^2, stayed by the stanchions, and the boom-supporting chain rigged on the shears, substantially as described.

11. The combination of the excavators mounted in supports l and o n, pendent from the hood and pipe c, transmitting-wheel t, pivoted on the pipe, driving-pinions s, and the driving-shaft q, mounted on the upper side of said pipe c, substantially as described.

12. The combination, with the driving-shaft q, mounted on the upper side of pipe c and connected with the excavators, of motor-engine mounted on the branched pipe g, and the gear-train connecting the motor-engine and said shaft through the wheel j', pivoted in the axis of the joint-connection of said pipes c and h, substantially as described.

13. The combination of the stop-chain q^2 with the pipe g, having the flexible section c^2, and being mounted on trunnion-bearings and jointed to the pipe c, having the excavators, substantially as described.

14. The combination, with the traversing carriage and the suction-pipe mounted thereon, of the driving-wheel v', having the plain rim n^2, and the toothed rack s', having the plane rail o^2, said wheel being geared with said carriage and with the motor-train mounted on the suction-pipe, and the rack being attached to the deck of the boat, substantially as described.

15. The combination, with the traversing carriage and the flexibly-jointed suction-pipe pivoted on it, of the driving-wheel of the carriage, having one end of its shaft mounted on the vibrating suction-pipe and the other end connected with the carriage by a box adapted to shift as the pipe vibrates, substantially as described.

16. The guard-rail b^2, in combination with the traversing carriage having the suction-pipe pivoted on it, and provided with the guard-bracket connecting it with said guard-rail, substantially as described.

17. The excavator driving-gearing inclosed in a protecting-case, in combination with apparatus maintaining hydrostatic pressure in the case to exclude sand and other gritty matters, substantially as described.

18. The combination of trunnion-band n^2 and trunnions y' with pipes g and c, said pipe g having a flexible section, c^2, allowing it to vibrate, substantially as described.

MORRIS F. BRAINARD.

Witnesses:
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