

No. 645,353.

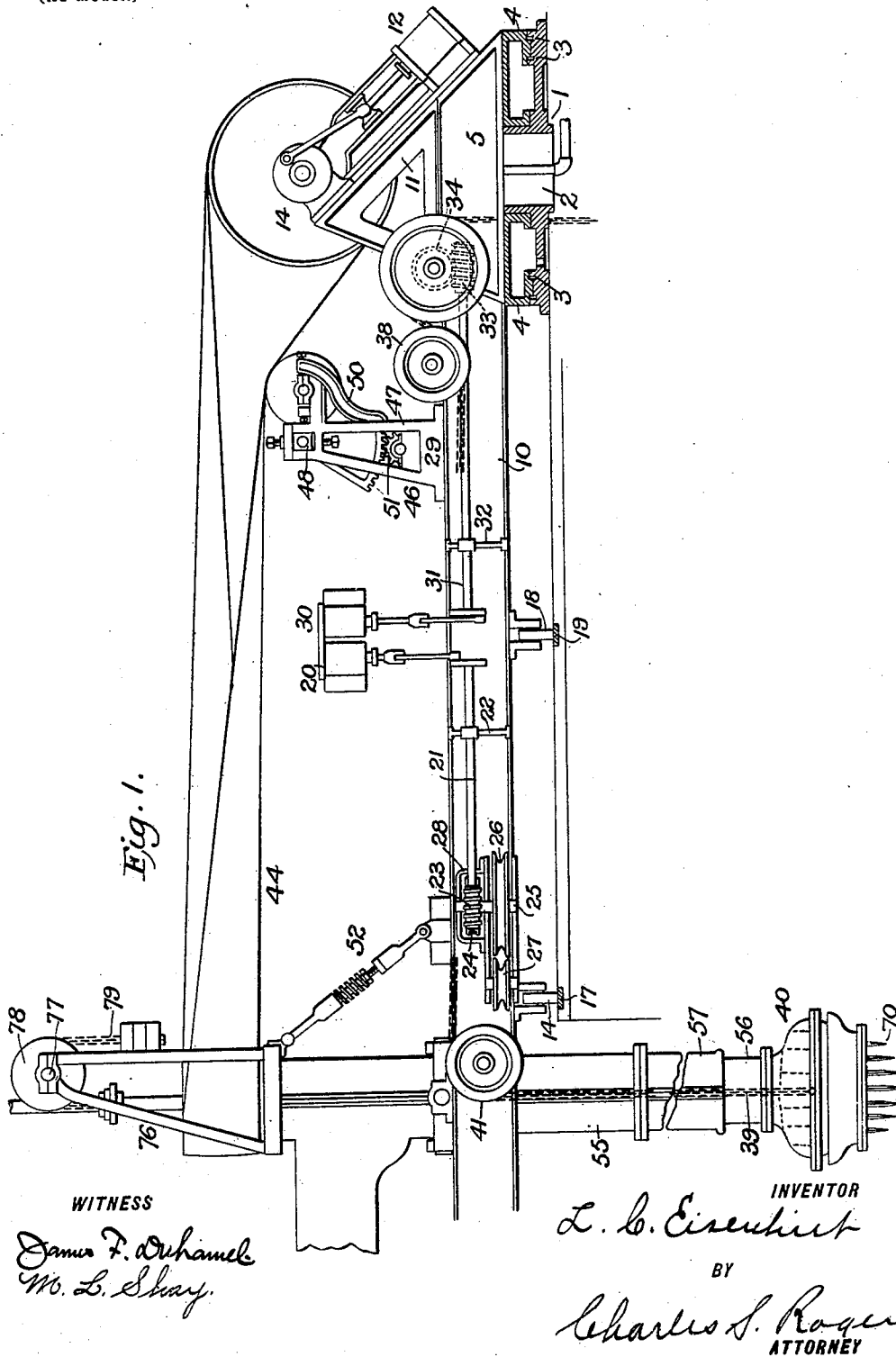
Patented Mar. 13, 1900.

**L. C. EISENHUT.
DREDGING MACHINE.**

(Application filed Jan. 6, 1899.)

(No Model.)

3 Sheets—Sheet 1.



WITNESS

James F. Duhamel
Mo. L. Shay.

INVENTOR

L. G. Eisenhart

BY

Charles S. Rogers
ATTORNEY

No. 645,353.

Patented Mar. 13, 1900.

L. C. EISENHUT.
DREDGING MACHINE.

(Application filed Jan. 6, 1899.)

3 Sheets—Sheet 2.

(No Model.)

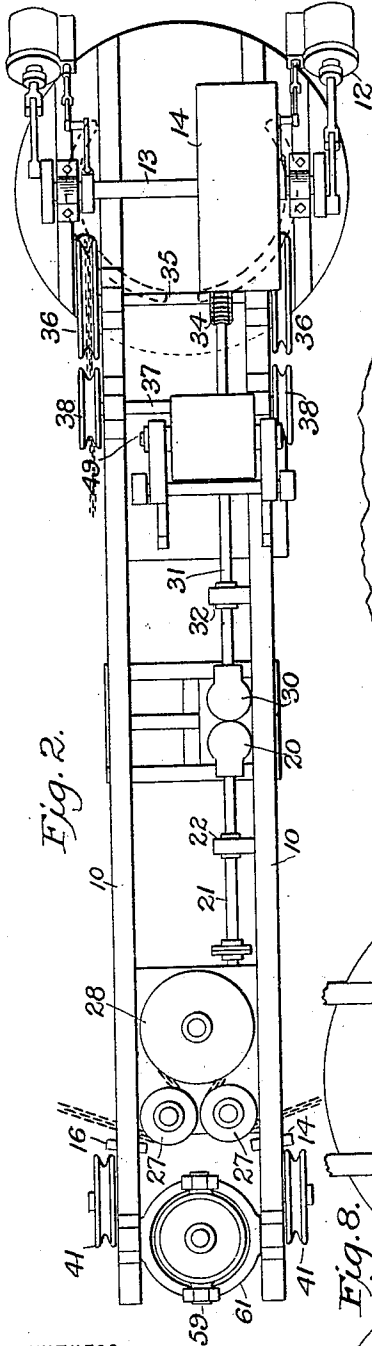


Fig. 2.

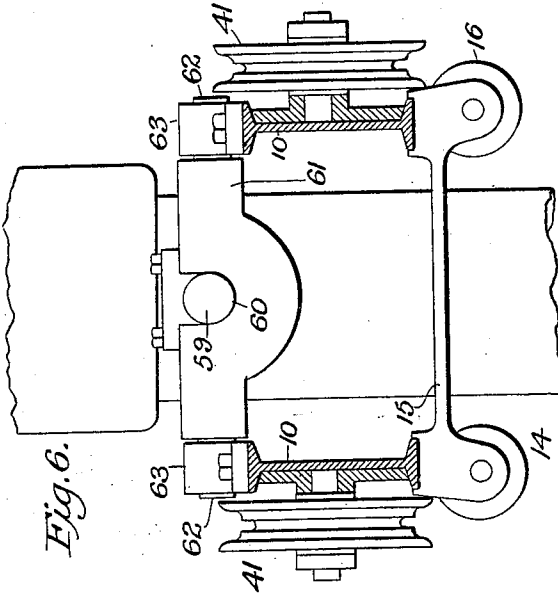


Fig. 6.

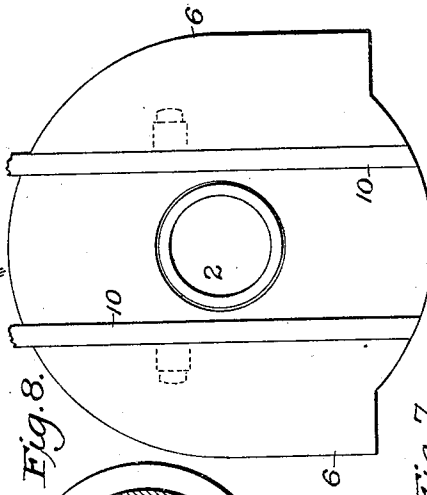


Fig. 8.

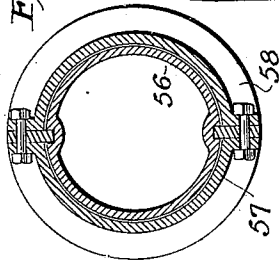


Fig. 9.

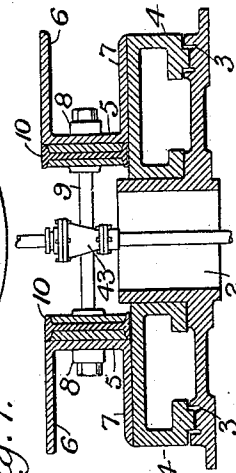


Fig. 7.

WITNESS

James F. Duhamel.
W. L. Shay.

INVENTOR

L. C. Eisenhut

BY

Charles S. Rogers
ATTORNEY

No. 645,353.

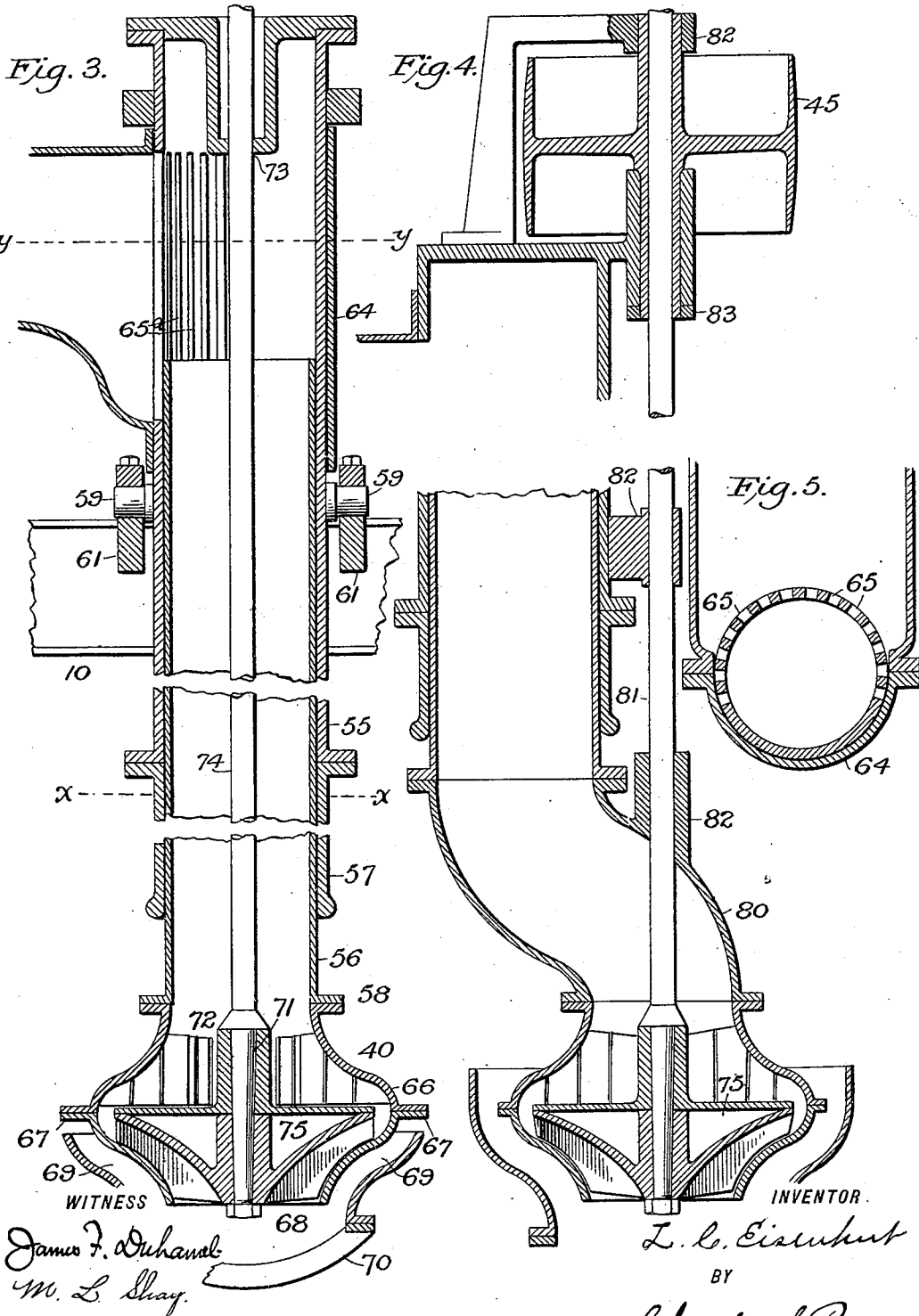
Patented Mar. 13, 1900.

L. C. EISENHUT.
DREDGING MACHINE.

(Application filed Jan. 6, 1899.)

(No Model.)

3 Sheets—Sheet 3.



WITNESS

James F. Duhanal
W. L. Shay.

INVENTOR.

L. C. Eisenhut

BY

Charles S. Rogers
ATTORNEY

UNITED STATES PATENT OFFICE.

LAURENSE C. EISENHUT, OF NEW YORK, N. Y.

DREDGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 645,353, dated March 13, 1900.

Application filed January 6, 1899. Serial No. 701,388. (No model.)

To all whom it may concern:

Be it known that I, LAURENSE C. EISENHUT, a citizen of the United States, residing at New York, borough of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Dredging-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to dredging or excavating machines, and particularly to those wherein a subaqueous turbinate telescopic close and direct acting pump is employed for the removal of obstructions from the bottom of ponds, reservoirs, streams, rivers, channels, canals, harbors, and docks, consisting of mud, silt, sand, clay, sand-gravel, and such other solids, and of such size or bulk as may with safety and economy pass through the pump and connections employed.

Some of the objects of this invention are to produce an apparatus of this character provided with an extensive or telescopic construction of pump, pipe, and discharge head or outlet, and also with a vertical and extensive driving-shaft having bearings and counterbalance-weight.

A further object of the invention is to provide improved means of lengthening or extending the pump and discharge-pipe employed to any desired depth, and yet without great delay in operation and at a comparatively small cost and at no expense to the rigidity of operative parts of the apparatus or to the impairment of the desired results as to the quantity of solids under removal, other than the cost for the additional height through which the material is to be conveyed.

A further object is to obtain and maintain satisfactory results in apparatus of this character by the employment of pumps or pumping systems in the subaqueous removal of such materials which cannot be successfully removed by means of long suction-pipes leading from the seat of the solids to the pump, but the pump proper is to be brought into immediate, direct, and continuous contact with the object to be removed, being even partially or totally embedded therein in order

to force the solid, together with the necessary amount of water, to the point of delivery.

With these and other objects in view the invention consists, essentially, in the construction, combination, and arrangement of parts, substantially as hereinafter more fully described in the following specification and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section, of my improved apparatus. Fig. 2 is a top plan view of the same. Fig. 3 is a longitudinal central section of the suction-pipe. Fig. 4 is a similar view of a modified form of construction. Fig. 5 is a detail view of the discharge-head on line *yy*, Fig. 3. Fig. 6 is a detail view of the universal joint or support of the suction-pipe, showing the outer truck. Fig. 7 is a detail view of the bed-plate, turn-table, and universal joint of the steam-supply pipe. Fig. 8 is a detail view of the carriage-frame; and Fig. 9 is a transverse section of the suction-pipe taken on lines *xx* of Fig. 3.

Similar characters of reference designate corresponding parts throughout the several views.

As will be readily understood, my improved machine is so constructed as to be placed upon the deck of a vessel or upon a platform or foundation, and it may be operated over the front, the rear end, or the sides of the vessel or platform, and, furthermore, one or more machines may be operated simultaneously from one vessel or platform.

The only parts of the machine requiring rigid and permanent fastening to the vessel or platform are the bed-plate, traversing rail and foundation, and traversing chain ends.

The motive power employed will preferably be steam by means of steam-engines of special design and construction; but compressed air or electricity may also be used.

Referring to the drawings and particularly to the construction illustrated in Figs. 1, 2, and 7 thereof, the reference character 1 designates a bed-plate, preferably provided with an extended hollow center 2 and having annular or other grooves 3 to receive and retain lubricant for the continuous lubrication of the moving or sliding parts.

Movably mounted upon the bed-plate 1 and held in position thereon by the hollow center 2 is a turn-table 4, adapted to revolve upon prepared bearing-surfaces on the bed-plate, and to the turn-table are secured in any suitable manner carriage-frames 5, preferably provided with parallel flanges 6 and 7, as clearly shown in Figs. 1 and 7 of the drawings. The carriage-frames 5 are preferably provided with hubs 8 to receive a transverse shaft 9, which also passes through one end of the carriage-beams 10, so as to secure said beams to said frames in such a manner as to be free or independent from the surface of the turn-table 4, as illustrated in Fig. 7, and directly upon the carriage-frames 5; but indirectly to the turn-table 4 are rigidly secured in any desired manner engine-frames 11, adapted to receive engines 12, operating jointly at an angle of preferably forty-five degrees upon one engine-shaft 13 and band or pulley wheel 14, as shown in Figs. 1 and 2, and engines 12 are partially mounted upon and connected with the carriage-frames 5, thus binding or uniting the two frames and at the same time allowing for the respective adjustment or alteration of either. Thus it will be understood that the bed-plate 1 permits of the free but true central movement of the turn-table 4, carriage-frames 5, engine-frames 11, and engines 12, together with the engine-shaft 13 and band-wheel 14, through the required degree of arc around the hollow center of the bed-plate and upon the prepared and constantly-lubricated surface bearing of the same.

The carriage consists of two parallel carriage-beams 10, preferably I-beams, of wrought iron or steel, either rolled in one part each or built up, as may be desired, connected in any suitable manner at predetermined intervals throughout the length thereof, so as to constitute one complete whole.

The length, width, and depth of the carriage will be regulated by the capacity of the pump and other conditions, and the dimensions thereof may be varied considerably when found necessary.

The carriage is secured and joined to the carriage-frame 5 in such a manner as to bring the former above and free of the latter to permit of any irregularity in the level surface or alinement of the deck of the vessel or the platform between the bed or foundation plate and the traversing rail at the free end of the carriage, and this connection between the carriage-frames 5 and carriage-beams 10 is effected by means of a shaft 9, of wrought iron, steel, or other suitable material, passing through the hubs 8 of the carriage-frames and likewise through similar hubs upon the carriage-beams 10, Fig. 7, thus uniting both and yet permitting of self-adjustment, as before mentioned. I may also form a conduit out of the carriage and pass the material through the turn-table into compartments formed in the bottom of the vessel.

The carriage is provided near the free end thereof with a specially-designed truck 14, Figs. 1 and 6, secured thereto in any suitable manner, having a frame 15, carrying revolving truck-wheels 16, adjusted to and held in suitable bearings of the truck-frame 15, to carry the weight of the carriage, suspended pump, and all other parts attached to the carriage, and this truck is designed to facilitate a traversing movement of the parts above mentioned as the wheels 16 of the truck run over the traversing rail 17, Fig. 1, secured to or supported upon the deck or platform with which the apparatus is connected.

The traversing rail 17 will describe an arc across the bow or breadth of the vessel or platform, and may also extend a limited distance beyond the vessel or platform, carrying the apparatus to permit of the digging of such width of channel that the vessel may follow and continue the operation of digging a channel or passage directly in front of the vessel. I may also employ another truck or supporting device 18, Fig. 1, preferably located intermediate of the length of the carriage directly under and forming part of the bed-plate of the engine 20, approximately similar to that heretofore described, and this truck 18 is also adapted to run on a segmental or arc-shaped traversing rail 19, substantially similar to that hereinbefore referred to; but I do not confine myself to the employment of two trucks or to the location of the same upon the carriage.

Mounted in a suitable frame or brace between the carriage-beams 10 is a specially-designed reversible steam-engine 20, Figs. 1 and 2, of suitable power adapted to operate a worm-shaft 21, suitably journaled in hangers or braces 22, preferably secured near the lower edge of the carriage-beams 10, and the shaft 21 is provided at the free ends thereof with a worm or similar device 23, adapted to engage with and operate a worm-wheel 24, carried by a vertical shaft 25, also carrying a chain-gear wheel 26, as clearly shown in Figs. 1 and 2 of the drawings. Adjacent to the chain-gear wheel 26 and at each side thereof between the carriage-beams 10 are mounted chain guide or sheave wheels 27, Figs. 1 and 2, and a chain or other device passes around the chain-guide wheels 27 and the chain-gear wheel 26, and the extremities thereof are attached to the ends of the traversing rail 17 or to any suitable portion of the deck of the vessel or to the platform supporting the apparatus. The worm 23, worm-wheel 24, chain-gear wheel 26, and guide-wheels 27 are preferably inclosed by a frame or housing 28 of any preferred form or construction, as shown in Figs. 1 and 2 of the drawings.

The traversing apparatus before described is located and rigidly secured within the carriage, near the free or outboard end thereof and in a horizontal position, as will be readily understood.

The lower part of the housing or frame 28,

the truck-frame 15, and the bed-frame of engine 20 are all preferably located at the bottom of the carriage, together with the bed-plate or frame 29, secured at the top edge of the carriage, and are constructed and applied in such a manner to the carriage-beams 10 as to constitute a rigid link and binder, making one inseparable and complete carriage of the parallel carriage-beams 10, as will be readily understood.

The apparatus, to produce the desired hoisting and lowering movement of the telescopic turbinate pump at the outer or free end of the carriage, consists, essentially, of a motor substantially similar to that heretofore described in connection with the traversing apparatus and is preferably operated by a reversible steam-engine 30, located side by side with the traversing engine 20, but independent of the same, except as to joint occupation of the same bed or foundation plate, which is located in a suitable space within the carriage and partaking of all the traversing movement thereof, as will be readily understood.

The hoisting-engine 30 operates a worm-shaft 31, suitably journaled in hangers or braces 32, provided at the free end thereof with a worm 33, adapted to operate a worm-wheel 34 upon the shaft 35, suitably mounted in or upon the upper edge of the carriage-beams 10, carrying at the extremities thereof chain-gear wheels 36, and similarly mounted and parallel with the shaft 35 is another shaft 37, carrying guide or sheave wheels 38, as clearly shown in Figs. 1 and 2 of the drawings, and said worm and worm-wheel are preferably provided with a suitably designed frame or housing, also located in and secured to the carriage, but on the top side thereof.

From the immediately-preceding description of the hoisting apparatus it will be readily understood that the hoisting-engine 30 operates the worm 33, which imparts rotating motion to a worm-wheel 34 and shaft 35, carrying chain-gear wheels 36, one at either side of the carriage and directly over the turntable.

As shown in Fig. 1 of the drawings, suitable chains 39 or other devices are attached to the pump 40, one chain at each side of the pump, and pass upward over sheave or guide wheels 41, located on and rigidly secured to the free end of the carriage, one at each side thereof and in line with the vertical axis of the pump 40, and the chains 39 extend along the outer sides of the carriage to and around at the lower or under sides the guide or sheave wheels 38, thence upward and over the chain-gear wheels 36, passing through openings in the carriage-frames, turn-table, and bed-plate to allow the chains 39 to pass downward through the deck or platform to such extent of length as the upward and downward movement of the pump requires, also to keep the chains in taut contact with the chain-gear wheels 36 and prevent the coiling of the sur-

plus lengths. Suitable provision is also made for constant equality of length of the chains 39 between points of attachment to the pump 40 and the chain-gear wheels 36 by means of turnbuckles interposed in said chains between the chain-guide or sheave wheels 38, the length of the chain between said wheels permitting of their application. The traversing and hoisting apparatus hereinbefore described are especially designed for this service and constitute a vital part of the whole system. As there is an almost constant traversing movement of the carriage, and with it the engines, a rigid connection of the live-steam feed-pipes feeding steam from the boiler to the engines is not possible, and pliable pipes, as steam-hose, would prove costly and unsatisfactory. Therefore an appliance to overcome this difficulty becomes imperative. Hence I have produced a device of this character consisting, substantially, of a flanged conical chamber 43, preferably of steam metal, truly bored, and the upper flange faced true with the axis of the bore and a hollow plug, conical at lower end and truly fitted and ground into conical chamber. The upper part of plug of reduced size and straight in form is inserted and held in position by truly fitted and ground headpiece to both upper flange of chamber and upper and partly-circular-shaped surface of conical plug, the headpiece also provided with stuffing-box gland to allow for the packing of reduced and extending part of plug. The headpiece being secured to chamber by bolts, suitable flanged connections made with steam-pipe from boiler at lower flange of chamber and from engine at upper reduced part of plug, a straight-line passage of steam is secured, while the connections at upper and lower flange may assume a changed position at any time from that imparted at the beginning. The plug, well fitted and ground steam-tight to sides of body or chamber, also to under side of headpiece and provided with additional packing outside, will prove a self-adjusting joint on a straight line, the body or chamber joint being further provided with suitable lugs or projections cast to body to permit of being rigidly fastened and, as in this case, to pass up and through the extended hollow center of the main bed-plate of the machine in close proximity to engines, here permanently and rigidly attached and made stationary, while the upper part or extension of plug is connected to steam-chests of engines and may move with the carriage and entire machine in traversing its prescribed space of operation and remain steam-tight during the change of position and when at rest.

The medium of transmitting the pump-engine power from band-wheel 14 to pump-shaft band-wheel 45 is preferably a leather or rubber belt 44 of requisite size to counteract any infringement upon true alinement between engine-shaft and pump-shaft and the respective band-wheels, caused by a swaying or mo-

tion of the vessel and a constant, or nearly so, requirement to maintain the pump in a vertical position commercially to secure the greatest effective service and mechanically the most convenient operation of the telescopic turbinate pump 40, for the purpose of subaqueous excavation or dredging, it is necessary, beyond doubt or dispute, that the pump be always operated in a vertical position. This position brings the pump-shaft at right angle with engine-shaft and necessitates a belt of so-called "quarter-twist," as shown in the drawings, and while undesirable it cannot be obviated or a mechanically more desirable or economical transmitter substituted. To obtain the best possible results under these conditions, an intermedium 46 is here applied, specially designed and applied for two purposes—first, to keep the belt in as near full contact with pulleys and proper alinement as possible, and, second, the belt being preferably endless and without lacing to take up such slack thereof as is occasioned by the stretching of the belt. This intermedium or fair leader and tightener consists, substantially, of a base or bed plate 29, extending, preferably, over the carriage and being bolted thereto, from which rise two columns or standards desirably provided with vertical adjustable bearings 48, wherein is journaled a horizontal shaft, and upon this shaft, preferably mounted parallel to each other, are two arms or carriers 50, receiving the horizontally-adjustable bearings of the intermediate pulley-carrying shaft. The opposite ends of said arms or carriers 50 are preferably connected by a segmental rack-bar constructed to engage with a pinion 51, carried by a shaft suitably mounted in the lower portion of said standards and adapted to be operated by worms or worm-wheels (not shown) or in any desirable manner to move said segmental rack-bar, and thereby raise or lower the pulley upon said pulley-carrying shaft to maintain the proper tension upon the driving-belt. Thus the belt may be maintained at the proper tension for a long period of time, also permitting of ready and correct adjustment. I also preferably employ an adjustable and spring-cushioned brace 52 to suspend pump from carriage, its function being to keep the pump in proper vertical position and resist the belt in drawing the pump toward engine and at same time to permit a free movement, the experience being that a swaying from side to side is of frequent occurrence and magnitude, while that before and after is of very limited occurrence and magnitude.

My improved extensible and telescopic turbinate pump consists, substantially, of a plurality of tubular sections, preferably adapted to slide one within the other, to provide for the lengthening or shortening of the pump, as the case may require, and I preferably so construct and assemble the pump-sections in such a manner that the pump will be auto-

matically extensible and reducible as the vessel or platform carrying the apparatus moves up and down by the action of the waves.

In Figs. 3, 4, 5, and 9 I have illustrated on an enlarged scale my improved pump, preferably composed of an upper or outer tubular section 55 and an inner or lower tubular section 56, the former being desirably provided with a short tubular section or collar 57, adapted to contact with the bottom flange 58 of the inner section 56 and limit the upward movement of the inner section 56 within the outer section 55, as will be seen from Figs. 1 and 3 of the drawings. Formed on or connected with the outer pump-section 55, on opposite sides thereof, are trunnions 59, Fig. 6, journaled in suitable bearings 60, formed in a cradle or rocking frame 61, preferably provided with oppositely-extending projections or trunnions 62, journaled within bearings 63, formed on or connected with the upper edges of the carriage-beams 10, whereby a universal joint is produced so constructed and arranged that the pump 40 will always maintain a vertical position no matter how the vessel or platform carrying the apparatus may be rocked or swayed by the waves. The application and construction of this universal joint constitutes one of the essential features of my invention. Revolvably mounted upon the outer pump-section 55, preferably above the universal joint and retained in position by annular flanges 55^a or other means is a discharge-head 64, desirably provided with a discharge orifice or nozzle 65 of any preferred construction, with which may be connected a pipe or hose to convey the material operated on to the point of delivery, and the outer section 55 is preferably provided with a plurality of longitudinal slots 65^a, adapted to register with the orifice or nozzle of said discharge-head to prevent the egress of unsuitable matter, such as large gravel and stones. Suitably connected with the flange 58 of the inner section 56 is the upper or top portion of the pump-casing 66, having an annular flange 67, with which is connected a bottom portion 68 of said casing, preferably provided with obliquely-inclined water-passages 69, which may be of any preferred formation or length, constructed to introduce water from above directly upon the material operated upon to facilitate the disintegration thereof and to afford lubrication during the passage of the material through the pump.

The pump casing or head may be provided with segmental or other bars or cutting edges 69^a or with a plurality of pointed projections 70, Fig. 1, to facilitate the operation of the pump by partially loosening the solid matter to be removed.

Journaled in a bearing 71 in a skeleton frame or spider 72, formed on or connected with the pump-head, and in the bearing 73 in the upper end of the pump 40 is the pump-shaft 74, carrying a conical winged piston 75, as shown in Figs. 3 and 4, and the upper

portion of said pump-shaft 74 is preferably provided with a band-wheel adapted to receive the belt 44, as before described.

The pump-casing is preferably provided with internal ribs or vanes constructed to change or deflect the spiral movement of the material produced by the action of the piston 75, so as to cause the material to move up through the excavator in a vertical or straight line.

Formed on or connected with the upper end of the outer pump-section 55 in any desired manner is a preferably-triangular frame 76, in the upper portion of which is journaled a shaft 77, carrying a sheave or guide wheel 78, adapted to receive a counterweighted chain 79, the other end whereof is preferably connected to a sleeve or collar 79^a, loosely held in position upon the pump-shaft 74 by jam-nuts 79^b or equivalent devices to counterbalance the weight of said shaft and facilitate the extension or shortening of the pump 40, and the shaft 74 is preferably movably connected with the band-wheel carried thereby although keyed thereto, so that said shaft may be raised or lowered when desired.

In Fig. 4 I have illustrated a modified form of pump, shown and described in relation to Fig. 3, wherein a pump 80, substantially similar to that heretofore described, is provided with an exterior shaft 81, journaled in suitable bearings 82 and provided with a band-wheel 45, adapted to be operated by the belt 44 in the manner before described.

The operation of the apparatus will be readily understood from the foregoing description when taken in connection with the accompanying drawings and the following explanation thereof. The engines 12 are started, which puts the band-wheel 45 in operation through the medium of the belt 44, and the material operated upon is drawn or sucked up by the pump 40 and forced out through the discharge-head 64 to the point of delivery, and when it is desired to raise the pump the engine 30 is put into operation and which, through the medium of the worm-carrying shaft 31, worm-wheel 34, and chain-gear wheels 36, winds the chain 39, as before described. Lateral movement is imparted to the pumps 40 through the engine 20, worm-carrying shaft 21, worm-wheel 24, and chain-guide wheel 26 operating chain suitably attached to the deck or platform upon which the machine is located.

I do not limit or confine myself to the specific construction, combination, and arrangement of parts herein shown and described, and I reserve the right to make all such changes therein and modifications thereof as may be required in practice and as come within the spirit of my invention.

Having accurately described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A dredging-machine provided with a

foundation or bed plate having axial and peripheral bearing surfaces or zones with lubricating grooves or ducts and a frame constructed to move directly upon said bearing-surfaces and be lubricated throughout such movement.

2. A dredging-machine provided with a foundation or bed plate having separate bearing surfaces or zones with lubricating grooves or ducts and a frame supported directly by said bearing-surfaces, said plate having a tubular center passing through said frame to retain the same in position upon said bearing-surfaces, whereby said frame is lubricated throughout the movement thereof.

3. A dredging-machine provided with a foundation or bed plate having a tubular center, a frame upon said plate, an excavator connected with said frame, hoisting mechanism above said frame and devices attached to said excavator and passing around said mechanism so that the free ends of said devices depend through said frame and bed-plate and are kept taut and straight.

4. A dredging-machine provided with a foundation or bed plate having a tubular center and axial and peripheral bearing surfaces or zones, a turn-table held upon said bearing-surfaces by said center passing therethrough, engines upon said turn-table and a pipe constructed to supply the actuating medium to said engines throughout the entire movement of said parts.

5. A dredging-machine provided with a foundation or bed plate, a turn-table thereon and carriage-frames having adjustable connection with said turn-table.

6. A dredging-machine provided with carriage-frames and carriage-beams connected to said frames so as to provide for the automatic vertical adjustment between said parts.

7. A dredging-machine provided with carriage-frames having attaching-flanges whereby the same are secured in position, carriage-beams within said frame and a shaft connecting the frames and beams so that the latter are provided with automatic vertical adjustment in relation to the former.

8. A dredging-machine provided with carriage-frames carriage-beams movably connected therewith and devices carried by the free portion of said beam to support the latter throughout the movement thereof.

9. A dredging-machine provided with carriage-frames having lateral flanges, the lower flange being secured to a support and inclined engine-frames upon the upper flange constructed to support engines or motors.

10. A dredging-machine provided with carriage-frames having a lower and upper attaching-flange, the former being constructed for connection with the support, equilateral engine-frames secured upon said upper flanges and engines or motors mounted upon both of said frames and binding the same together.

11. A dredging-machine provided with a

revoluble turn-table having axial and peripheral bearing-surfaces, carriage-frames mounted thereon and inclined engine-frames upon the latter supporting a driving-shaft, and engines or motors, said parts being constructed to revolve without interruption of the action of the same.

12. A dredging-machine provided with a foundation or bed plate, a turn-table thereon, a rectangular carriage-frame upon the latter, triangular engine-frames and engines or motors secured upon both the engine-frames and carriage-frame.

13. A dredging-machine provided with a foundation or bed plate, a turn-table mounted thereon, carriage-frames upon the turn-table, carriage-beams adjustably connected with the former and means for movably supporting the free end of said beams.

14. A dredging-machine provided with a foundation or bed plate, a turn-table mounted thereon, carriage-frames upon the turn-table and carriage-beams adjustably connected with the former.

15. A dredging-machine provided with a foundation or bed plate, a turn-table revolvably mounted thereon, carriage-frames upon the turn-table, carriage-beams adjustably connected with the carriage-frames and truck or trucks carried by the free portion of said beams constructed to travel upon suitable supports to maintain the proper horizontal position of said beams.

16. A dredging-machine provided with revoluble carriage-frames, carriage-beams connected with said frames, a motor carried by said beams constructed to operate a device connected with the deck or platform and said beams to actuate the same laterally.

17. A dredging-machine provided with carriage-beams, a worm-shaft supported by said beams, a worm-wheel constructed to engage with the worm on said shaft and means connected with said worm-wheel to operate a device attached to the deck or platform to move said beams laterally.

18. A dredging-machine provided with carriage-beams, a worm-shaft supported by said beams, a worm-wheel constructed to engage with the worm on said shaft and a chain-gear wheel operated by said worm-wheel to actuate a chain or cable connected with the deck or platform to move said beams laterally.

19. A dredging-machine provided with carriage-beams, a worm-shaft supported by said beams, a worm-wheel constructed to engage with the worm on said shaft, a chain-gear wheel operated by said worm-wheel to actuate a chain or cable attached to the deck or platform to move said beams laterally and guide or sheave wheels mounted adjacent to said gear-wheels to retain said chain or cable in engagement with the latter.

20. A dredging-machine provided with carriage-beams, a worm-shaft supported by the latter, a worm-wheel constructed to engage the worm on said shaft, a chain-gear wheel op-

erated by said worm-wheel to actuate a chain, or cable attached to the deck or platform to move said beams laterally, guide or sheave wheels mounted adjacent to said gear-wheels to retain said chain or cable in engagement with the latter and an engine or motor carried by said beams to actuate said shaft.

21. A dredging-machine provided with carriage-beams a worm-shaft attached to said beams, a worm-wheel constructed to be operated by said worm and means actuated by said worm-wheel to operate a chain or cable connected with an excavating device.

22. A dredging-machine provided with carriage-beams, a worm-shaft connected therewith, a worm-wheel operated by said worm, a chain-gear wheel actuated by said worm-wheel, an excavator and means connected with the latter and with said chain-gear wheel for raising or lowering the excavator.

23. A dredging-machine provided with carriage-beams, chain-gear wheels, means for operating the latter, guide or sheave wheels adjacent to said gear-wheels, an excavator and a chain or cable connected therewith and passing over said guide-wheels, and said chain-gear wheels.

24. A dredging-machine provided with carriage-beams a worm-shaft attached thereto, a worm-wheel actuated by said worm, chain-gear wheels operated by said worm-wheel, guide or sheave wheels adjacent to said chain-gear wheels, an excavator, and a chain or cable connected therewith and passing over said guide-wheels and said chain-gear wheels.

25. A dredging-machine provided with a carriage, a worm-shaft mounted therein, chain-gear wheels mounted adjacent to said carriage and constructed to be operated through the mediation of said worm, guide or sheave wheels adjacent to said chain-gear wheels, chain guide or sheave wheels mounted near the free end of said carriage, an excavator adjacent to the last-mentioned guide-wheels, a chain passing over said guide-wheels and operated by said chain-gear wheels and a motor or engine carried by said carriage to actuate said worm-shaft.

26. A dredging-machine provided with carriage-beams, an excavator mounted between the free ends of said beams so as to have vertical and horizontal movement in respect thereto.

27. A dredging-machine provided with carriage-beams, a rocking frame having swivel connection therewith, so as to have an oscillating movement between said beams and an excavator supported by said frame.

28. A dredging-machine provided with carriage-beams and an excavator supported by a frame mounted between said beams, whereby said excavator is provided with a universal oscillating movement.

29. A dredging-machine provided with carriage-beams, a rocking frame movably connected therewith, a frame upon said rocking frame carrying an excavator, whereby the

latter is provided with a universal oscillating movement.

30. A dredging-machine provided with a carriage, carrying a drive-wheel, an excavator having a band-wheel belted to said drive-wheel and a yielding brace between said carriage and excavator to counteract the pull of said belt.

31. A dredging-machine provided with a carriage, a rocking frame journaled therein, and an excavator provided with trunnions mounted in bearings in said frame, whereby universal movement is provided for said excavator.

32. A dredging-machine provided with a carriage, engines or motors mounted thereon, an excavator supported by said carriage actuating connections between said motors and excavator, and means for elastically supporting the excavator.

33. A dredging-machine provided with an excavator having lateral movement and means for elastically preventing the deflection of the latter.

34. A dredging-machine provided with a carriage, an excavator movably mounted therein and extending thereabove and a device between said carriage and the upper end of said excavator to elastically maintain the latter in an approximately-vertical position.

35. A dredging-machine provided with a carriage having a band-wheel, an excavator-shaft supported by said carriage and carrying a band-wheel operated by the first-mentioned band-wheel and an extensible and contractible device between the carriage and shaft-bearing to prevent the deflection of the latter by the action of the band connecting said band-wheels.

36. A dredging-machine provided with a rectangular carriage having a drive-wheel an excavator supported in the free end thereof carrying a band-wheel belted to said drive-wheel and a tensionizer between said wheels.

37. A dredging-machine provided with a rectangular carriage supporting a drive-wheel, an excavator supported in the outer end thereof carrying a band-wheel belted to said drive-wheel, a tensionizer adjustably mounted upon said carriage provided with a wheel having adjustable bearings and constructed to bear against said belt.

38. A dredging-machine provided with a counterweighted excavator-shaft to relieve the pressure upon the bearing thereof.

39. A dredging-machine provided with a casing, an excavator-shaft and means supported by the former to counterbalance the latter.

40. A dredging-machine provided with a carriage, an excavator-casing supported therein, a shaft within said casing and means within said casing to counterbalance said shaft.

41. A dredging-machine provided with a carriage, an excavator-casing supported thereby, an excavator-shaft within said cas-

ing a frame upon said casing carrying a guide or sheave wheel and means connected with said excavator-shaft and passing over said wheel to support the former.

42. The combination in a dredging-machine of an excavator having grate-like discharge-openings to separate the material passing therethrough, and a discharge-head revolvably mounted upon said excavator over said opening.

43. A dredging-machine provided with an excavator having a grated discharge-opening and a discharge-head movably connected with said excavator so that the opening therein registers with said grated opening.

44. A dredging-machine provided with a carriage an excavator supported by universal connection therewith having a plurality of telescopic sections and means for extending or shortening the excavator.

45. A dredging-machine provided with a carriage, an excavator mounted therein having a plurality of telescopic sections, an excavator-shaft carrying a conical winged piston, a band-wheel having slidable connections with said shaft and means for operating said wheel to rotate said piston.

46. An excavator provided with a working head having obliquely-inclined passages formed therein to convey water from above upon the material worked.

47. An excavator provided with serpentine passages constructed to receive water from above and discharge the same in converging streams upon the material worked.

48. A dredging-machine provided with a foundation or bed plate having a tubular center and axial and peripheral bearing surfaces or zones, elevated above the main portion thereof, a turn-table mounted upon said bearing-surfaces and held thereon by said center, engines upon said turn-table and a pipe passing through said center constructed to provide a constant supply of actuating medium to said engines throughout the movement of the parts.

49. A dredging-machine provided with a turn-table and a carriage connected therewith, said carriage being so constructed as to provide for the automatic adjustment between said parts.

50. A dredging-machine provided with a pump constructed to operate directly within the material worked and means inclosing the extremity of the latter while admitting liquid thereto.

51. A dredging-machine provided with a pump-casing extending into the material worked and provided with inlets for the introduction of liquid within the casing and a pump within the extremity of said casing, constructed to operate directly upon and within the material worked.

52. A dredging-machine provided with a pump-casing having an enlarged working head, a pump within the latter having a con-

ical winged piston constructed to force the material up through said casing in a spiral direction, and means upon said casing to deflect the spiral movement of the material.

- 5 53. A dredging-machine provided with a pump-casing having an enlarged working head, a pump within the latter having a conical winged piston constructed to force the material up through said casing in a spiral

direction and ribs or vanes upon the casing to deflect the spiral movement of the material. 10

In witness whereof I have affixed my signature in the presence of two witnesses.

L. C. EISENHUT.

Witnesses:

CHARLES S. ROGERS,
M. L. SHAY.