

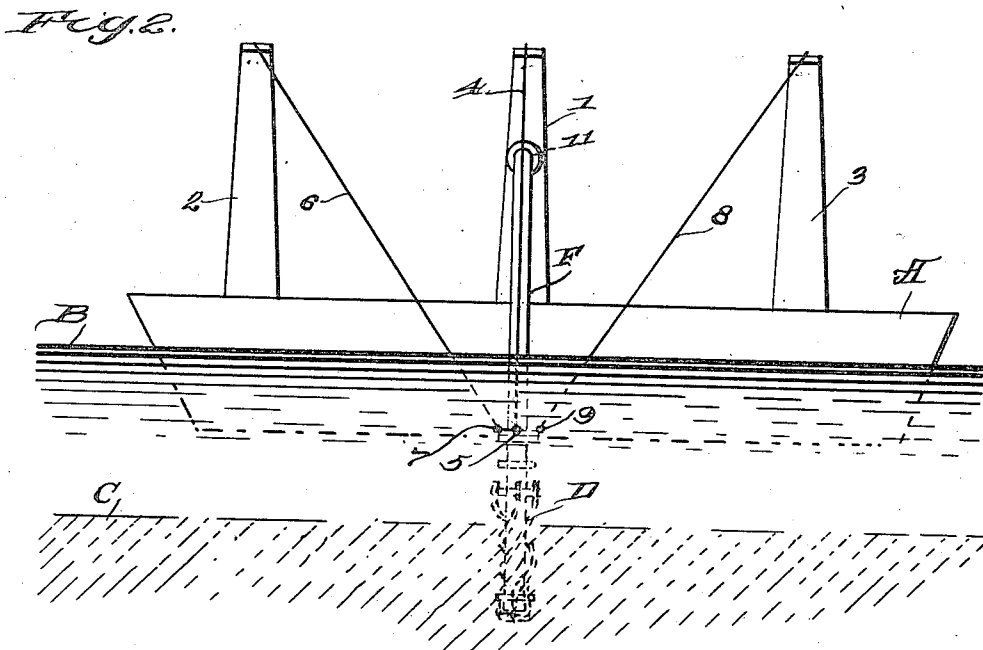
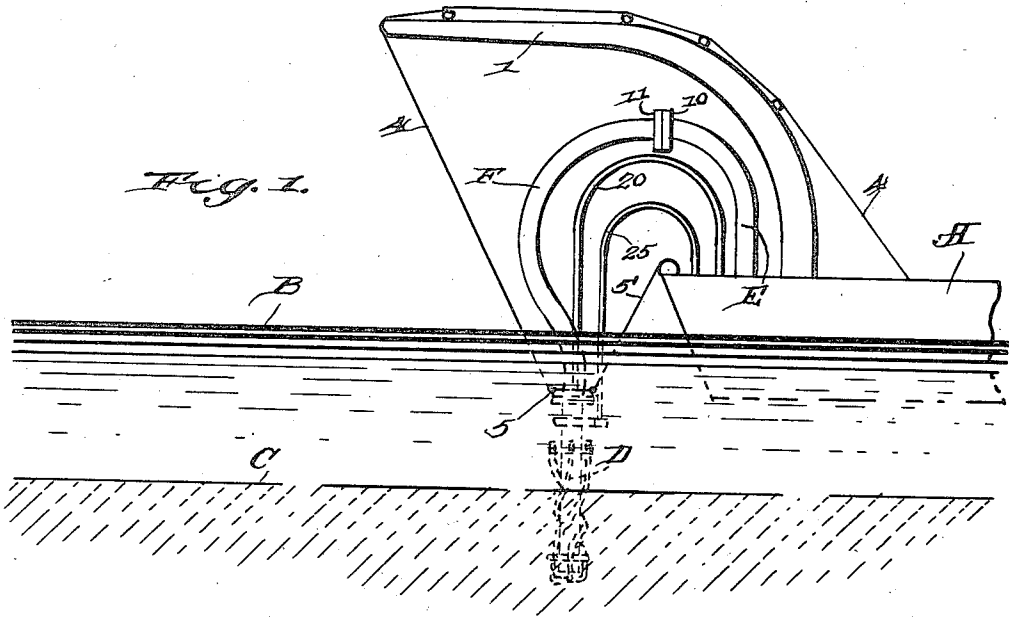
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2,017,296

DREDGING APPARATUS

Original Filed Aug. 25, 1933 2 Sheets-Sheet 1



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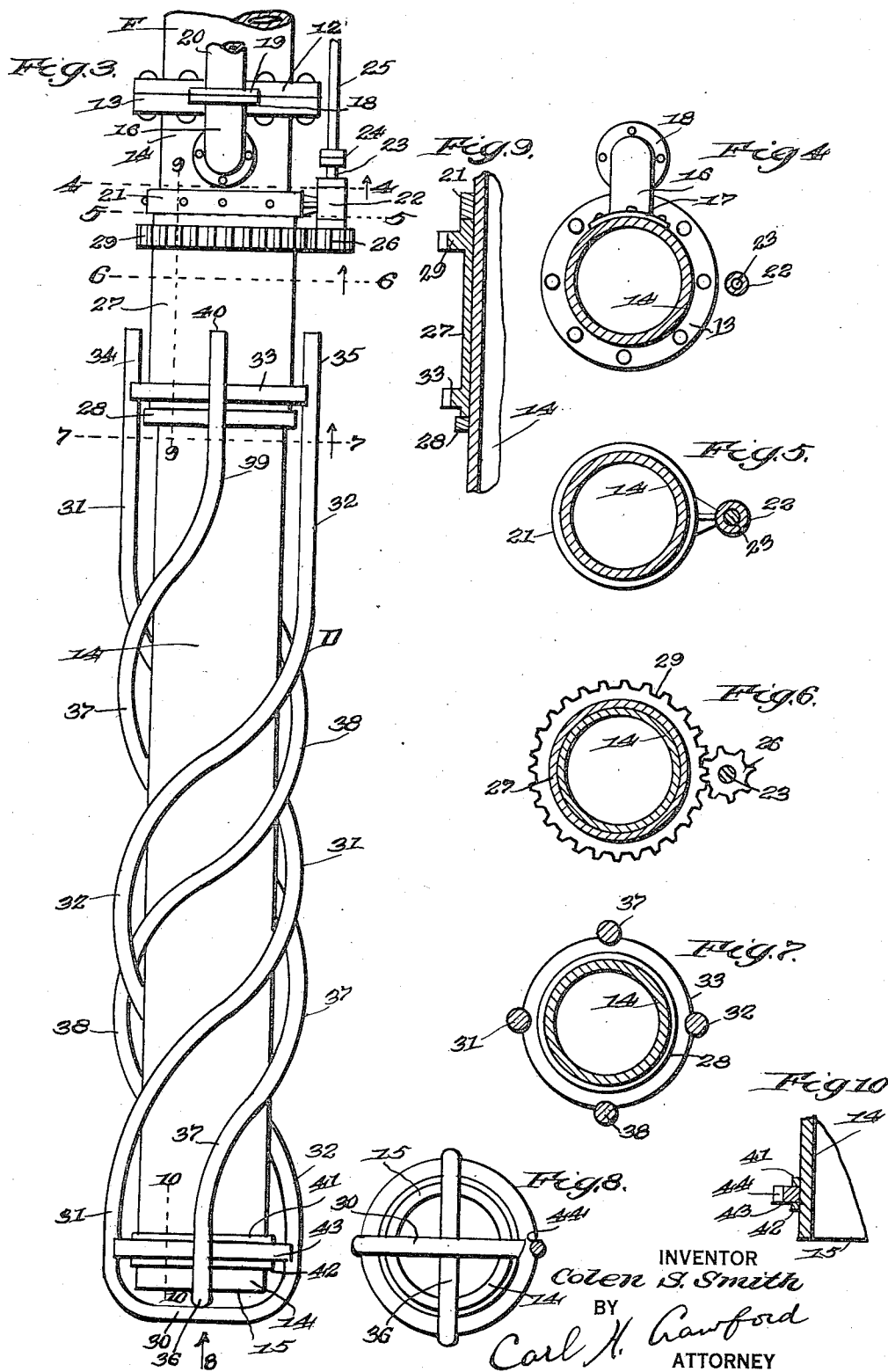
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2,017,296

DREDGING APPARATUS

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5 Claims. (Cl. 37-67)

This invention relates to improvements in dredging apparatus and more especially in the suction pipe therefor.

A feature of this invention resides in a suction pipe having an intermediate flexible section and an elongated and rigid nozzle section.

A further feature resides in mechanism connected with the nozzle section for elevating and lowering the same and also positioning the latter in various locations in a stream.

A further feature resides in a clearing or blow-out pipe having a flexible section extending to the dredge and being in communication with the nozzle section for forcing out of the latter any accumulations of material that would otherwise clog the same.

The invention also involves a skeleton-like assembly of bars or rods rotatably mounted on and extending across the open end of the nozzle and disposed lengthwise of the periphery thereof, the rods or bars being spirally disposed with a length and pitch sufficient so that when they are rotated, they will act in concert with the weight of the nozzle to cause the latter to penetrate any material with which it contacts.

A further feature resides in flexible driving means extending from the dredge to the nozzle for imparting rotation to such assembly.

The invention has many other objects and features which will be more fully described in connection with the accompanying drawings and which will be more particularly pointed out in and by the appended claims.

In the drawings:—

Fig. 1 is a view in end elevation of a dredge showing how the device of my invention is associated therewith.

Fig. 2 is a view in side elevation thereof.

Fig. 3 is an enlarged view of the nozzle section showing how it is connected with the intermediate flexible section.

Fig. 4 is a sectional view on line 4-4 of Fig. 3.

Fig. 5 is a sectional view on line 5-5 of Fig. 3.

Fig. 6 is a sectional view on line 6-6 of Fig. 3.

Fig. 7 is a sectional view on line 7-7 of Fig. 3.

Fig. 8 is an end view of the nozzle looking in the direction of arrow 8, of Fig. 3.

Fig. 9 is a sectional view on line 9-9 of Fig. 3.

Fig. 10 is a sectional view on line 10-10 of Fig. 3.

Like characters of reference designate similar parts throughout the different figures of the drawings.

In Figs. 1 and 2, I have shown a dredge A, which of course will be suitably equipped with

sources of power and suction, which need not be illustrated. The water line is indicated at B and the bed surface of the stream at C. I have very generally indicated at 1, a main hoisting and lowering post secured to the dredge A and overhanging the same, as shown in Fig. 1. At 2 and 3, are similar posts that serve to locate or position the nozzle, as will presently appear. The post 1 has an elevating line 4, adapted for connection at 5, with the nozzle, which is generally indicated at D. The post 2 has a guiding line 6, connected with the nozzle D, at 7, and post 3 has a guiding line 8, connected with nozzle D, at 9. It will be understood that these lines 4, 6 and 8, will extend to the dredge A, and will be operated by suitable devices such as a windlass, not shown.

That part of the suction pipe which I will term the supporting section, is indicated at E, and will be suitably connected with a source of suction, such as a pump, not shown, and adapted for location on the dredge and suitably powered. This supporting section E, is a rigid stationary section and has a flange 10, for attachment thereto of an intermediate flexible section F, which will be of such length as to afford the nozzle D, a relatively wide range of latitude in being positioned at different locations with respect to the dredge A.

The flexible section F, has a flange 11' adapted to be attached to flange 10, and a flange 12, adapted to be attached to flange 13, of the nozzle D, the three sections, E, F and D, constituting the suction pipe, in that form of the invention herein shown.

Reference will next be made to the construction and features of the nozzle section D, with particular reference to Figs. 3 to 10.

As illustrated, section D comprises a pipe 14 of uniform diameter and bore and which extends from its flange 13 to the open nozzle end 15. A rigid elbow fitting 16, opens to said pipe 14, at 17, where it is secured thereto, and has a flange 18, that is secured to flange 19, of a flexible section 20, that extends to and into the barge A, and is adapted for connection with a pump or reservoir whereby air at relatively high pressure, far greater than the suction in pipe 14 at least, may be turned on to clear and blow out any obstructing and clogged material that may have accumulated in the nozzle section. The flexible section 20, will in practice, have a length equivalent to the length of section F, of the suction pipe.

A journal ring 21, is secured to pipe 14, and carries a bearing 22, in which a shaft 23, is jour-

nalled. Said shaft 23, is coupled at 24, to a flexible shaft 25, which extends into the dredge A, and is connected with a suitable source of power, not shown. On shaft 23, is a pinion 26. A gear sleeve, or transmission sleeve 27, is rotatively mounted on pipe 14, between ring 21, and a similar thrust ring 28, to prevent said sleeve 27 from moving lengthwise of pipe 14. A gear 29, which may be formed integral with sleeve 27, meshes with pinion 26, whereby rotation is imparted to said sleeve 27.

Reference will next be made to a novel means for causing the nozzle to penetrate any material with which it contacts below the water.

Surrounding a major portion of the length of the nozzle pipe 14, is a skeleton-like assembly or cage, which, in the present form of the invention consists of a plurality of bars or rods of any desired cross section, the same being herein shown as cylindrical. In the drawings, I have shown a rod having a bight 30, which extends across the open end 15 of the nozzle, the limbs extending lengthwise of pipe 14 and being spirally formed as shown. The sleeve 27, has a rod anchoring flange 33, secured or formed integral therewith, and the upper end portions of the rods are adapted to be anchored to said flange 33, in any suitable manner, such as by welding or brazing them in suitable recesses in the periphery of the flange, as shown in Fig. 7. It will be seen that the ends 34 and 35, are free, for a purpose that will presently appear. The bight 36, of another rod, has its limbs 37 and 38 extended lengthwise about pipe 14, in the same manner as previously described regarding the companion rod and the ends, one only being shown at 39, are secured in the flange 33 and the free end 40, extends beyond said flange as shown, and all of the free ends 34, 35 and 40, are in lengthwise spaced relation from gear 29. Near the nozzle end 15, I provide thrust shoulders 41 and 42, and between said shoulders is a rod anchoring ring 43 which is revolubly disposed on pipe 14. Said ring has a peripherally disposed notch 44, for each of the limbs, and hence the ring 43 and flange 33, serve not only to anchor the limbs in fixed spaced relation to each other, and in peripherally spaced and concentric relation to pipe 14, but they also function to hold the bights 30 and 36 in spaced relation to the open end 15 of nozzle pipe 14.

While I have only shown two rods, it will be understood that as many may be employed, in practice, as are deemed necessary, in view of this disclosure. It is also a feature of the invention to provide rods of spring steel, which has many advantages by reason of the fact that this feature would permit the rods to spring and yield without being deformed, as will later appear, although the yielding feature is not an essential feature of the invention.

At this point, I desire to emphasize the fact that the nozzle pipe 14, is elongated and is very greatly increased in length with respect to the average length of a nozzle for this purpose. In fact, for one phase of the invention, it may be considered that the nozzle consists of that portion of pipe 14 that extends from shoulder 42 to the open end 15, the remainder of the pipe being a section of the suction pipe. At any rate, it will now be clear that this elongated nozzle 14 is very heavy, and the weight is purposely added for a function that will be later developed.

It will be clear that the bights 30 and 36, not only extend across the open end 15 and thereby arrest entrance thereto of excessive size mate-

rial, but it will also be seen that the bights are disposed very closely abreast of the open end 15 so that in addition to arresting entrance of oversized material like rocks, the revolving movement will shift such obstructing material to one side.

I will next describe the operation of the invention.

The operator in the barge or dredge A, will manipulate the power controlled lines or cables 5 and 5' to dispose the nozzle D in the desired lateral position with respect to the dredge A. If a different longitudinal position is desired, the power lines 6 and 8, will be employed. Thus it will be clear that the nozzle may be located in any desired position within the range of the mechanism designed for this purpose.

The nozzle D, will first be lowered until the lower end engages the river bed C, and then, or even before, power will be applied to flexible shaft 25, to rotate the "dig-in" or penetrating rod assemblage formed by rods 31, 32, 39 and 40, and the direction of rotation will be such that these spiral rods will act as an auger, aided by the weight of the nozzle, to cause the latter to penetrate the gravel or other bed to the depth desired. Of course, this would be limited by the gear and pinion 29 and 26, respectively, as these parts could not go into the gravel, but any depth short of this, would be possible.

Now it will be clear that the bights 30 and 36, will form a cage very closely abreast of the open end 15, of the nozzle, and because they are rotating, they will not only prevent entrance of large stones but will act to shift them to one side of the nozzle. As the latter descends into the solid bed C, larger stones engaging the rods will be lifted upwardly, by reason of the spiral form of the latter, and if they are of spring steel, they will yield and later spring back to form. Because of the fact that the nozzle D is non-rotatively connected with section F, and the latter is likewise connected with pipe E, it will be seen that the nozzle pipe 14 cannot rotate while penetrating the bed C.

It is desired to emphasize the fact that the bights 30 and 36, forming the cage across the open end 15, can, with my construction, be disposed in very close relation thereto thereby rendering the suction far more efficient by reason of the fact that it has a far greater "draw" on the material than if the cage were in greater spaced relation to the nozzle end. If for any reason the pipe 14 clogged with muck or other material, the "blow-out" feature through pipe 16 would be initiated to clear the pipe. It is a feature of the invention to provide a "blow-out" pressure far in excess of the suction draw, or if desired, suction may momentarily be stopped to afford full force and effect of the clearing pressure. As the clearing pressure forces the material against the rotating bights, the latter will serve to break up and disperse it as it is expressed outwardly from nozzle end 15.

After dredging at one location of the nozzle has been completed, the latter can be raised and positioned at another point, by the hoisting and locating mechanism herein-before described, and the next operation will be the same as that just detailed.

It will be clear that the rods are in spaced peripheral relation to the pipe 14, which makes them self clearing, and it will also be noted that the upper ends of the rods are anchored to the flange 33, below their terminals, so that when material is raised as the nozzle descends into the

bed C, it will be self clearing when it reaches the upper free ends of the rods.

It is a distinctive feature of the invention to interpose a flexible section between the rigid nozzle and supporting sections and to localize all the operating and movable parts on the nozzle.

Because of this construction, I am able to reduce the aggregate weight, and very greatly increase the length and range of the suction pipe.

And further, with a given length of pipe, I can locate the nozzle nearer the dredge by bowing the flexible section, and without moving the dredge, than would be the case if the suction pipe were rigid throughout its length. By reason of this intermediate flexible section, I can dispose the nozzle section in a substantially vertical position, so that it can penetrate the river bed to a greater depth than would be the case if the suction pipe was rigid, in which event, the nozzle would always have to enter the bed at an inclination to the vertical.

It will also be clear that with my improved construction, no projective thrust from the dredge is necessary to embed the nozzle into the river bed because the weight of the nozzle, and the screw or auger-like device shown, both coact to make the nozzle self penetrating into the bed.

It will be clear that by reason of the intermediate flexible section, the nozzle will at all times be mechanically free floating and self or gravity acting, in the performance of its functions, hence, the mechanism for manipulating the nozzle always acts in tension.

It will thus be seen that the invention involves the features of lowering a suction passage or duct, which is preferably non-rotatable, below the water surface and into contact with the river or like bed, and in coacting with the material of the bed, preferably rotatively, to thrust the duct into the bed after the duct has been lowered below the surface of the water.

It will thus be seen that the nozzle is free for unrestricted movement in any direction, responsive to the cables 4, 6 and 8, and during penetrative operation, the barge A does not sustain the weight of the nozzle. It will also be clear that no mechanism is needed to impart thrust to sink the nozzle into the bed and hence the barge A is not called upon to sustain any such thrust with the objectionable result of shifting the barge out of position. By reason of these features, the nozzle can at all times be lowered and can operate in a vertical position.

It is believed that the apparatus of this invention will be fully understood from the foregoing description, and while I have shown and described only one specific form of the invention, I do not wish to be limited thereto except for such limitations as the claims may import.

I claim:—

1. In a dredging apparatus, a suction pipe having a flexible section and an elongated rigid nozzle section provided with an open end, an assembly of rods extending across the open end of said

nozzle section and being spirally disposed lengthwise about the periphery of said nozzle section with a sufficient pitch to coact with the weight of said nozzle section to cause penetration of the latter into the material with which it contacts, means revolubly mounting said assembly of rods in spaced relation on said nozzle section, and flexible driving means for causing rotation of said assembly of rods.

2. In a dredging apparatus, a dredge, a supporting pipe fixedly mounted on said dredge and adapted for connection with a suction pump, a flexible pipe connected with said supporting pipe and of sufficient length to afford a nozzle ample range of movement, an elongated rigid nozzle connected with said flexible pipe and having movable means for causing penetration of the nozzle into the material with which it contacts, and flexible driving mechanism extending from the dredge to said movable means for operating the latter.

3. In a nozzle structure for dredging apparatus, a nozzle pipe having an open end, rods having their bights extended across said open end to arrest over-size material, the limbs of said rods extending spirally lengthwise about the periphery of said nozzle pipe, a ring anchored to said rods and rotatively mounted on said nozzle pipe near said open end, a transmission sleeve rotatively mounted on said nozzle pipe and having a gear above the ends of said rods and said sleeve extending below and inside the ends of said rods and having a flange anchored to the latter below their terminal ends, and a pinion carried by said nozzle pipe and meshing with said gear for rotating said sleeve and rods.

4. In a dredging apparatus, a dredge having a suction pipe provided with a nozzle section having an open end, rods having their bights extended across said open end to agitate and arrest entrance of over-size material into said nozzle section, the limbs of said rods extending spirally lengthwise and substantially in concentric spaced relation about the periphery of said nozzle section, means for revolubly mounting said rods on said nozzle section, and means for rotating said rods whereby coaction thereof with the weight of said nozzle section will cause the latter to descend into the river bed and elevate surrounding material as said nozzle section descends.

5. In a nozzle for a dredging machine, a nozzle section provided with an open end, a rod-like cage extended across said open end to agitate and arrest entrance of over-size material into said nozzle section, and said rod-like cage having rod portions extending spirally and lengthwise along and about the periphery of said nozzle section, means revolubly mounting said rod-like cage on said nozzle section, and means for rotating said rod-like cage whereby coaction thereof with the weight of said nozzle section will cause descent of the latter into the river bed and elevate and free said section from surrounding material as said nozzle section descends.

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