No. 869,273. PATENTED OCT. 29, 1907.

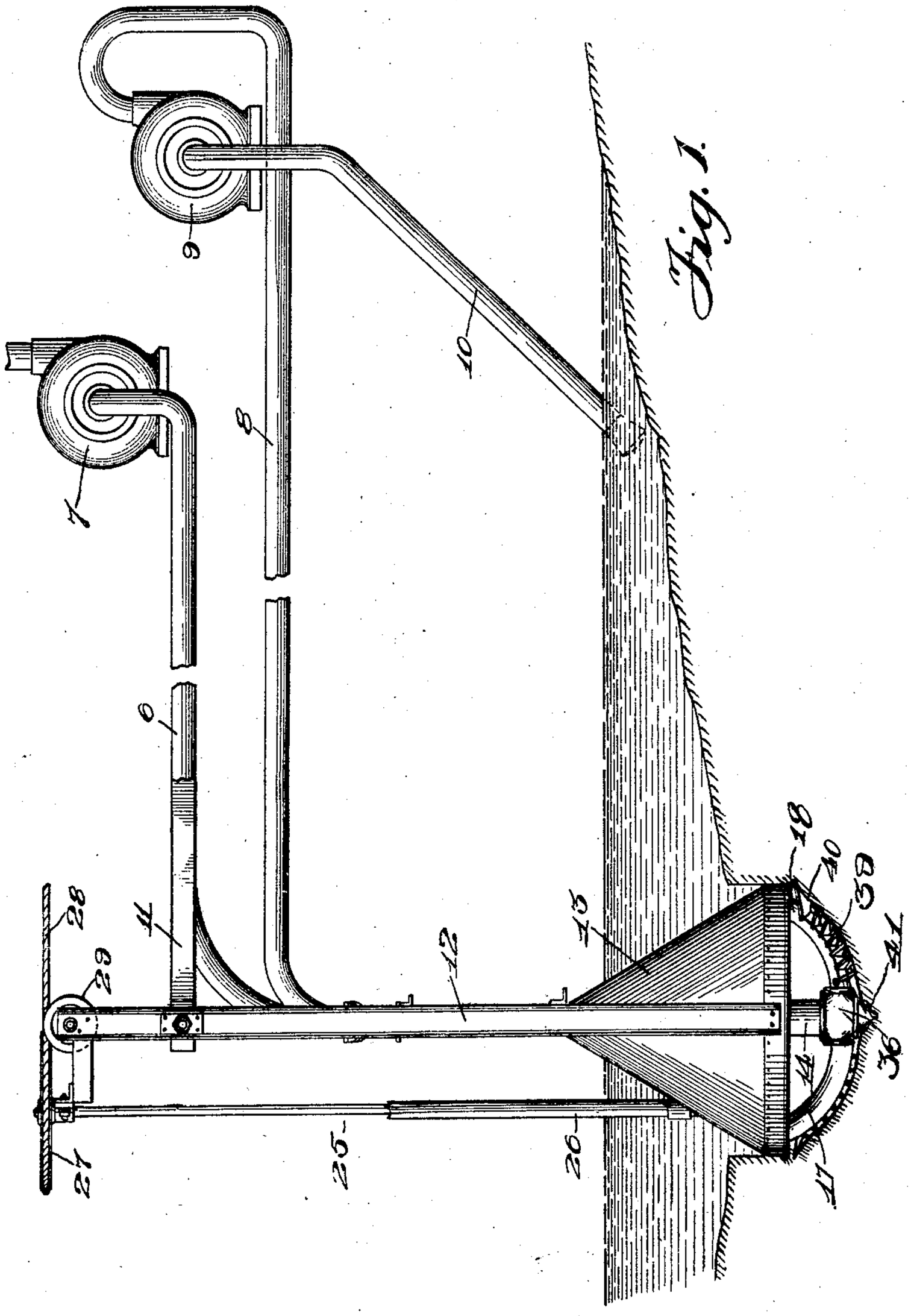
E. B. STODDARD.

DREDGING APPARATUS.

APPLICATION FILED JAN. 9, 1905.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

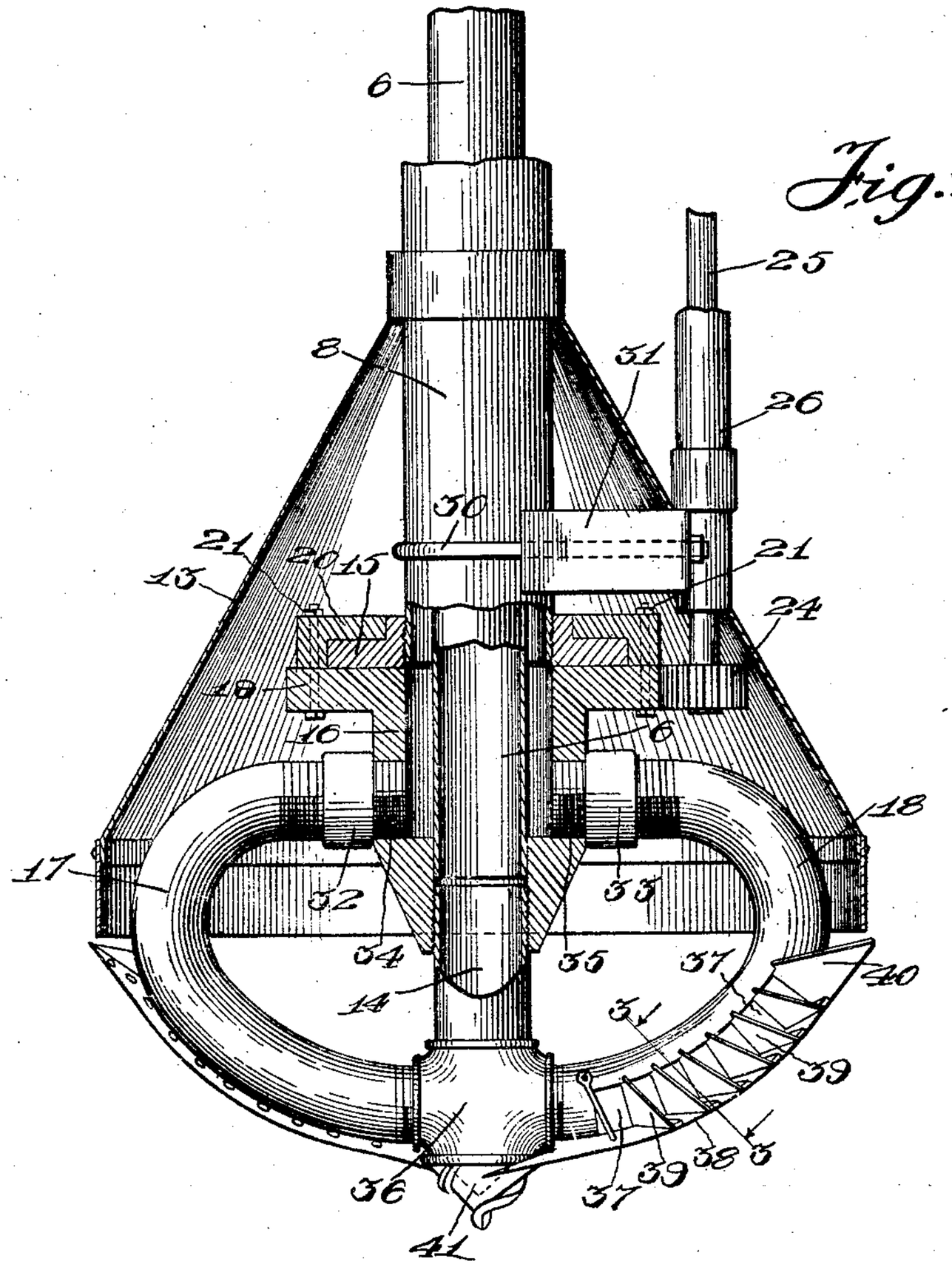
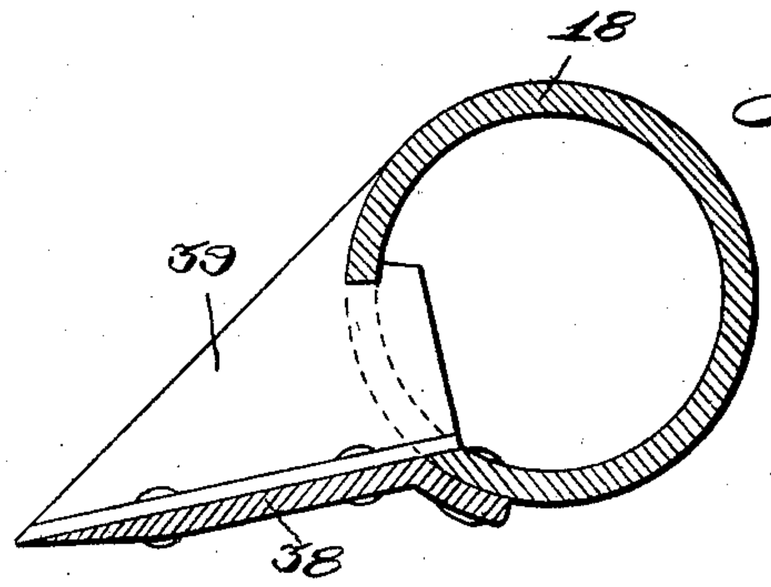


Fig. 3.



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3 SHEETS—SHEET 3.

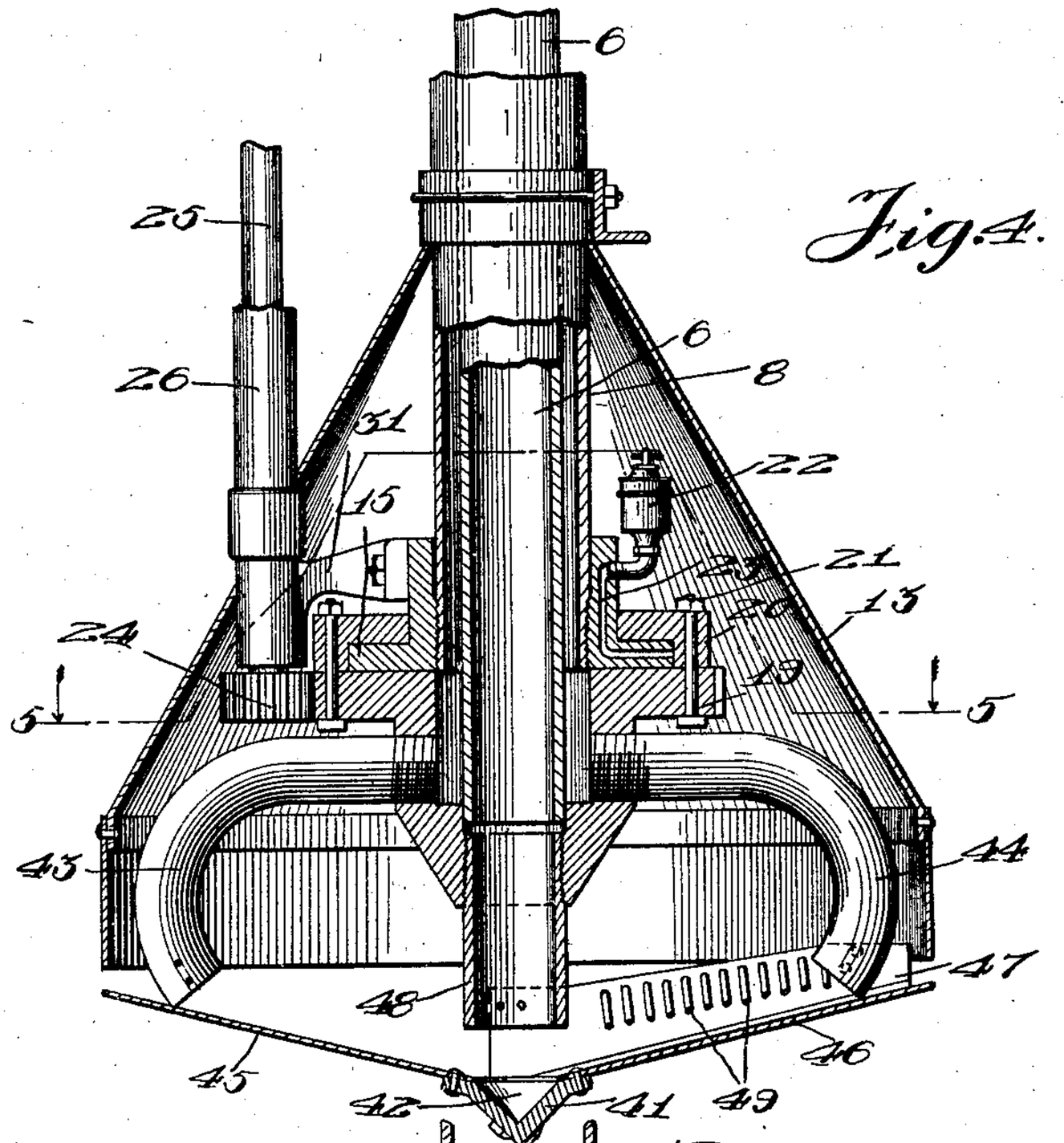

Fig. 4.

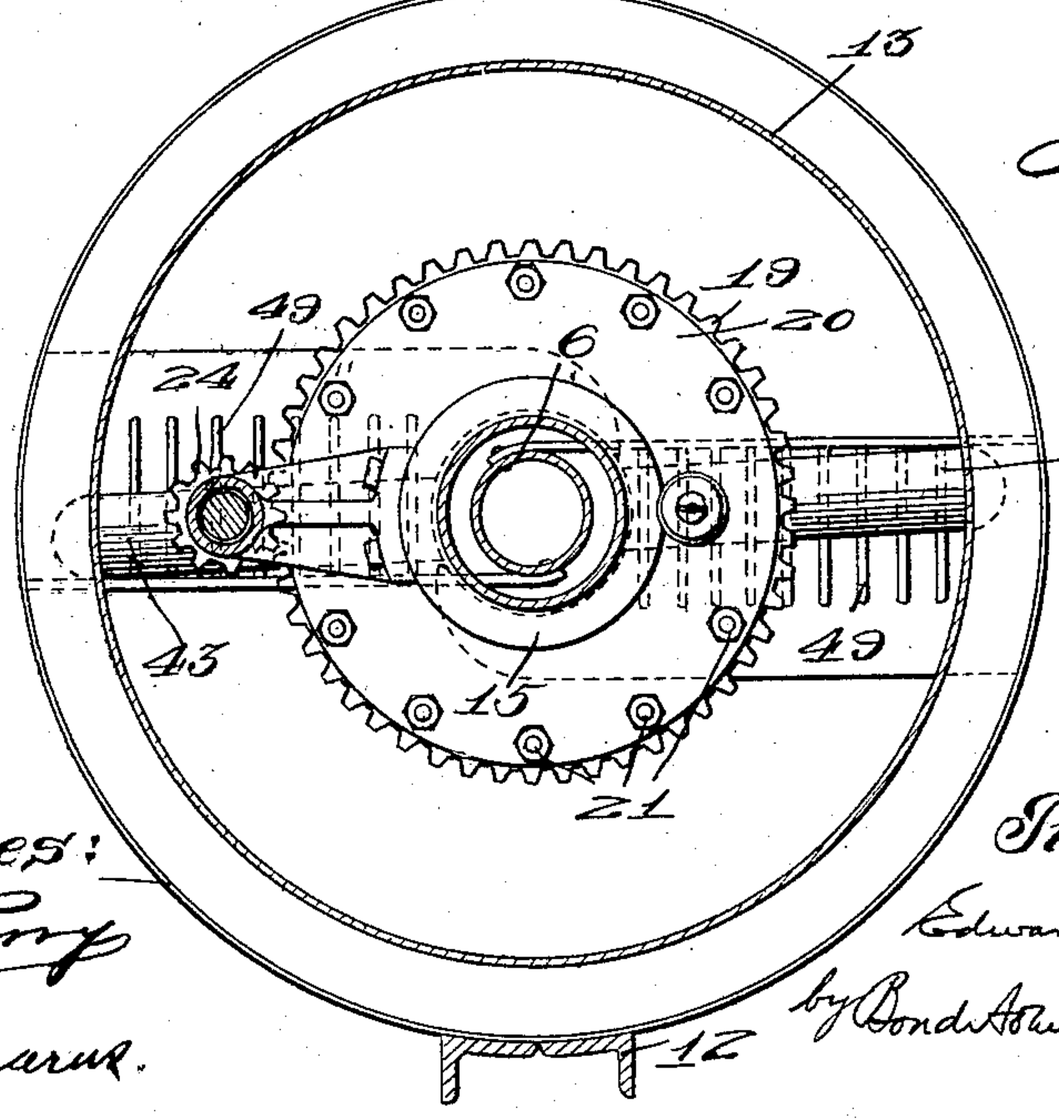

Fig. 5.

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UNITED STATES PATENT OFFICE.

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DREDGING APPARATUS.

No. 869,273. Specification of Letters Patent. Patented Oct. 29, 1907.

Application filed January 9, 1905. Serial No. 240,255.

To all whom it may concern:

Be it known that I, EDWARD B. STODDARD, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Dredging Apparatus, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to dredging-machinery, and has particularly to do with machines operating by suction. Heretofore, suction dredging-machines have been subject to the objection that they have not effectually taken up or recovered the heavier particles,—the result being that when used for dredging auriferous sand or gravel the heavier particles, which are always the richest in gold, have not been recovered, but have been allowed to sink away from the intake of the dredge. This defect has proved so serious in practice that at present, so far as I am aware, suction-dredges are not considered practicable for such use.

My present invention has for its object to provide a suction-dredge which will be free from the objection above noted, and which will in other respects be capable of efficient use in recovering gold from auriferous sand or gravel, whether the sand be submerged or not. I accomplish this object as illustrated in the drawings and as hereinafter described. What I regard as new is set forth in the claims.

In the accompanying drawings,—Figure 1 is an elevation, illustrating the general arrangement of the principal parts of my improved apparatus; Fig. 2 is a sectional view, illustrating in detail the construction of one form of the suction-apparatus; Fig. 3 is a cross-section on line 3—3 of Fig. 2; Fig. 4 is a sectional view, illustrating a modified form of apparatus; and Fig. 5 is a cross-section on line 5—5 of Fig. 4.

Generally speaking, my improved dredging-apparatus comprises rotary feeding-arms which communicate with an intake-pipe and act to supply the sand or gravel, mixed with water, to such intake-pipe. Said intake-pipe discharges into an off-carrying suction-pipe, to which suction is applied by any suitable mechanism for the purpose. A water-supply pipe communicates with said arms and conducts water thereto,—the arrangement being such that the water so supplied to said arms is directed toward the intake-pipe and causes a current of the mixed gravel and water to flow toward said intake-pipe; thus positively directing the sand or gravel thereto. A pump or other suitable apparatus is connected to said water-supply pipe, for forcing a current of water therethrough toward said feeding-arms. Centrally disposed below the intake-pipe is a screw, or equivalent drilling-mechanism, arranged so that the rotation of the feeding-arms causes the dredge to penetrate the bed of sand, or other material operated upon; and suitable mechanism is provided for rotating said feeding-arms and drill. The intake-pipe and feeding-arms are inclosed by a hood, which operates to protect the operating-parts of the apparatus, and also prevents the surface material from drifting into the depression made by the operation of the dredging-mechanism.

Referring now to the drawings for a specific description of the apparatus therein illustrated,—6 indicates the off-carrying or suction pipe, which communicates with a pump 7, as shown in Fig. 1.

8 indicates the water-supply pipe, the lower portion of which surrounds the suction-pipe 6 and which connects with a pump 9. The pump 9 is also provided with a suction-pipe 10, through which water is supplied thereto. In the arrangement shown in Fig. 1, the pipe 10 extends down into a body of water, which also covers the bed of sand operated upon.

It may be well to explain that the form of apparatus illustrated is designed to be used for dredging submerged sand or gravel near the shore of a body of water—the pumping-mechanism being located on the shore and the dredging-mechanism being supported and manipulated from the shore by means of suitable extensible mechanism, preferably in the form of a swinging crane. Part of the support for the supply and suction pipes and boring-mechanism is shown at 11 in Fig. 1. The supporting-devices for these pipes may be of any suitable construction, so that it is not deemed necessary to illustrate them further.

12 indicates upright bars, connected at opposite sides of the support 11 and carrying at their lower ends a hood 13, preferably funnel-shaped, as shown in Figs. 1 and 2. Said hood incloses the operating-parts of the boring and off-carrying-mechanism, as shown in Fig. 2, and at its upper end supports the driving-mechanism for rotating the boring-devices, as shown in Fig. 1.

14 indicates the intake-pipe, which forms a continuation of the suction-pipe 6 but is disconnected therefrom, so that it is free to rotate while the suction-pipe 6 remains stationary.

As shown in Fig. 2, the lower end of the suction-pipe 6 extends through a collar 15 which is fixedly secured to the lower end of the water-supply pipe 8 and forms a support for a sleeve 16 which carries the feeding-arms 17—18, as will be hereinafter described. The sleeve 16 is provided at its upper end with a gear 19, which is preferably formed integral therewith. Said gear and the sleeve 16 are supported from the collar 15 by a flanged ring 20 rigidly secured to the gear 19 by bolts 21 or other suitable means, as shown in Fig. 2. The arrangement is such that the flange of the ring 20 projects over the collar 15 and rides thereupon, so that the sleeve 16 is supported by the collar 15 as it rotates. A lubricator 22 is preferably provided, which communicates with a duct which conducts the oil or other lubricant to the bearing-surfaces, as shown in Fig. 4.

The sleeve 16 is rotated by means of a pinion 24, which meshes with the gear 19,—said pinion being

mounted at the lower end of a shaft 25 mounted in a suitable bearing 26 and provided at its upper end with a pulley 27 driven by a rope 28, or other suitable means, from any suitable source of power.

29 indicates idlers, provided at the upper ends of the uprights 12. The bearing 26 is preferably connected with the water-supply pipe 8 by a U-shaped bell 30 and pillow-block 31, as shown in Fig. 2, but any other suitable construction may be employed.

As shown in Fig. 2, the lower end of the sleeve 16 is extended down below the upper end of the intake-pipe 14, so that it serves to support and guide said pipe.

The feeding-arms 17—18 are tubular in form, and are curved, as shown in Fig. 2,—their upper ends being connected by sleeves 32—33 with nipples 34—35 which are screwed into the sleeve 16 at opposite sides thereof. By this construction, the upper ends of the arms 17—18 may be connected or disconnected at pleasure. The lower ends of said arms are screwed into opposite sides of a coupling 36 provided at the lower end of the intake-pipe 14.

The lower portion of each of the arms 17—18 is open at one side, as shown at 37 in Fig. 2,—a cutting-blade 38 being provided along the lower margin of each opening, said cutting-blades being designed to cut into the sand or gravel as the dredging-devices rotate and direct the material through the adjacent openings into the feeding-arms. Each of said arms is also provided with upright wings 39, secured to the blade 38 and along the upper margins of the openings 37, as shown in Fig. 2. Said wings are set a distance apart, as shown and serve to divide up the material and direct it properly into the feeding-arms. They also serve to brace the blades 38, and as their outer surfaces are inclined backwardly and upwardly, they serve also to direct large, hard masses—such as abnormally large pebbles or stones—over the feeding-arms, and thereby prevent clogging of the apparatus. The wings 39 are also set so as to direct the material slightly toward the intake-pipe,—thereby promoting the movement of the material in that direction.

40 indicates deflectors at the outer ends of the openings 37, for catching material lying near the outer ends of said openings and directing it thereinto.

41 indicates a screw or drill provided centrally below the intake-pipe 14, for causing the apparatus to penetrate the sand or gravel operated upon.

In operation the feeding-arms, with the intake-pipe 14, are caused to rotate by rotating the shaft 25 and pinion 24. The screw 41 thereby is caused to penetrate the sand or other material operated upon,—carrying the feeding-arms 17—18 downward and holding the blades 38 in operative engagement with the sand. The result is that the surface of the sand is sliced off by the blades 38,—the material entering said arms through the openings 37. Any large stones pass over the arms,—rising on the inclined forward edges of the wings 39. In the meantime, suction is applied to the suction-pipe 6, and water is forced down the water-supply pipe 8 and into the upper ends of the arms 17—18, passing through said arms down to the lower end of the intake-pipe 14. The result is that the material entering through the openings 37 is forced down to the intake 14, through which it rises into the suction-pipe 6, and is carried off through said pipe to the mill or other place of discharge. As the machine continues to operate, the dredging apparatus descends, sinking deeper as the material is carried out, so that the operation may be carried on until as great a depth as may be desired is reached. The surface-material at the sides of the excavation is held up by the hood 13, so that it does not fall into the excavation and interfere with the recovery of the material from the lower strata.

It will be noted that all the material encountered by the feeding-arms is caused to pass thereinto, except such larger pieces as are thrown off by the wings 39; and after having once entered said blades it is necessarily carried out by the suction, so that the heavier particles are recovered, as well as the lighter ones.

The upper surface of the screw 41 is preferably hollowed out or made in the form of a cup, as shown at 42 in Fig. 4, to serve as a receptacle for nuggets so heavy as to be incapable of being lifted by the suction; so that even such masses, when once carried into the feeding-arms, are eventually recovered.

In Figs. 4 and 5, I have shown a modified arrangement of feeding-arms, in which, instead of extending the arms to and connecting them with the intake-pipe, I provide arms 43—44 which terminate near the outer ends of cutting-blades 45—46, which are separate from said feeding-arms. Said blades 45—46 extend from the periphery of the hood 13 inwardly to the screw 41 with which they are connected, and are provided with vertically-disposed plates 47 at their rear edges,—giving said blades an L-shaped appearance in cross-section. Said plates 47 serve to direct the material taken up by the blades 46 down to the intake-pipe, which, in this arrangement, terminates a short distance above the upper surface of the screw 41, as shown at 48 in Fig. 4. The inner ends of the plates 47 are preferably riveted to the intake-pipe 48, the outer ends of the plates 47 being preferably riveted to and supported by the arms 43 and 44,—as shown. 49 indicates rods, which are connected to the plates 47 and the blades 46, extending backward and upward, as shown in Figs. 4 and 5. Said rods serve to break up the material and direct the larger masses up over the back-plates 47, in the same manner as the wings 39.

The operation of the modified form of apparatus is, in many respects, the same as already described,—the principal difference being that the material supplied to the intake-pipe is not as closely confined, since the blades 45—46 are more open than the tubular arms 17—18. The arms 43—44 direct the water supplied downward and inward over the blades 45—46,—carrying the material down to the lower end of the intake-pipe 48, through which it is carried up by suction, passing out through suction-pipe 6, as hereinbefore described.

My improved dredging-apparatus is rendered more efficient by reason of the fact that the construction is such that the material is positively fed to the intake-pipe, so that a certain and uniform proportion of solid material is supplied thereto in such manner that the suction-pump is compelled to lift it, and consequently practically all of the material loosened by the excavating-mechanism is recovered.

The forms of apparatus illustrated in the drawings and herein described may be regarded as typical embodiments of my invention, but I do not restrict my-

self to the apparatus shown, since my invention includes, generically, the subject-matter of the broader claims, as well as the specific improvements set forth in the narrower claims.

While my improved dredging-apparatus is designed primarily for use in recovering gold from sand or gravel, it may be used for any other purpose to which it is adapted. The fact that the material operated upon may be positively fed to the intake enables the operator to control the quantity of material discharged in a given time, and the apparatus may be kept up to its maximum capacity at all times if desirable. The quantity of material discharged may be varied by varying the rapidity with which the drilling-mechanism is caused to descend, and the rate of flow of the water through the water-supply and suction-pipes.

That which I claim as my invention and desire to secure by Letters Patent is,—

1. In a dredging-machine, the combination of an axially-disposed intake, one or more feeding-arms arranged to rotate about said intake, means for rotating said arms, and means for directing water through said arms toward said intake.

2. In a dredging-machine, the combination of an axially-disposed intake, one or more feeding-arms arranged to rotate about said intake, means for rotating said arms, excavating-blades for excavating material in advance of said arms, and means for directing water through said arms toward said intake.

3. In a dredging-machine, the combination of an intake, a water-supply pipe, means for excavating the material, means for directing the excavated material to said intake, and means for discharging the water from said water-supply pipe inwardly toward said intake through the excavated material.

4. In a dredging-machine, the combination of an intake, a water-supply pipe, means for excavating the material, means for directing the excavated material to said intake, means for discharging the water from said water-supply pipe inwardly toward said intake through the excavated material, and suction-mechanism communicating with said intake.

5. In a dredging-machine, the combination of an intake, a water-supply pipe, means for excavating the material, means for directing the excavated material to said intake, means for discharging the water from said water-supply pipe inwardly toward said intake through the excavated material, suction-mechanism communicating with said intake, and means for rotating said excavating-devices.

6. In a dredging-machine, the combination of an axially-disposed intake, a water-supply pipe, one or more tubular feeding-arms communicating therewith and arranged to discharge inwardly toward said intake, excavating-means connected with said arms and rotating therewith, and means for rotating said arms.

7. In a dredging-machine, the combination of an intake, a water-supply pipe, one or more tubular feeding-arms communicating with said water-supply pipe and adapted to rotate about said intake, said feeding-arms being arranged to discharge the water inwardly toward said intake, said arms being open at one side to receive the excavated material, excavating-means for supplying material to said arms, and guides for directing the material into said arms.

8. In a dredging-machine, the combination of an intake, a water-supply pipe, one or more tubular feeding-arms communicating with said water-supply pipe and adapted to rotate about said intake, said feeding-arms being arranged to discharge the water inwardly toward said intake, said arms being open at one side to receive the excavated material, excavating-means for supplying material to said arms, and inclined guides for directing the material into said arms.

9. In a dredging-machine, the combination of an intake, a water-supply pipe, one or more tubular feeding-arms communicating with said water-supply pipe and adapted to rotate about said intake, said feeding-arms being arranged to discharge the water inwardly toward said intake, said arms being open at one side to receive the excavated material, excavating-means for supplying material to said arms, and inclined guides for directing the material into said arms.

10. In a dredging-machine, the combination of an intake, a water-supply pipe, one or more tubular feeding-arms communicating with said water-supply pipe and adapted to rotate about said intake, said feeding-arms being arranged to discharge the water inwardly toward said intake, said arms being open at one side to receive the excavated material, excavating-means for supplying material to said arms, and devices for directing abnormally large masses over said arms.

11. In a dredging-machine, the combination of an intake, one or more feeding-arms arranged to revolve around said intake for supplying material thereto, means below said intake for catching the heavier particles of material, and suction-mechanism communicating with said intake.

12. In a dredging-machine, the combination of an intake, one or more feeding-arms arranged to revolve around said intake for supplying material thereto, means below said intake for catching the heavier particles of material, suction-mechanism communicating with said intake, and a drill below said intake.

13. In a dredging-machine, the combination of an intake, a suction-pipe communicating therewith, a water-supply pipe concentrically arranged with reference to said suction-pipe, feeding-arms communicating with said water-supply pipe and extending outward and downward therefrom and inward to the intake, said feeding-arms being open at one side to receive the excavated material, and excavating-blades carried by said arms.

14. In a dredging-machine, the combination of an intake, a suction-pipe communicating therewith, a water-supply pipe concentrically arranged with reference to said suction-pipe, feeding-arms communicating with said water-supply pipe and extending outward and downward therefrom and inward to the intake, said feeding-arms being open at one side to receive the excavated material, excavating-blades carried by said arms, and a series of wings carried by said arms, said wings being spaced a distance apart in front of said openings.

15. In a dredging-machine, the combination of an intake, a suction-pipe communicating therewith, a water-supply pipe concentrically arranged with reference to said suction-pipe, feeding-arms communicating with said water-supply pipe and extending outward and downward therefrom and inward to the intake, said feeding-arms being open at one side to receive the excavated material, excavating-blades carried by said arms, and a series of wings carried by said arms, said wings being spaced a distance apart in front of said openings, the forward edges of said wings being inclined upward and backward.

16. In a suction dredging-machine, the combination of an intake, revolving excavating-means adapted to loosen the material, and means for directing water under pressure toward the intake through the loosened material.

17. In a suction dredging-machine, the combination of an intake, revolving excavating and feeding mechanism adapted to cut up the material excavated, said feeding-mechanism being inclosed except at the forward side thereof, and means for directing water under pressure through said feeding-mechanism toward the intake.

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