

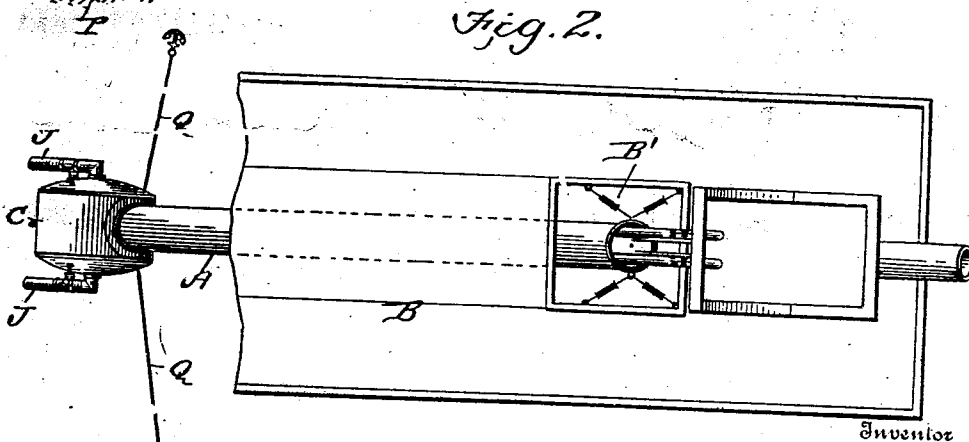
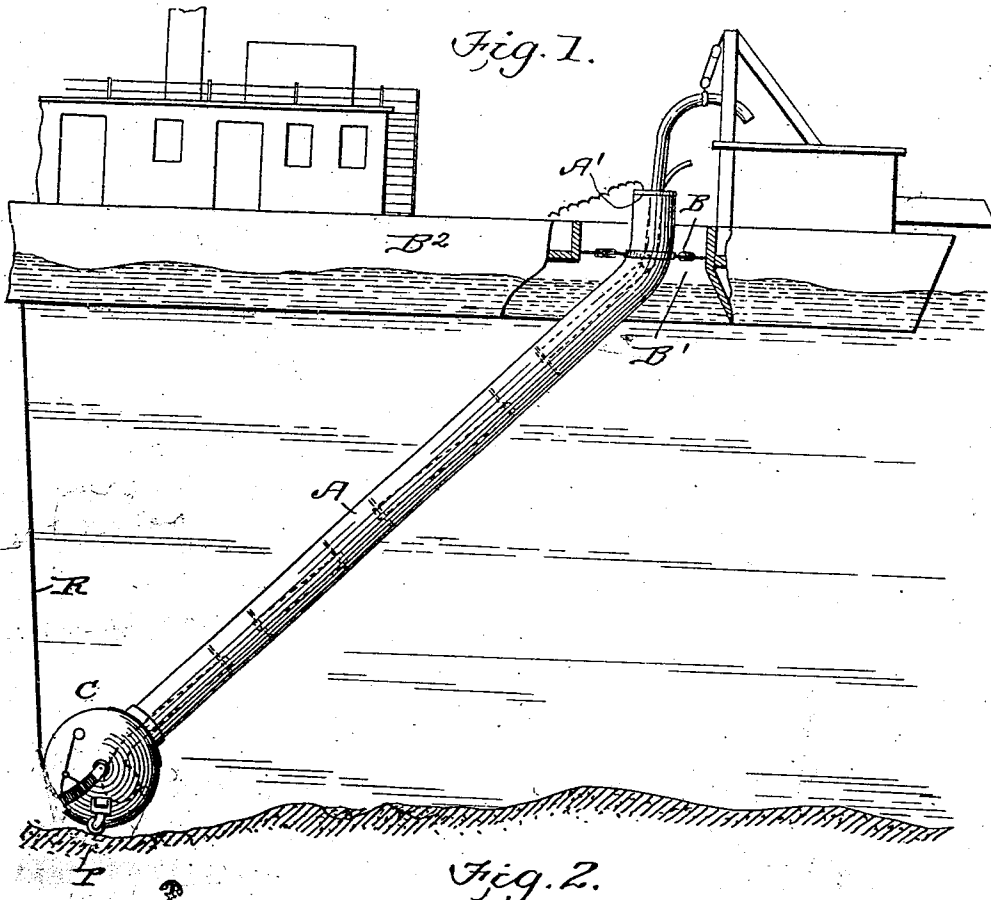
867,984.

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PATENTED OCT. 15, 1907.

S. LAKE.
DREDGING APPARATUS.
APPLICATION FILED DEC. 21, 1906.

4 SHEETS—SHEET 1.



Witnesses
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Ellie M. Perry

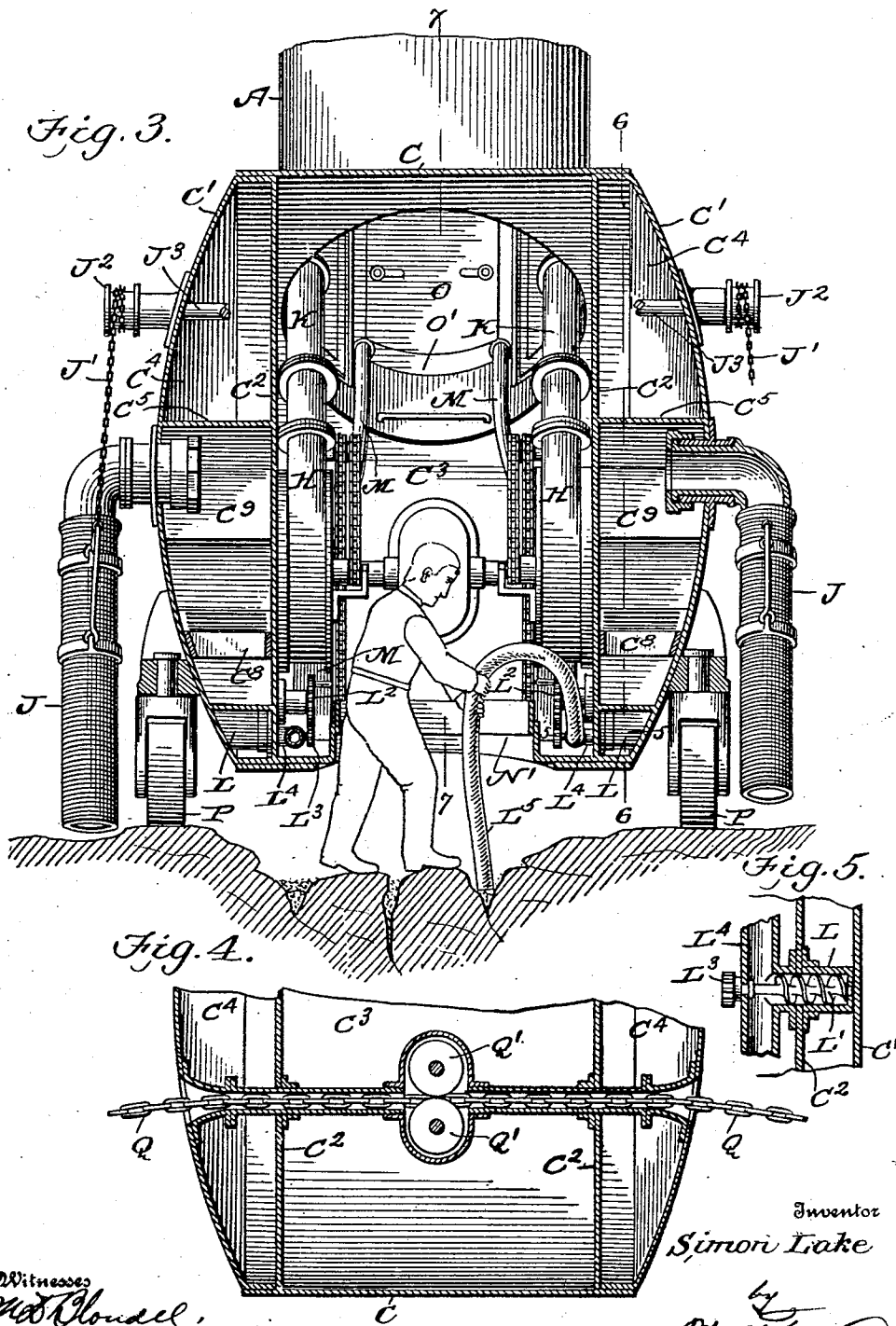
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DREDGING APPARATUS.

APPLICATION FILED DEC. 21, 1906.

4 SHEETS—SHEET 2.



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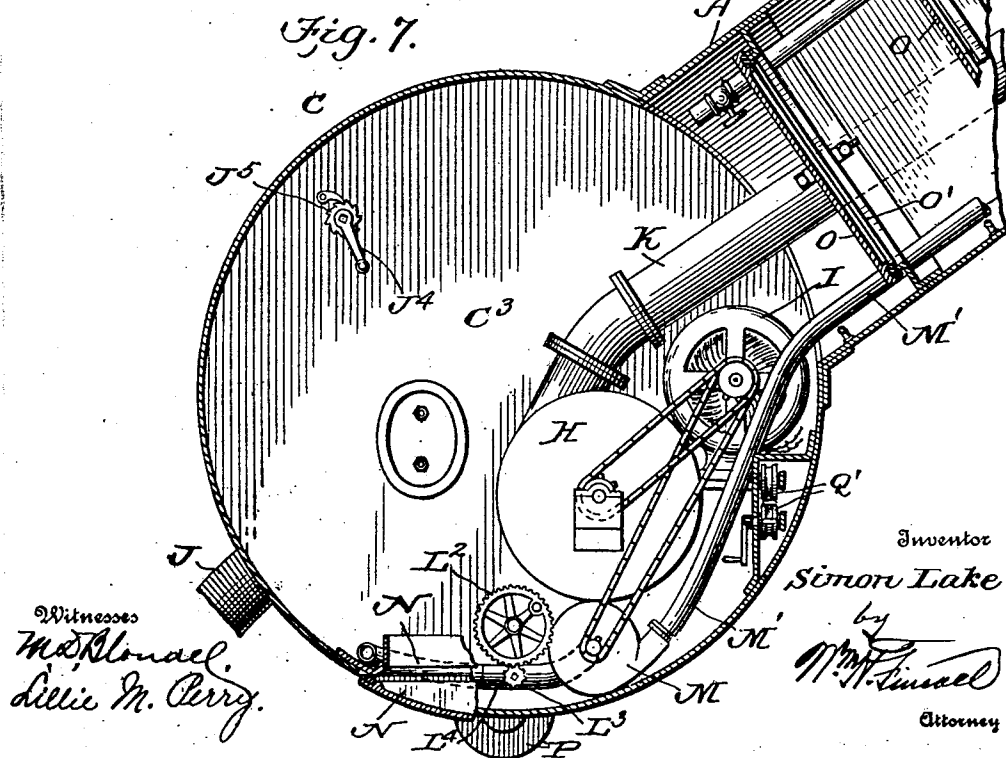
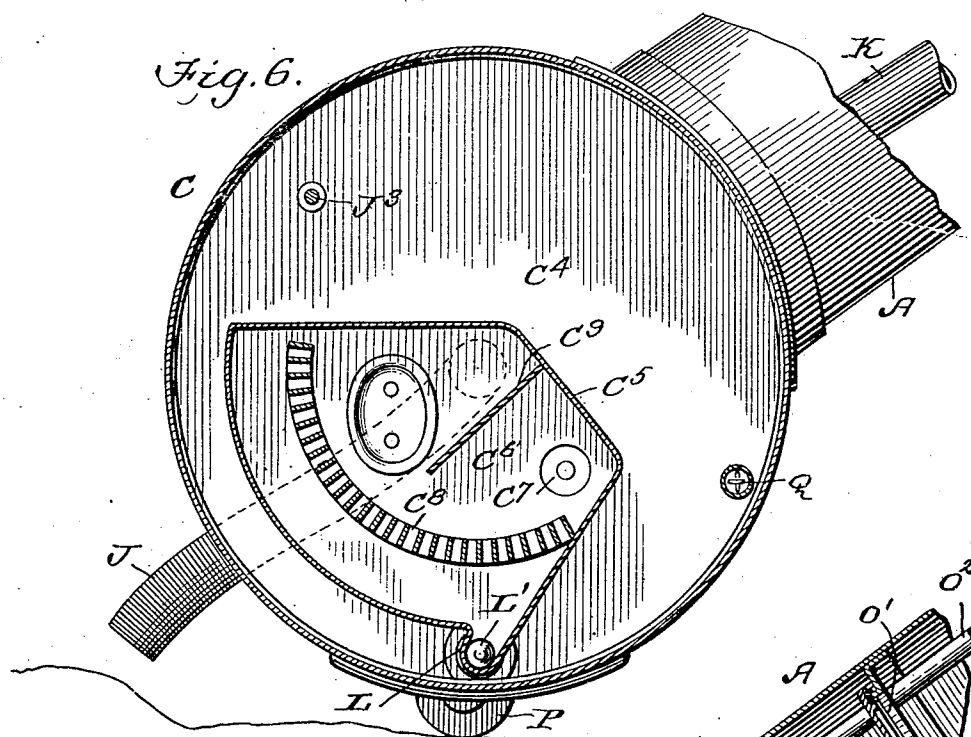
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S. LAKE.

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4 SHEETS—SHEET 3.

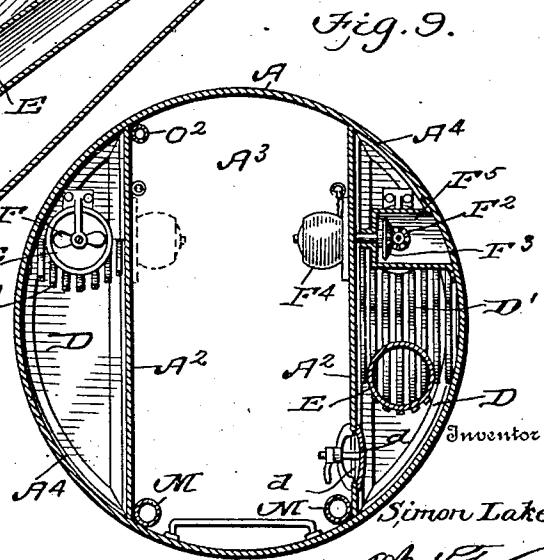
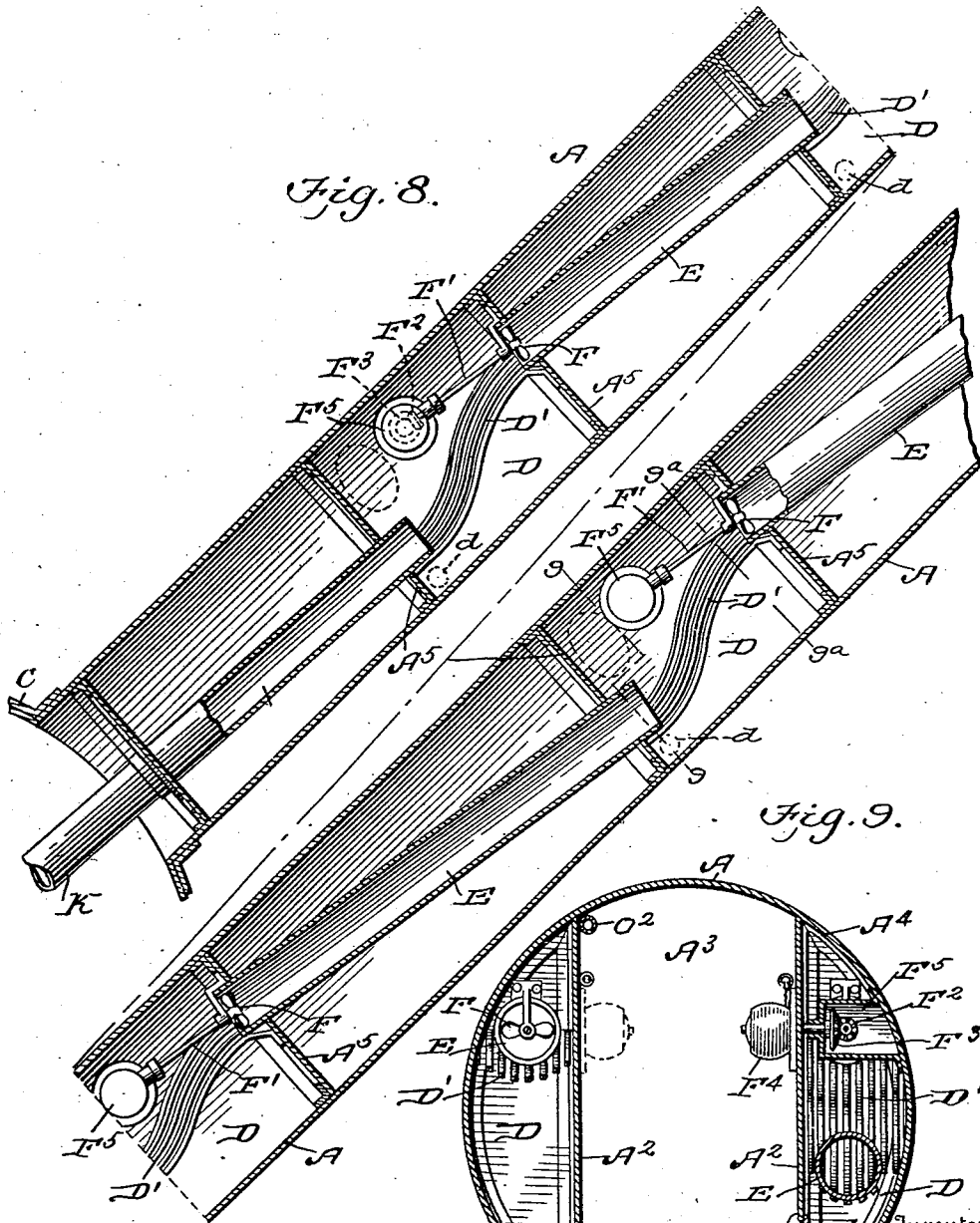


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DREDGING APPARATUS.

APPLICATION FILED DEC. 21, 1906.

4 SHEETS—SHEET 4.



Witnesses
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UNITED STATES PATENT OFFICE.

SIMON LAKE, OF BRIDGEPORT, CONNECTICUT.

DREDGING APPARATUS.

No. 867,984.

Specification of Letters Patent.

Patented Oct. 15, 1907.

Application filed December 21, 1906. Serial No. 348,993.

To all whom it may concern:

Be it known that I, SIMON LAKE, a citizen of the United States, residing at Bridgeport, county of Fairfield, and State of Connecticut, have invented a certain new and useful Improvement in Dredging Apparatus, of which the following is a full, clear, and exact description.

The object of this invention is to provide a dredging apparatus, having especially in view the recovery of gold and other material from the beds of rivers and other bodies of water.

At the present time, in certain localities, gold is recovered by bucket and grab dredges and by suction dredges, but satisfactory results have not been achieved, owing to the natural difficulties encountered, such as wind and wave currents. In the case of river dredging, it is usually necessary to remove sand, stones and even boulders to get down to the richest deposits; and where the bed is rocky and uneven, or where large boulders exist and the currents are rapid, bucket dredging is impracticable, for the reason that the buckets cannot be lowered into the crevices; and on bottoms where the buckets can work, the nuggets and fine gold, which lie at the bottom of the sand and stones, are lost by being dropped or washed out of the bottoms of the excavating device, especially where the currents are strong.

Suction dredges as now constructed are well adapted for handling sand, gravel and small stones, but the suction or lifting force has not been sufficient to successfully lift gold, owing to the high specific gravity of the latter and the fact that the gold settles upon the bottom and away from the influence of the suction pipe, leaving only the lighter particles to be recovered. Particularly is this true where boulders and rocks exist, and where the currents are strong or the surface of the water is rough, since it is impossible for divers to operate successfully either for blasting, which is necessary at times to get at the richest deposits, or to handle the suction pipe to bring it sufficiently close to the bed rock or clay bottom to recover the gold.

The invention comprises a submergible tube, having its lower end terminating in a casing forming a working chamber, with which is connected suction apparatus employed for collecting the gold, sand and gravel and delivering it into separating chambers where the gold is separated from the sand and gravel and the sand and gravel finally discharged back into the body of water. Supplemental means are employed for assisting the suction apparatus in lifting the gold, sand, gravel and water; and furthermore, means are employed within the working chamber, capable of being operated independently of the suction apparatus for collecting the gold located in small crevices and in places where the larger pipes cannot work. The casing

containing the working chamber also contains means for shifting the casing laterally as required in the progress of the dredging.

The invention also comprises certain details of construction and arrangement of parts, as will be fully set forth in the following description and pointed out in the claims.

In the accompanying drawings, illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is an elevation, partly in section. Fig. 2 is a partial plan view. Fig. 3 is a vertical section of the lower or working end of the tube. Fig. 4 is a vertical section of part of the casing back of the section Fig. 3, illustrating means for shifting the lower end of the tube in lateral directions. Fig. 5 is a horizontal section drawn on the line 5—5 of Fig. 3. Fig. 6 is a vertical section drawn on the line 6—6 of Fig. 3. Fig. 7 is a vertical section drawn on the line 7—7 of Fig. 3. Fig. 8 is a longitudinal section of a portion of the tube showing the separating chambers. Fig. 9 is a cross section of the tube, the section on the right-hand side being drawn through the irregular line 9—9 of Fig. 8, and the section on the left-hand side being drawn on the line 9"—9", Fig. 8.

A, designates the submergible tube, supported at its upper end by yielding supports B, in the well B' of a suitable surface vessel B². The extreme upper end of the tube terminates in an angular portion which in the position shown extends substantially vertical from the surface of the water and may be provided with a hatch A', to prevent the ingress of water.

The tube A is divided throughout its length by longitudinal partition plates A², into three compartments A³, A⁴, A⁴, the central compartment A³, providing a passage-way to and from the casing C at the lower or working end of the tube, while the compartments A⁴, are divided by transverse plates A⁵, into a series of separating chambers D, thrown into communication by pipes E. Within each chamber D and extending its full length, is a screen D' (preferably constructed of bars) which extends from the discharge end of each pipe E, upon a compound curve to the mouth or entrance of the next higher pipe, and within the mouth of each pipe is a propeller F, held upon one end of the shaft F', whose opposite end is provided with a pinion F², engaged by a gear F³, upon the shaft of the motor F⁴, held in the compartment A³, of the tube. The shafts of all the motors extend through the plates A², and the gears and pinions are protected by suitable housings F⁵, to prevent their contact with the water, sand and gravel during the passage of the latter through the chambers.

The working end or casing C, is considerably larger in diameter than the tube and somewhat in the shape of a drum, but having concavo-convex heads or ends C'. The casing is divided by plates C², into three compartments C³, C⁴, C⁴, the compartment C³, forming a

working compartment in which may be located centrifugal pumps H, each communicating with a chamber in the respective compartments C¹, and each pump is operated by a suitable motor I, connected by lead-wires with a dynamo (not shown) located on the surface vessel. Journalled in each head and communicating with its respective compartment is a suction pipe J, supported at its free end by a chain J', operating on a drum J², supported upon a shaft J³, which extends through the adjacent head C' and divisional plate C², and each has its inner end provided with a crank J⁴, by which the shaft and drum are revolved. A pawl and ratchet J⁵, are employed for holding the shaft and likewise the tube in position. By this arrangement the suction pipes J may be readily raised and lowered to bring their lower ends into proper relation with the bed of the river. Each compartment C¹, is subdivided by a partition C⁵, providing a separate chamber C⁶, into which the discharge ends of the respective suction pipes J, empty. The pumps H communicate with the chambers C⁶ through the suction openings C⁷. Arranged in each chamber C⁶ is a screen C⁸, against which the material is discharged when it flows out of the suction pipe, but this material is prevented from directly entering the openings C⁷ by a baffle plate C⁹, interposed between the pump adit and the suction opening C⁷.

When the water and materials are discharged into the chambers C⁶, they fall upon the screens C⁸, through which the gold passes and, by gravity, collect towards the lower end of the chambers, while the water, sand and lighter particles of gold and other materials will readily pass out through the suction openings C⁷. The larger materials which could not pass through the screens will fall down towards the suction opening directly in the sphere of the action of the pump and will be drawn into and forced out through the discharge pipes K.

The pipes K, discharge upon the screens D', of the overmost chambers D, in the tube A, where any of the lighter particles of gold that may have passed through the first separating chamber, are separated from the sand and larger materials by passing through the screens and are collected in the lower ends of the chambers. The larger particles of gravel with the sand and water continue through the chambers, and enter the pipes E, and discharge upon the next screens, and so on throughout the length of the tube. This arrangement of chambers gives a series of separating stages whereby all of the gold is collected. It will be understood that as many chambers may be employed as conditions require.

As shown in Fig. 8, each discharge pipe K, is of smaller diameter than the pipes E, which would naturally cause a diminution in the velocity of the outflowing water and materials, and to compensate for this the propellers F, are provided which serve to accelerate the water and material passing through the pipes.

In the bottom of each separating chamber C⁶, is arranged a semi-circular trough, L, having a screw conveyor L', operated by a gear L², meshing with a pinion L³, upon the free end of the conveyor shaft. The outer end of each trough terminates in a T-pipe section L⁴, to one end of which is connected a flexible suction tube L⁵, the opposite end being connected to

a centrifugal pump M, having a discharge pipe M', which extends up through the central compartment A³, of the tube and discharges into a suitable tank provided on the surface vessel. The tubes L⁵ and the pumps M, serve, first, for conveying the gold from the lower ends of the collecting chambers C⁶, and second as a supplemental means for collecting the gold and other metals from small crevices and other places where the larger pipes cannot reach.

When it is desired to clean the chambers C⁶, the manhole plate or cover N closing the manhole N', formed in the bottom of the compartment C³, of the casing C, is removed and the end of either flexible pipe is inserted into the water, the pump is then set in motion through the medium of a chain belt running from a sprocket on the shaft of the motor I, which draws in water and forces it up through the pipe M'; the conveyor is then operated and draws the closely packed gold into the path of the inflowing water and is conveyed therewith through the pipe M' and empties into the receptacle as previously stated. This operation is not effected, however, until communication of the lower or working end of the tube A has been cut off from the upper end, which is done by closing and locking the manhole plates O, over the opening frames O', built in the lower end of the tube A, (Fig. 7). Compressed air is admitted through the valve controlled pipe O², running from an air pump (not shown) on the surface vessel sufficient to counterbalance the pressure of water at the bottom of the tube. Communication to the lower end of the tube is likewise cut off when it is desired to handle the tubes L⁵ and insert their lower ends into small cracks and crevices. In this instance the diver operates on the bed of the river through the manhole with perfect freedom, irrespective of currents and wave motion, and thus is able to collect all the precious metals which have, through their great specific gravity, worked their way down through the sand and gravel and found a resting place in such openings.

Caster rollers P are secured to the heads C' of the casing C, to support the casing and the lower end of the tube A and prevent the casing and tube from coming into contact with the water bed.

An anchor chain Q, is arranged in a pipe extending through the casing. Figs. 4 and 6, the ends of the chain being provided with anchors, Fig. 2, of any suitable pattern. The chain Q, passes between two chain wheels Q', Fig. 4, journalled in a water-tight housing interposed in the pipe and arranged in the working compartment C³, of the casing. One shaft of one chain wheel is provided with a crank-handle by which the wheel may be revolved. By revolving the wheels, the chain is engaged by them and consequently the lower end of the tube and casing may be shifted laterally in either direction.

A cable R, suspended from a windlass (not shown) on the surface vessel is connected to the lower end of the tube, and by it the latter may be raised when the surface vessel is moved any considerable distance.

In operation the lower end of the tube is lowered so that the casing will rest adjacent to the water bed. The suction tubes are then adjusted and the pumps started, and thereby will be drawn in water and all sand, gravel and gold that may lie in the path of the suction tubes. The water and materials are first deposited

in the separating chambers C⁶, and falling upon the screens the gold will pass, but the larger particles of gravel will collect upon the screens. When the gold has banked up in the chambers so as to come within the sphere of action of the suction pumps, it is then drawn through the pumps and forced through the pipes K, into the lowermost separating chambers D, formed in the tube A, where it falls upon the screens D', through which the lighter particles of gold, that may have escaped through the chambers C⁶, will pass and collect until the lower portions of the chamber are filled and the material accumulated above the screens, when it, and the sand and larger gravel that could not find a passage through the screens, will be thrown into the path of the outflowing water and with it carried to the next chamber, and so on throughout the entire length of the tube. Thus there are a series of separating actions by which all of the gold may be separated and collected from the sand and gravel. The gold being much heavier than the sand and gravel will not be so susceptible to the influences of the up-traveling water as these materials, and will readily fall through the screens and collect in the bottoms of the chambers, and the water, sand and gravel will be finally discharged into a tank upon the surface vessel from which they will fall back into the body of water, or may be led to any suitable locality in any usual manner.

At intervals the gold and heavier substances collected in the chambers C⁶ are removed by the conveyers, as before stated. The material in the various chambers D may be removed through openings d, normally held closed by plates d', shown most clearly in Figs. 8 and 9, but each chamber may be provided with a conveyer and connected up with the pipes M' in the same manner as the chambers C⁶. Suitable manholes are also provided by which access may be had to all of the chambers.

What I claim is:—

1. A dredging apparatus, comprising a submergible tube, having a working chamber at its lower end, and a suction apparatus arranged in connection with and operable from the working chamber and adapted for delivering material to the upper end of the tube through said tube.
2. A dredging apparatus, comprising a submergible tube, having a working compartment in its lower end, and means arranged in the said compartment for collecting and delivering material to the upper end of the tube.
3. A dredging apparatus, comprising a submergible tube, having a casing at its lower end containing a working chamber, suction tubes arranged alongside of said casing for collecting and delivering material to the upper end of the tube, and means within said casing and operable within said working chamber for moving the lower end of the tube in lateral directions.
4. A dredging apparatus, comprising a submergible tube, having separating chambers arranged therein, a working compartment at the lower end of the tube, and means arranged in the working compartment for collecting and delivering material to the said separating chambers.
5. A dredging apparatus, comprising a submergible tube, separating chambers arranged therein throughout its length, and means in the lower end of the tube for collecting and delivering material to the said chambers.
6. A dredging apparatus, comprising a submergible tube, a casing arranged at the lower end thereof and containing a working compartment and separating chambers, separating chambers arranged in and throughout the length of the tube, and suction apparatus for collecting and delivering material and forcing it through all of the said chambers.

7. A dredging apparatus, comprising a submergible tube, a casing arranged at its lower end, a working compartment and separating chambers in the tube, suction apparatus controllable from the compartment for delivering material into the chambers and from the chambers to the upper end of the tube, and means for removing the collected material from the said chambers.

8. A dredging apparatus, comprising a submergible tube, having separating chambers arranged in successive order throughout its length, suction apparatus for collecting and forcing material to and through the chambers, and means in the chambers for accelerating the passage of the material.

9. A dredging apparatus, comprising a submergible tube, having its lower end terminating in a casing, a working compartment and separating chambers in the casing, communicating separating chambers formed in the tube, suction apparatus communicating with the chambers in the casing, suction pipes also connected to the chambers, means for raising and lowering the pipes, and delivery pipes connecting the suction apparatus and the lowermost chambers in the tube.

10. A dredging apparatus, comprising a submergible tube, having a series of communicating separating chambers formed therein, a casing at the lower end of the tube, said casing having a working compartment and separating chambers, suction tubes connected to the last mentioned chambers, pumps connected to the said chambers, and a discharge pipe extending from each pump to one of the chambers in the tube.

11. A dredging apparatus, comprising a submergible tube, having a series of separating chambers, screens held in the chambers, a casing connected to the lower end of the tube, separating chambers arranged in the casing and having screens therein, suction pumps and tubes connected to the last mentioned chambers, delivery pipes for conveying material from the pumps to the chambers in the tube, and means for operating the pumps for the purpose specified.

12. A dredging apparatus, comprising a submergible tube, having a passage-way throughout its length, and separating chambers adjacent thereto, a casing at the lower end of the tube, having a working compartment communicating with the passage-way, separating chambers in the casing adjacent to the working compartment, suction tubes and pumps connected to the separating chambers in the casing, and delivery pipes extending from the pumps to the separating chambers in the tube.

13. A dredging apparatus, comprising a submergible tube, having a passage-way throughout its length, and separating chambers adjacent thereto, screens in the chambers, pipes connecting the chambers above the screens, a casing at the lower end of the tube and having a working compartment communicating with the said passage-way, separating chambers adjacent to the compartment, screens in the said chambers, pumps connected with the separating chambers in the casing, delivery pipes connected to the pumps and to one of the chambers in the tube, and suction pipes connected to the separating chambers in the casing.

14. A dredging apparatus, comprising a submergible tube, a casing connected thereto and having a manhole and cover for same, suction pumps arranged in the casing and having tubes which are adapted to operate through the manhole, means for closing communication between the submergible tube and the casing, and a compressed air supply pipe extending into the casing.

15. A dredging apparatus, comprising a submergible tube, a casing at one end thereof, and having a working compartment and separating chambers, suction tubes connected to the chambers, pumps connected to the chambers, and discharge pipes connected to the pumps.

16. A dredging apparatus, comprising a submergible tube having a working compartment at its lower end, communicating separating chambers in the tube, a suction apparatus, suction pipes communicating with the suction apparatus, and delivery pipes connected to the suction apparatus and extending to the lowermost chambers in the tube.

17. A dredging apparatus, comprising a submergible tube having a casing at its lower end, separating cham-

bers arranged in said casing, screens arranged in and dividing the chambers, pipes extending from one chamber to the other, and pumps connected with said casing and adapted to deliver material to and force it through the said chambers.

18. A dredging apparatus, comprising a submergible tube having a compartment at its lower end, separating chambers in the tube, pipes connecting the chambers, propellers revolvably mounted in the pipes, means for operating the propellers, and suction apparatus for collecting and delivering material to the lowermost of the said chambers.

19. A dredging apparatus, comprising a submergible tube having a working compartment at its lower end and chambers throughout its length, screens in the chambers, pipes connecting the chambers above the screens, propellers mounted in the pipes, means for operating the propellers, and suction apparatus for collecting and delivering material to the lowermost of the chambers.

20. A dredging apparatus, comprising a submergible tube having a passage-way throughout its length and a working compartment at its lower end, separating chambers arranged adjacent to the passage-way and communicating therewith, means for opening and closing such communication, pipes connecting the separating chambers, propellers mounted in the pipes, means for operating the propellers, and suction pumps for collecting and delivering material to the lowermost chambers in the tube.

21. A dredging apparatus, comprising a submergible tube, a casing at its lower end and having a manhole and cover for same, division plates in the casing forming a working compartment and separating chambers in said casing, suction pumps connected to the chambers, delivery pipes extending from the pumps, and means for cleaning the lower portions of the chambers.

22. A dredging apparatus, comprising a submergible tube, a casing at its lower end and having a manhole and cover for same, division plates in the casing forming a working compartment and separating chambers in said casing, suction pumps connected to the chambers, delivery pipes extending from the pumps, a trough formed in the lower portion of each chamber, each trough having its outer end terminating in a pipe section which extends into the working compartment, a screw conveyor operating in each trough, a flexible tube connected to one end of the pipe section, a pump connected to the opposite end of the pipe section, and a delivery pipe extending from the pump.

23. A dredging apparatus, comprising a submergible tube, a casing at its lower end and having a working compartment and separating chambers, a screen in each of said chambers, suction pipes connected to the chambers and discharging therein above the screens, pumps arranged for connection with the chambers, delivery pipes extending from the pumps, and means for removing material from the chambers below the screens.

24. A dredging apparatus, comprising a submergible tube having a central passage-way throughout its length and separating chambers adjacent thereto throughout the length of the tube, screens dividing the chambers longitudinally, pipes connecting the chambers, a casing at the lower end of the tube and having a central working compartment which communicates with the said passage-way, separating chambers adjacent to the compartment, a screen in each of the separating chambers in the casing, suction tubes connected to the last mentioned chambers above the screens, pumps connected to the said chambers, and delivery pipes connected to the pumps and discharging into the lowermost chambers in the said submergible tube.

25. A dredging apparatus, comprising a submergible tube having a passage-way throughout its length, communicating separating chambers formed in the tube adjacent to the passage-way, a casing at the lower end of the tube having a working compartment provided with a manhole and a cover for the same, separating chambers in the casing adjacent to the compartment, suction pipes connected to the chambers of the casing, pumps adapted for drawing material into the chambers of the casing through the suction pipes and delivering it from the said chambers to the chambers of the submergible tube, means

for opening and closing communication between the said passage-way and the working compartment, and means for removing the collected material from the chambers of the casing.

26. A dredging apparatus, comprising a submergible tube, partition plates arranged longitudinally therein and dividing the tube into a central compartment forming a passage-way through the tube and side compartments on each side of the central compartment, transverse plates arranged in the side compartments and dividing them into a series of chambers, screens arranged in each chamber, the said partition plates having openings leading into the chambers, and plates covering the openings, pipes extending from one chamber to the other, a casing at the lower end of the said tube, and pumps for collecting and delivering material to the said chambers.

27. A dredging apparatus, comprising a submergible tube, a casing at the lower end thereof, separating chambers arranged in the casing, suction tubes connected to the chambers, pumps connecting the chambers, delivery pipes extending from the pumps, and means for shifting the lower end of the tube in lateral directions.

28. A dredging apparatus, comprising a submergible tube, a casing at the lower end thereof, suction pumps, suction tubes affording communication between the casing and the pumps, a tube extending laterally through the casing, a chain extending through the said tube and having its ends provided with anchors, and means for moving the lower or casing end of the tube along the chain in either direction.

29. A dredging apparatus, comprising a submergible tube having chambers at the lower end thereof, screens in the chambers, suction tubes connected to the chambers and discharging upon the screens, and suction pumps communicating with the chambers.

30. A dredging apparatus, comprising a submergible tube having separate chambers at its lower end, suction tubes connected to the tube and discharging into the chambers, means for adjusting the tube, and pumps communicating with the chambers and having delivery pipes extending therefrom.

31. A dredging apparatus, comprising a tube, one end of which is adapted to be lowered into the water, suction tubes arranged at the lower end of the tube and adapted for collecting and delivering material to the upper end of the tube.

32. A dredging apparatus, comprising a submergible tube having a passage-way throughout its length, suction tubes arranged at the lower end of the submergible tube for collecting and delivering material to the surface, and means controlled from within the submergible tube for moving its lower end in lateral directions.

33. A dredging apparatus, comprising a submergible tube having a passage-way throughout its length and a working chamber communicating with the passage-way, and means controlled from within the said chamber for collecting and delivering material to the surface.

34. A dredging apparatus, comprising a submergible tube closed at its lower end and having a hatch in the said end, a cover for the hatch, means for closing communication to the lower end of the tube to provide an air-tight chamber, means for supplying air under pressure to the chamber, and suction pipes controlled from within the chamber for collecting and delivering material to the upper end of the tube.

35. A dredging apparatus, comprising a tube, one end of which is adapted to be lowered into a body of water and having a passage-way throughout its length, the said lower end having a hatch opening and cover for the same, means for closing communication to the lower end, means controlled from within the tube for collecting and delivering material to the upper end of the tube, and means for closing the passage-way adjacent to the lower end of the tube.

In testimony whereof I have hereunto set my hand this 19th day of December A. D. 1906.

SIMON LAKE.

Witnesses:

M. D. BLONDEL,
A. M. DEAN.