No. 629,910. Patented Aug. 1, 1899.

E. C. NICHOLS.

SUBMARINE MINING AND ORE SEPARATING APPARATUS.

(Application filed Nov. 29, 1897.)

(No Model.) 7 Sheets—Sheet 1.

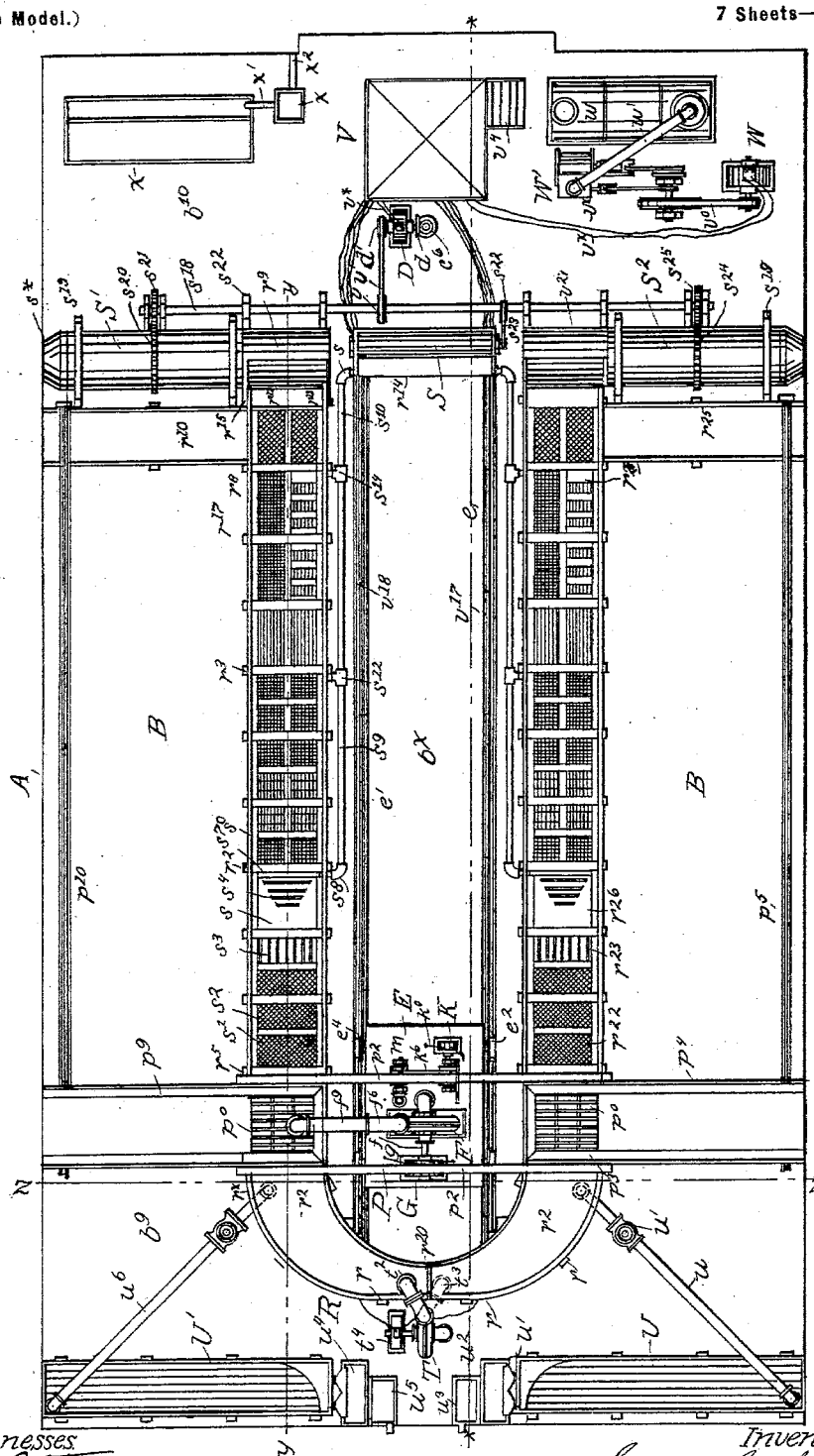


Fig. 1.

Witnesses
F. G. Turner
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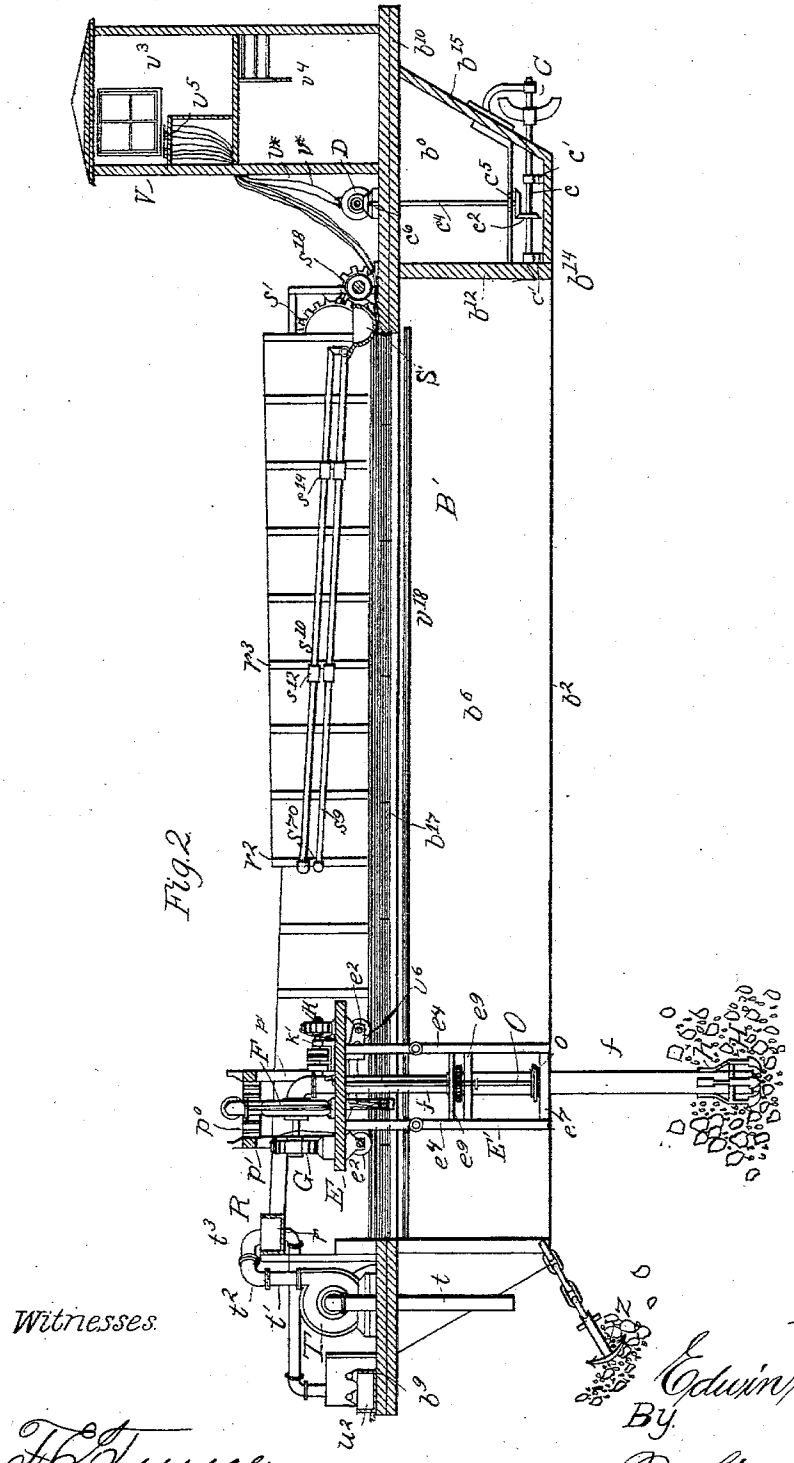


Fig. 2

Witnesses.

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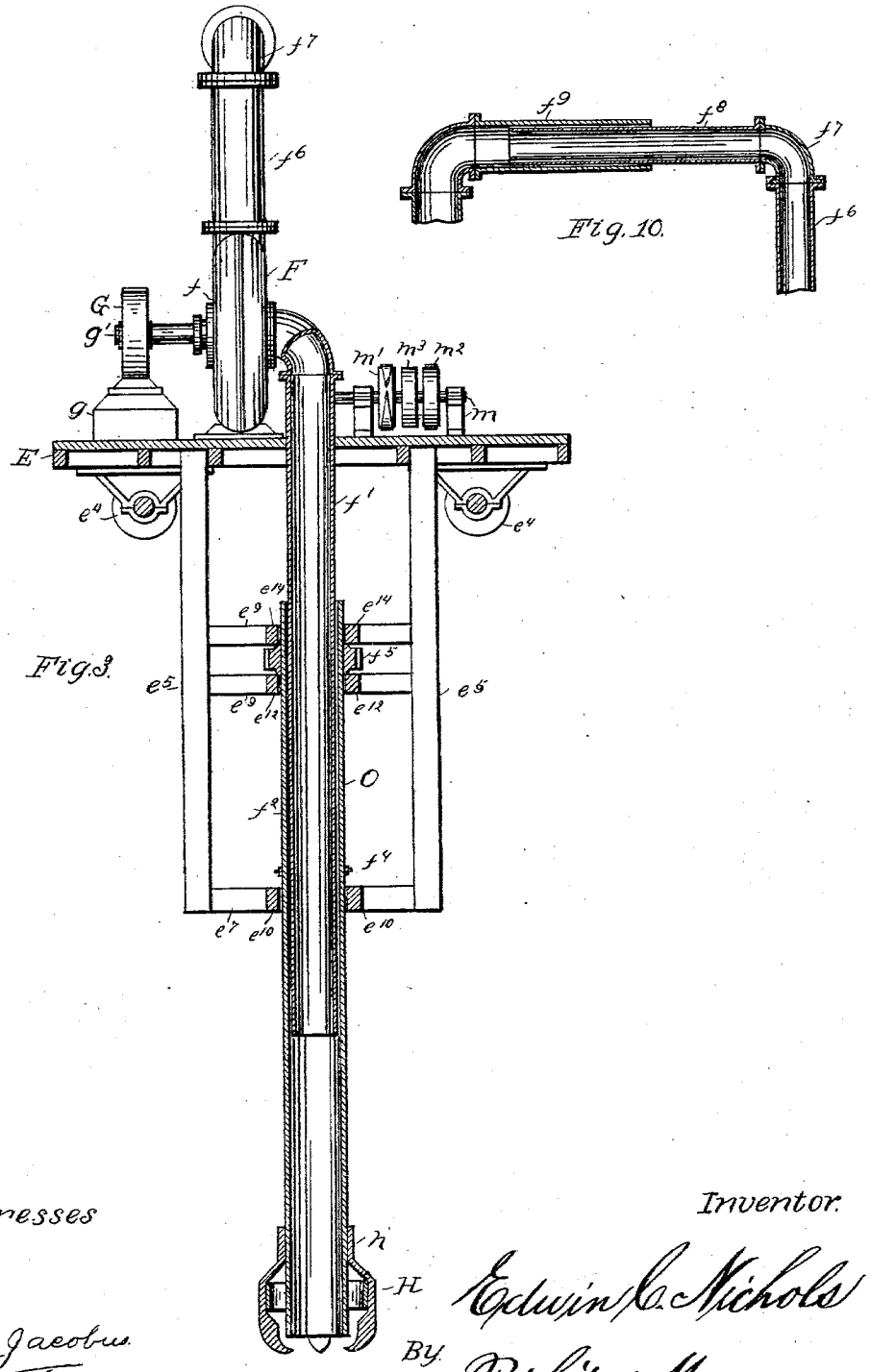


Fig. 3.

Fig. 10.

Witnesses

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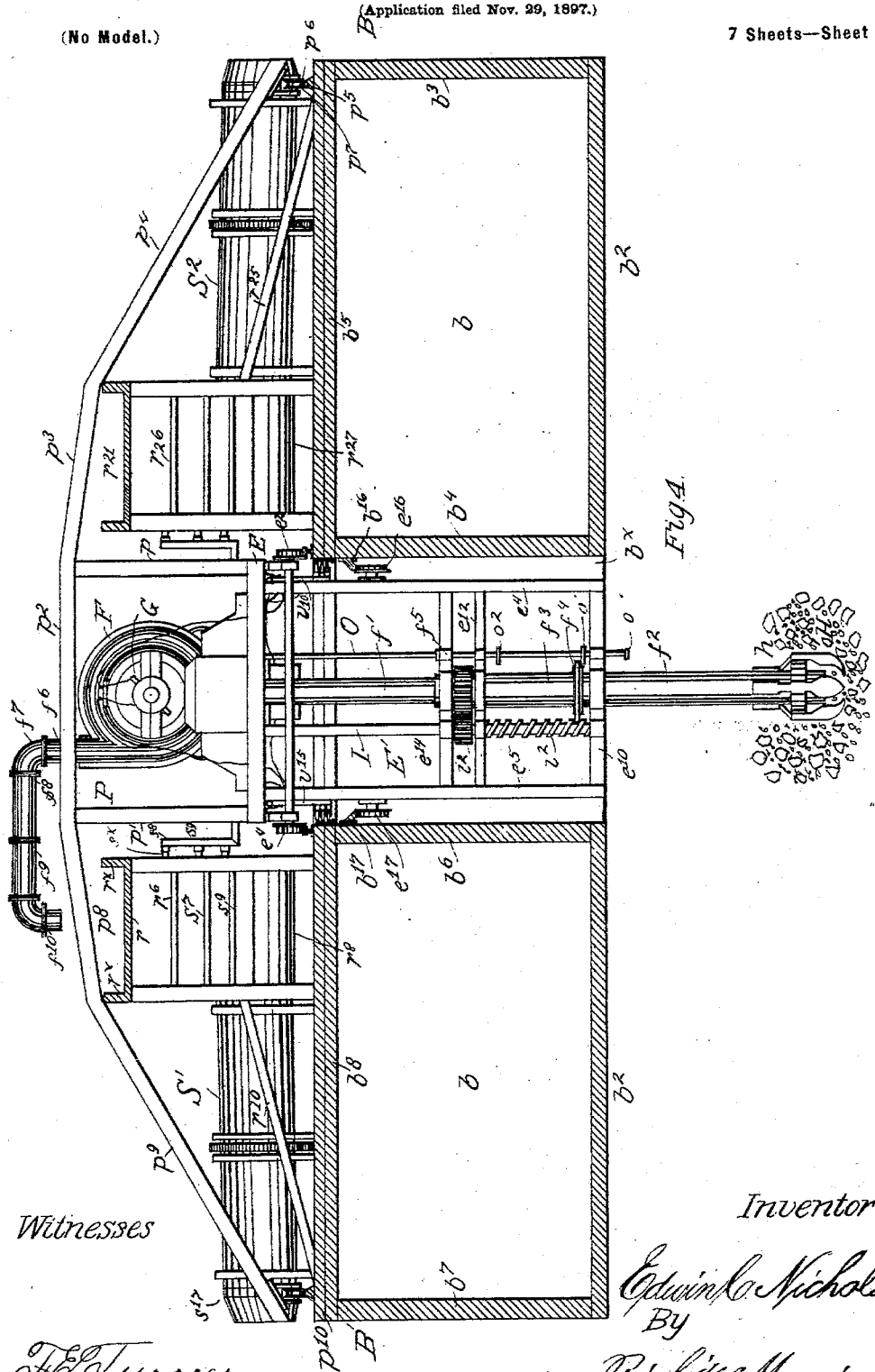


Fig 4.

Witnesses

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SUBMARINE MINING AND ORE SEPARATING APPARATUS.

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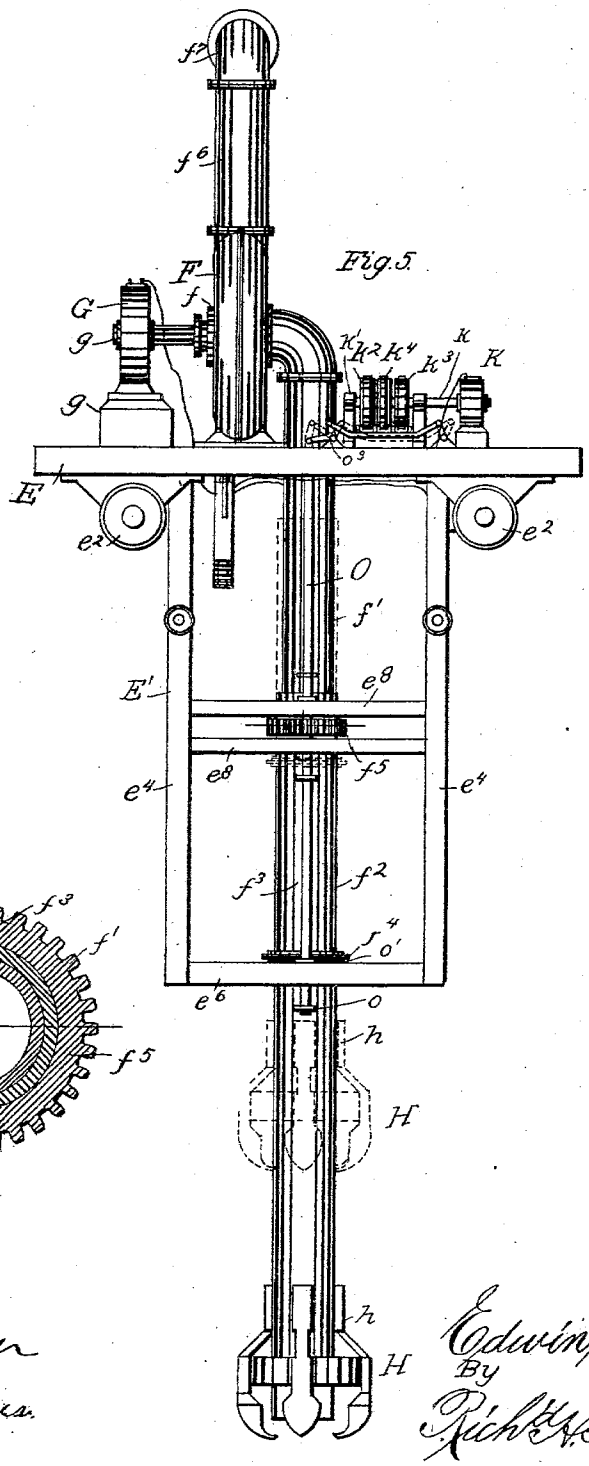


Fig. 5.

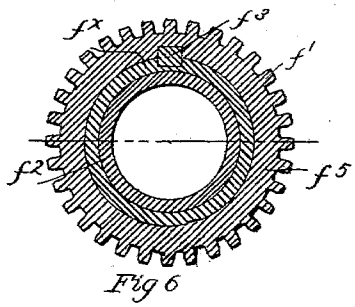


Fig 6

Witnesses

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SUBMARINE MINING AND ORE SEPARATING APPARATUS.

(Application filed Nov. 29, 1897.)

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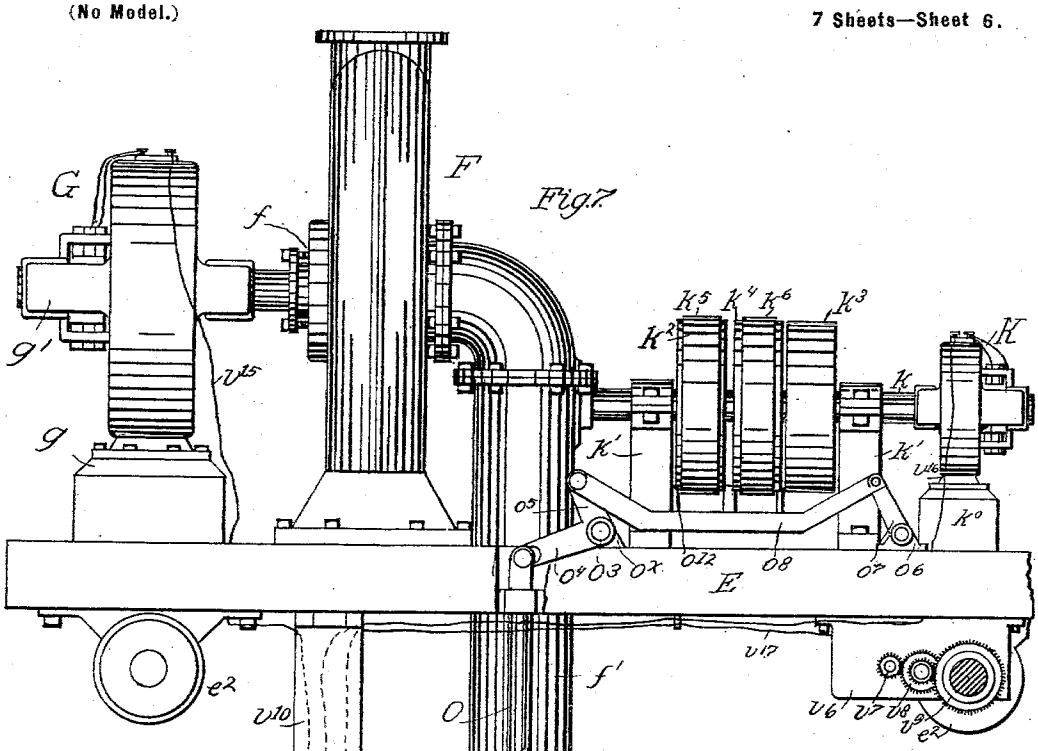


Fig.7.

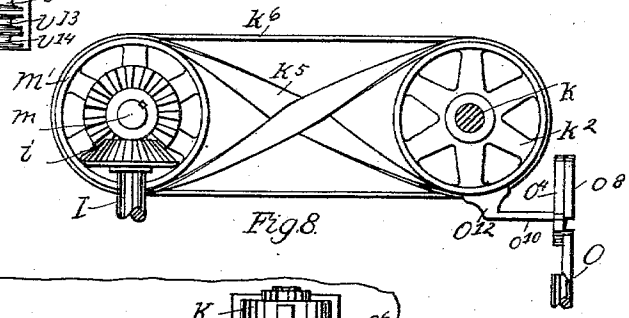


Fig.8.

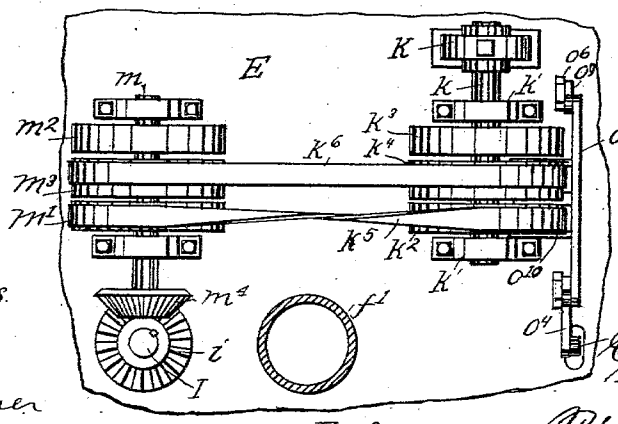


Fig.9.

Witnesses.

F. C. Turner

A. B. Jacobus

Inventor.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(Application filed Nov. 29, 1897.)

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Fig. 11.

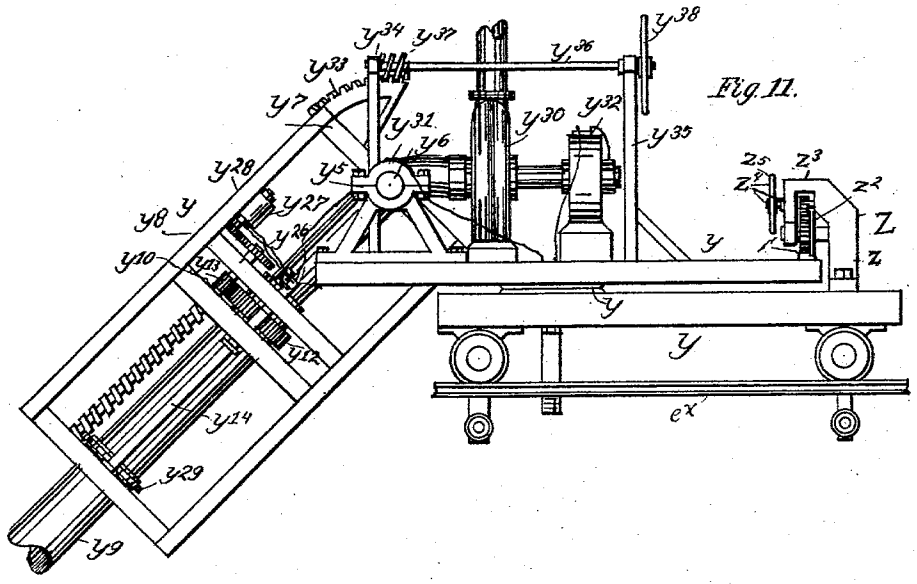
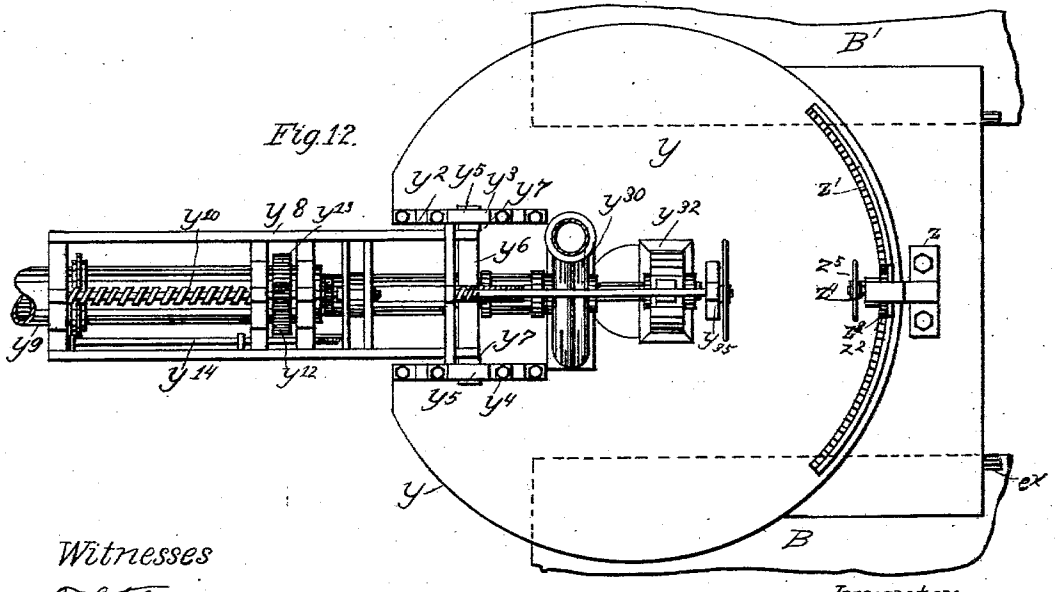


Fig. 12.



Witnesses

F. E. Turner

A. B. Jacobus

Inventor

Edwin C. Nichols

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDWIN C. NICHOLS, OF TOPEKA, KANSAS, ASSIGNOR OF ONE-HALF TO WILLIAM C. SMITH, OF SAME PLACE.

SUBMARINE MINING AND ORE-SEPARATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 629,910, dated August 1, 1899.

Application filed November 29, 1897. Serial No. 660,029. (No model.)

To all whom it may concern:

Be it known that I, EDWIN C. NICHOLS, a citizen of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented a certain new and Improved Submarine Mining and Ore-Separating Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others to make and use the same, reference being had to the accompanying drawings, forming a part of this specification.

The objects of my invention are, first, to attack the auriferous material in the substratum of the beds of rivers or other watercourses and separate these deposits from the overlying material at any desired point in the bed at will; second, to prospect and control the entrance of the mining-shaft to the auriferous strata of the bed of the river at any point upon the floats; third, to regulate automatically the extension of the telescopic portion of the hollow shaft within the auriferous strata and its withdrawal; fourth, to attack and separate the auriferous strata at various inclined planes to the bed, bar, or bank of the river; fifth, to enable a continuous separation to be maintained of material discharged at any point upon the side of the sluiceway of the floats; sixth, to enable the reciprocal movements of the car and of the power devices upon said car to be controlled from one location upon the floats.

My invention consists in the novel construction and combination of parts, such as will first be fully described, and specifically pointed out in the claims.

In the drawings, Figure 1 is a plan view of the water-carriage, showing the intermediate sluice, the flumes upon both sides of the sluice, and the separators in the flumes, the water-supply apparatus to the flumes, the movable car carrying the automatic supply-shaft and motors for controlling its movements and suction and force apparatus, the intercepting-pipes in the water-flume and the amalgamating-cradle and pipes leading thereto, and the rotary amalgamating vessels and operating-shafts, the engine and generator, a central switch-station upon the water-carriage and power-conveyers for operating the movable car, and motors connected with the switch in the station, also showing the motor for operating the screw-propeller to the water-carriage and the various washers for separating the ore from the amalgam. Fig. 2 is a vertical sectional view of the water-carriage and ore-separating apparatus, taken upon the line $x\,x$ of Fig. 1. Fig. 3 is a longitudinal sectional view of the movable car and suction-pipe. Fig. 4 is a transverse view, in vertical section, of the water-carriage, taken upon the line $z\,z$ of Fig. 1, showing the flumes in section, also showing the movable car and the telescopic material-supplying shaft and reversing-gear and motor upon the car, and also the separator and the rotary amalgamating vessels at the rear end of the water-carriage. Fig. 5 is a side view of the movable car above the sluice of the water-carriage, showing an enlarged detail of the material-conveyer, as in Fig. 2, the elevated position of telescopic part of the material-conveyer being shown in dotted lines, also showing the belt and belt-pulley in the motor-shaft for operating the reversing-shaft to the material-conveying hollow shaft and its motor and the automatic belt-shifting device. Fig. 6 is a detail sectional view of the stationary and telescopic portion of the hollow shaft, showing the feathered gear-wheel in section. Fig. 7 is a detail side view, enlarged, of the movable car on the floats, with the frame beneath the rear end, showing the suction and force apparatus, the hollow material-conveying shaft connected therewith shown broken away at the lower end, the belt-pulleys and shaft, the belt-shifting device, the motors actuating the belt-pulleys on the motor-shaft, and also the motors actuating the suction and force apparatus and the movable car. Fig. 8 is a detail side view of the motor for actuating the reversing-shaft to the telescopic end portion of the material-conveying hollow shaft, showing the belt-pulleys upon the motor-shaft and the belt-shifting arm, the upper end portion of the reversing-shaft, showing the bevel-gear and the belt-driving shaft carrying the bevel-gear, meshing with the bevel-gear on the reversing-shaft. Fig. 9 is a broken plan view of the rear end of the platform of the car, showing the motor and

belt-pulleys for reversing the action of the shaft having the worm, also showing the belt-shifting bar. Fig. 10 is a sectional view in detail of the telescopic portion of the discharge-pipe leading from the suction and force pump. Fig. 11 is a detail side view of the movable car, showing a rotary platform and means for suspending and vibrating the frame for the material-supplying hollow shaft in alternate positions upon the car. Fig. 12 is a plan view of the movable car and also the rotary platform as seen in Fig. 11, showing the means for changing the angle of inclination of the frame for the material-conveying hollow shaft and also the lateral movement of said frame.

Similar letters of reference indicate corresponding parts in all the figures.

Referring to the drawings, A represents a floating barge or water-carriage which is designed more particularly for harbor or river navigation and is composed of two separate floats B B′, each having a water-tight compartment b, extending from one end of the float to the other. The bottom b^2 of each float is flat and in general construction permits a light draft, while in buoyancy they will sustain the weight of the machinery and also all ore necessary for treatment. The sides b^3 b^4 of float B are vertical, and extending the entire length of the float is a horizontal deck b^5, which also extends in width from the outer edge of the side b^3 to the outer edge of the side b^4. The float B′ is constructed precisely the same as the float B, with the vertical sides b^6 b^7 and deck b^8, which latter is upon the same horizontal plane as the deck b^5. The floats B B′ are arranged a comparatively short distance apart, and between the respective sides b^4 b^6 of said floats is a sluice $b^\times$, of equal width at both ends of said barge. The forward ends of the floats B B′ are connected by a transverse floor-beam b^9, which extends from the outer side portion of the float B to the outer side portion of the float B′ and in width from the forward end of said floats in the direction of the rear end about one-fifth the described distance. The rear end portion of said floats is connected by the transverse floor or deck beams b^{10}, which extend the same described distance from the rear end of said floats toward the forward end as described of the deck-beam b^9. A short distance from the rear end of float B and connected with the outer portion of the side b^4 of said floats is a vertical wall b^{12}, which extends in a transverse direction to the sluice $b^\times$ and is connected with the side b^6 of the float B′. With the bottom b^2 of the float B, in sluiceway $b^\times$, is connected a horizontal extension b^{14}, which extends transversely to the said sluice and is connected with the bottom portion of the float B and extends from the under side of the wall b^{12} rearwardly the described length of the end of the respective floats, and from the rear edge of which extends upwardly and rearwardly a stern-wall b^{15}, conforming to the inclined rear end of each float, thus forming a water-tight compartment b^0 between said floats. In the bottom of compartment b^0 is a shaft c, which is mounted in the journal-bearings c' c', and extends through the stern-wall b^{15} of said compartment, and upon the outer end of said shaft c is a screw-propeller C, by means of which the water-carriage is moved from one position to another in the stream. On shaft c is a bevel-gear c^2. Above shaft c is a vertical shaft c^4, upon the lower end of which shaft is a bevel-gear c^5, which meshes with the bevel-gear c^2. The upper end of shaft c^4 extends through deck b^{10} of the floats B B′ and is provided with a bevel-gear c^6. (See Fig. 1.) Close in position to the gear c^6, upon the deck b^{10}, is a motor D, upon one end of the driving-shaft of which is a bevel-gear d, which is thrown in and out of gear with the bevel-gear c^6, and upon the other end is a pulley d' for the purpose herein described.

Upon the deck of the float B and extending in the longitudinal direction of said float and near the line of the outer position of the side b^4 is a track-rail e. Upon the other float B′ and near the line of the side b^6 is a track-rail e', both rails e e' extending in length from the transverse deck-beam b^9 to the transverse deck-beam b^{10}. Above the sluice $b^\times$ is a movable platform-car E, the flange-wheels e^2 of which upon one side of said car move upon track-rail e and the flange-wheels e^4 upon the other side upon track-rail e'. Upon the platform of the car E, a short distance from the forward end portion, is a rotary suction and force pump F, of the well-known construction, having the pump-shaft f. Upon the forward end of the platform of the car is a motor G, mounted upon a support g, the shaft g' of which motor is rigidly connected with the shaft f of the rotary pump. With the under side portion of the platform of the car E is connected a stationary frame E′, which is composed of the beams e^4 e^4, connected at their upper ends with said platform a short distance from the axles of the wheels e^2 e^2, respectively, near one side of the platform of the car, and the lower ends extended downwardly within the sluice $b^\times$ to a position in line with the bottom portions b^2 of the floats B B′. Near the other side of the platform of the car are the beams e^5 e^5, which extend from the under side of the platform the same described distance in sluice $b^\times$ as described of the beams e^4 e^4. The lower ends of the beams e^4 e^4 are connected together by a horizontal beam e^6 and the lower ends of the beams e^5 e^5 by the horizontal beam e^7. (See Figs. 2 and 3.) Connected with the beams e^4 e^4, at a point equidistant from the beam e^6 and the platform of the car, are separate beams e^8 e^8, and also connected with beams e^5 e^5, at the same described distance above beam e^7 as described of beams e^8 e^8, are the beams e^9 e^9. Extending from the beam e^6 to the beam e^7, at a point equidistant

from the opposite ends of said beams, are transverse supporting-beams e^{10} e^{10}, and extending from the separate beams e^8 e^8 to the separate beams e^9 e^9 are transverse connecting-beams e^{12} e^{14}. (See Fig. 4.)

With the induction-opening to the pump-case F is connected one end of a material-conveying hollow shaft f', the other end of which shaft extends downwardly between the beams e^{14} e^{12} to a position a short distance below the line of the under side of beam e^{12}. With the lower end of the portion f' of the hollow shaft is connected a rotary hollow shaft f^2, which fits over or telescopes with the hollow shaft f', and its upper end extends to a position a short distance above the beam e^{14}. On the outside portion of the telescopic portion f^2 of the hollow shaft f' is a longitudinal groove f^3, which extends from the upper end downwardly a suitable distance or about one-half the described length of said shaft. Upon the said portion f^2 of the shaft is a disk or ring f^4, which in its lowest position is near the upper side portion of the beam e^{10}. On the telescopic portion f^2 of the hollow shaft, between the beams e^{12} e^{14}, is a gear f^5, in which is a feather $f^\times$, which extends within the groove f^3 of shaft f^2 and permits the said portion f^2 of the shaft to slide through the gear. With the lower portion of the telescopic portion of the hollow shaft is connected the shank h of the cutter H, which extends at an angle outwardly from the outer side of the shaft a short distance and thence downwardly a short distance above the open end of said shaft and is provided with a trowel-shaped blade-cutter H. A series of the blades and shanks are connected with the lower portion of the hollow shaft f^2, extending around said shaft at equal distances apart and curving inwardly toward each other, so as to cut and start the material upwardly in the hollow shaft.

With the eduction-opening of the fan-case F is connected the discharge-pipe f^6, which extends upwardly a short distance and is provided with an elbow f^7, which turns or swivels upon the pipe f^6. With the elbow f^7 are connected the separate pipes f^8 f^9, which telescope one within another and are extended for the purpose hereinafter described. With pipe f^9 is connected an elbow f^{10}. Close in position to the portion f^2 of the hollow pipe and upon one side of said pipe is a rotary shaft l, (see Fig. 4,) which is stepped at its lower end in the beam e^{10}. The said shaft l is journaled in suitable journal-boxes upon the beams e^{12} e^{14} and extends through the platform of the car and a short distance above said platform, and upon said end is a bevel-gear i. (See Figs. 8 and 9.) Upon shaft l, between the beams e^{12} e^{14}, is a gear i^2, which meshes with the gear f^5 on the hollow shaft f^2. On the lower end of shaft l, between the beams e^{10} e^{12}, is a worm i^2, with which worm the disk or collar f^4 is engaged.

Upon the rear end portion and near one side of the platform of the car E is a motor K, the motor-shaft k of which extends in the direction of the fan-case F a considerable distance and is journaled in separate journal-boxes upon the upright standards k' k'. Upon the motor-shaft k, between the standards k' k', are the separate fixed pulleys k^2 k^3 k^4. Near the other side of the platform of the car is a separate shaft m, upon which are the loose pulleys m' m^2 and an intermediate fixed pulley m^3. Over the pulley k^2 is connected one end of a belt k^5, the other end of which belt is twisted once and extended over pulley m' and the two ends connected together in the usual manner. Over the pulley k^4 is extended one end of a belt k^6, the other end of which belt is extended over the pulley m^3 and the two ends connected together as described of belt k^5. On the end of the shaft m' is a bevel-gear m^4, which meshes with the gear i on the upper end of the shaft l. Upon the other side of the hollow shafts f' f^2 from that having the shaft l is a vertically-movable rod O, which extends from a position a short distance above the platform of the car near the belt-pulley k^2 downwardly through said platform and through the beams e^{14}, e^{12}, and e^{10}, in which said rod is journaled, and upon the lower end of said rod is a disk o. Upon rod O, above the beam e^{10}, is a rigidly-connected disk o', which extends beneath the lower edge of the disk f^4 on the telescopic hollow shaft f^2. A short distance above the disk o' is a fixed disk o^2, which disks are actuated by the disk f^4 on shaft f^2, as follows:

Upon the platform of the car E is a bell-crank lever o^3, which is pivotally connected with a support $o^\times$ on the said platform, one arm o^4 of the lever being pivotally connected with the upper end of the rod O. Near the outer side portion of the support k' for the motor-shaft k of the motor K and to a support o^6 on the platform of the car is pivotally connected a crank-arm o^7 (see Fig. 7) of the same length as the arm o^5 upon the bell-crank lever.

o^8 is the belt-shifting bar, which extends horizontally in rear of the supports k' k' for the motor-shaft K and is bent at an angle in an upward direction at each end, one bent portion being pivotally connected with the arm o^5 of the bell-crank lever and the other bent portion with the outer end of the crank-arm o^7. With the bar o^8 are rigidly connected the lateral bars o^9 o^{10}, upon the outer end of which bars is a shoe o^{12}, one of which shoes engages with the belt k^5 on pulley k^2 and the other with the belt k^6 on pulley k^4.

Upon the top of the platform of the car and at each end are the fixed standards p p of the frame P, which standards are near the line of the side of said platform, and upon the other side of said platform are standards p' p'. The standards p p' at one end of the car are connected together at the top by the transverse beam p^3 and at the rear end of the car by the transverse beam p^2.

With one side of the frame P is connected a sluice p^3, which extends downwardly a short distance in one angle of inclination to the point $p^\times$, in line with the outer side of the float B. Beneath the lower end of the sluice p^3 is a track-rail p^5, which extends the entire length of the float between the forward and rear decks b^9 b^{10}. With the under side portion of the sluice p^3, above the track-rail p^5, are flanged wheels p^6, which are journaled in the hangers p^7 on the under side of said sluice.

With the other side of the frame P is connected a sluice p^9, which is precisely the same as the sluice p^3 upon the other side of frame P, and which sluice p^9 extends to the side of the float B′ and is supported upon a track-rail p^{10} in the same manner as described of the sluice p^3. In the bottom of the sluice p^3, directly beneath the elbow f^{10} of the pipe f^9, is a coarse screen p^0. In the sluice p^3, upon the other side of the frame P, is a coarse screen or grating, which is the same as screen p^0.

For the purpose of preventing the car E from being raised in position upon the track-rails in a recoil of the shafts f' f^2 in meeting a resistance in the bed of the stream a track-rail b^{16} is secured to the inner side b^4 of the float B a short distance below the top of the said float, and which extends the same distance as the track-rail e in the said float. Upon the float B′ and the inner side b^6 of said float is a track-rail b^{17}, which extends the same distance as the track-rail b^{16}. On the beam e^4 of the frame E′ is a wheel e^{16}, which is journaled upon said frame and bears upon the under side of said track-rail. On the beams e^5 e^5 of frame E′ is journaled a wheel e^{17}, which travels on the guide-track b^{17}. Upon the beams e^4 e^4 are wheels e^{16}, which are similar to the wheels traveling upon the guide-rail b^{16}.

On shaft s^{18} is a pulley v, over which is extended one end of a belt v', the other end of which belt extends over the pulley d' on the shaft of motor D upon the deck b^{10} of the floats.

Directly in rear of the motor D is a two-story covered station or house V, the upper room v^3 of which is reached by the stairs v^4.

Upon the deck b^{10} and directly in rear of the rotary vessel S^2 is a generator W of electricity, which generator is actuated by the belt v^0 on the shaft, drawn by power from the driving-wheels on an engine W′. At one side of the generator W is a boiler, and w' is the pipe supplying the steam from the boiler to the engine. $v^\times$ $v^\times$ are conductors connected with the separate poles of the generator W and extending to the switchboard v^5 in the room v^3 of the station or house V. From the switchboard v^5 are separate conductors $v^\times$ $v^\times$, extending to the poles of the motor D.

For the purpose of moving the car E to and fro upon the track e e' on the floats B B′ a motor v^6 is arranged beneath the platform of the car E, (see Fig. 7,) on the shaft v^7 of which motor is a pinion v^0, which meshes with a gear v^8, which in turn meshes with a gear v^9 on the rear axle of the car. With the under side portion of the platform of the car and a short distance in rear of the beam e is an arm v^{10}, made from heavy steel and tempered so as to spring outward with great force. On the lower end of the spring-arm v^{10} are three separate roller-contacts v^{12} v^{13} v^{14}. Upon the other side of the platform and in rear of the beam e^5 (see Fig. 4) on car E is a spring-arm v^{25}, which is provided with roller-contacts, as described of the spring-arm v^{10}.

With the motor G on the car and one pole of said motor is connected one end of a conductor v^{15}, the other end of which conductor is connected with the roller-contact v^{12}. With the other pole of motor G is connected a conductor which extends to a roller-contact on the arm v^{25} in the same position as the roller v^{12}, said connections being made in the well-known manner of trolley connections.

With the pole of motor K is connected one end of a conductor v^{16}, the other end of which conductor extends to the trolley-wheel v^{13} on arm v^{10}. With the other pole of the motor is connected a conductor which extends to a trolley-wheel on the arm v^{25} in the same position as upon the arm v^{10}. With the motor v^6 beneath the car and one pole is connected one end of a conductor v^{17}, the other end of which conductor extends to the trolley-wheel v^{14} on arm v^{10}. With the other pole of the motor K is connected one end of a separate conductor k^0, which is connected with a trolley upon the arm v^{25}, corresponding to the position of the trolley v^{14} on said arm.

With the switchboard v^5 in the room of the station V are connected a series of conducting-wires v^{17}, which extend along the inner edge of the deck-beam of the float B a short distance below the upper edge and are suitably held in position in insulations on the said beam, so as to permit contact with the trolleys. One of said series of wires extends to one of the poles of the motor t^4, which operates the pump T on the forward end of deck b^9. The other wires extend to the line of the forward deck b^9, each coming into contact with one of the separate trolleys v^{12} v^{13} v^{14}. With the switchboard v^5 is connected a series of conducting-wires v^{18}, which extend along the inner side of the float B′, one of which extends direct to the other pole of motor t^4, and the other conducting-wires are extended to the deck b^9, with which the trolleys upon arm v^{15} come into contact.

Upon the deck b^{10} in the rear end of float B′ is a longitudinal stationary tank X, and adjacent thereto is a smaller tank x, which is connected by means of a pipe x' with tank X. With tank X is connected a discharge-pipe x^2, which extends in the direction of the rear end of float B′.

For the purpose of obtaining lateral as well as vertical movements and adjustable position of the hollow material-conveying shaft upon the movable car upon the track-rails e e' on

the respective floats B B′ the track-rails $e^{\times}$ $e^{\times}$ are extended to the forward end of the deck b^9, being a continuation of the track-rails e e' upon said floats, to which reference is made. (See Figs. 10 and 11, which figures represent an alternate method of reaching auriferous material to that shown in the former illustrations.)

In Figs. 10 and 11, Y represents the platform of the car, which is nearly of the same dimensions as the platform E and which is mounted on the said extended portions $e^{\times}$ $e^{\times}$ of the track-rails e e' on the floats B B′ and is operated by a motor beneath the car, as seen in Fig. 7 of the drawings.) Upon the platform of car Y is a rotary platform y, pivoted at y' to said platform and which is circular in form. In the forward part of the platform Y is an opening y^2. On each side of the opening y^2 are brackets y^3 y^4, which carry the journal-boxes y^5 y^5, in which is journaled a shaft y^6. With the shaft y^6 are rigidly connected the side beams y^7 y^7 at the upper end of the frame y^8, which frame is similar to and nearly of the same length as the frame E′ in Figs. 2, 4, and 6 of the drawings and is the same in width and length. In frame y^8 is a telescopic hollow shaft, which is mounted in the frame y^8 in the same manner as the parts of the hollow shaft f' f^2 and which telescopic part is operated by a worm on shaft y^{10}, both shafts being geared together with gear y^{12} y^{13}, which are the same as gear f^5, and said hollow shaft having feather-gear the same as gear f^3 in the other views, the movement of the telescopic part of the hollow shaft being accomplished by a rod y^{14}, which is the same as rod O, the mode of transmitting power to the worm, however, and also for operating the frame y^8 being as follows: On the shaft of the motor y^{27} is a gear which engages with a gear y^{28} on the upper end of the shaft y^{10}, carrying the worm, with which worm the disk y^{29} on the shaft y^{14} engages as upon the hollow shaft f^2. In rear of the shaft y^6 is the rotary pump y^{30}, which is the same as pump F in Fig. 1, with the induction-opening of which pump is connected one end of a flexible pipe y^{31}, the other end being connected with the upper end of the upper section of the shaft y^9. In rear of the pump y^{30} is a motor y^{32}, which is the same as the motor K on the platform of the car E, the motor-shaft, however, being directly connected with the pump-shaft of pump y^{30} and and is operated electrically, as described of the motor K.

In order to operate the frame y^8 vertically, upon the upper end of the frame y^8 is connected one end of a rack y^{33}, the other end of which rack extends rearwardly in a single upwardly-extended curved line. In front of the shaft y^6 is a standard y^{34}, which is slotted at the upper end to receive the rack y^{33}. In rear of the motor y^{32} is a standard y^{35}. Through the upper ends of the standards y^{34} and y^{35} extends a shaft y^{36}, upon one end of which is a worm y^{37}, which engages with the rack y^{33} on the frame y^8, and upon the other end is a wheel y^{38}. Upon the rear end portion of the platform y is a curved rack z'.

Upon the platform of the car Y is an upright or standard Z′, the upper end of which extends over the said platform y a short distance. On the inner side of the standard is journaled a gear-wheel z^2, which meshes with the rack z' on the rotary platform. Above the gear z' is a small spur-gear z^3, which meshes with the gear z^2, and which gear z^2 is provided with a shaft z^4, on the outer end of which is a wheel z^5 for operating the spur-gear and rotating the platform y from one position to another in the arc of a circle.

In the operation of the apparatus for the purposes designed the floats B′ B′ are propelled by the propeller C, which receives the power from the motor D on the deck b^{10} to the designated place in the river or stream at which operations are to be directed in the river-bed, and by means of anchor Z the carriage is anchored in position, the generator of electricity W being set at work by the power transmitted through the belt v^9 to its driven shaft from the driving-wheel of the engine W. The current so generated is transmitted through the conducting-wires $v^{\times}$ to the switchboard v^5 in station V whenever a switch connection is made with the conducting-wires to any motor. For the purpose of illustration the car E is shown at the forward end of the floats, from which point the car moves slowly in a rearward direction upon the track e e'. In the position as shown the telescopic part f^2 of the hollow shaft f' is raised above the bed of the river in the position as seen in dotted lines in Fig. 5. The operator throws the switch connecting the wires upon the switchboard v^5 with the motor K, and at the same time to the motor G, in which action the pump T is set in motion, and the reversing-belt k^5 being in position upon the pulleys k^4 and m^3 a reverse movement is communicated to shaft m and shaft l, and the disk f^4 is moved by the reverse movement of the worm i^2 downwardly, the telescopic part f^2 being permitted to slide through the gear f^5 by means of the feather in said gear, the power of the shaft l, which carries the worm, also causing a rotary motion to be given to the telescopic part f^2 of the hollow shaft, the inwardly-inclined cutters or blades H entering the upper strata of the soil in the bed of the river at the lowest point of operation of the shaft, at which point the disk f^4 on shaft f^2 strikes the disk o' on the rod O, drawing said disk downwardly to the beam e^{10}, also drawing the arm o^4 of the bell-crank lever downwardly and causing the belt-shifting arms o^9 on bars o^8 to throw the reversing-belt on pulleys k^2 m' and the belt k^6 upon pulleys m^3 k^5, which action causes the worm i^2 on shaft l to reverse its movement and the disk gradually moves upward, drawing the telescopic portion f^2 with it, some soil adhering, until the disk f^4 meets the

disk o^2 on rod O, and the rod is moved upwardly, actuating the bell-crank lever and the belt-shifting bar o^8 and throwing the belts upon the pulleys k^4 m^3, as before described. During the operation of motor K this movement of the hollow shaft f^2 is constantly repeated. When the movement of said part f^2 of the hollow shaft is in a downward direction, the desired depth is reached in the river-bed, which comprises the auriferous material, which through a long period of years and by the slow process of filtration the metal in fine particles is deposited by gravity, and which material requires the treatment in successive stages, for which the above-described apparatus is designed, in order to separate the metal in its entirety after being separated from the strata of soil which the hollow shaft f^2 penetrates. During the time in which the lower end of the hollow shaft f^2 is opening a passage to the auriferous material the suction and force pump P is drawing the loosened soil and stones, mixed with water, which impedes the way of the shaft, through the portions f' f^2 and ejecting the same through the pipe f^9, which falls upon the coarse screen or grate p^0, the stone and coarse material passing down the incline portion p^9 over the side of the float and the auriferous material upon the portion r of the flume R. During the reciprocal movement of the telescopic part f^2 of the hollow shaft in upward and downward direction the operation at the switchboard v^5 communicates power to the motor v^6 beneath the car E and the car moves a short distance rearwardly as soon as the belts on the pulleys shift their position and the part f^2 of the hollow shaft reaches its highest position, thus presenting a new material to be operated upon when the hollow shaft descends into the bed of the river. During the rearward movement of the car E the material which falls through the screens p^0 will fall upon the screens s^2 s^3 s^4 in flume r until the car reaches a point indicated by the standard r^2, past which point the screenings fall upon the conduit r^{17}, mixed with the water drawn by the pump, which passes to the end of the conduit and falls upon the flume r, the fine screenings which fall upon the burlap of the under conduit r^{18} also holding the fine metal which is left in the cloth. As the water slowly penetrates the fibers the material passing along the burlap is caused to fall upon the flume r and into the strong current of water flowing from pump T. In this manner the described distance of the floats at the bed of the river is thoroughly prospected and the material subjected to treatment and separation at any point on the floats, the whole operation being under the control of one person.

When a bank upon the side of a stream is to be attacked, the construction seen in Figs. 13 and 14 will be advantageously employed and may be an additional fixture upon the forward end of the floats to be used when occasion requires and operated in like manner upon the track-rails as described of the car E or the construction upon said car Y in order to gain the change of angle desired.

The washing of the burlap may be done in the tank U U at the forward end of the floats, the deposits being carefully removed and subjected to separation on the tank x, adjacent to the tank X, and the tank u^5, adjacent to the tank U'.

I have described the operation of the apparatus upon one side of the water, vessel, or float B', the mode of operation being precisely the same on the screens r^{22} r^{23} and on the flume r^2 on float B, the large amount of material to be treated requiring that operations may be alternately conducted upon one side or the other of the floats in order to permit repairs to the screens to be made and for other purposes. In order to change the flow of water, the pipe t^2 is swung so as to present the end t^3 on the other side of the partition r^{20}, and the water follows the flume r^3. The material-conveying pipe f^9 is moved in position so as to bring the end f^{10} over the screen in chute p^3, and the operation is conducted in precisely the manner described on the one side of the water-carriage.

With the aid of the car I am enabled to employ a hollow shaft of any desired size and change its position upon the floats expeditiously until the proper location is found to begin operations in the bed of the stream. The ordinary earth-auger may be employed on the rotary portion of the shaft instead of the blades and the apparatus upon the frame used for dry digging. In case the telescopic portion of the shaft should meet a resistance in going down greater than the power on the belts the belts will slip on the pulleys, and thus prevent injury to the said portion of the shaft.

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

1. In a submarine-mining apparatus, a frame, a motor upon said frame and a stationary material-conveying hollow shaft supported within said frame, a suction and force pump connected with said shaft, said shaft also having a separate telescopic portion, rotating power-conveying devices connected with the motor and said telescopic portion of said shaft, an elevating apparatus upon said frame, also connected with the telescopic portion of said shaft, and separate power-reversing mechanism upon said frame connected with said shaft, elevating apparatus, and also connected with said motor.

2. In a submarine-mining apparatus, a water-carriage and a frame upon said carriage, and a stationary material-conveying hollow shaft supported within said frame, having a telescopic portion, a suction and forcing apparatus and a conductor connected with the induction-opening to said apparatus and also with said shaft, a motor upon said water-carriage, and a rotary shaft having a worm upon

the frame carrying said hollow shaft, a power-conveyer connected with the shaft of said motor and the telescopic end portion of said hollow shaft, and a collar upon said telescopic portion of said shaft engaging with said worm, and means for reversing the action of said motor.

3. In a submarine-mining apparatus, a water-carriage and a platform upon said carriage, an oscillating frame, and a shaft with which said frame is connected, suitably supported upon said platform, and a hollow shaft adapted to be extended to the bed of the river, supported within said frame, a suction and forcing apparatus upon said platform, and a pipe having a flexible joint connected with the induction-opening to said suction and forcing apparatus, and also with said hollow shaft, and a frame upon said platform, and a worm upon said frame, and a curved rack upon said oscillating frame.

4. In a submarine-mining apparatus, a water-carriage comprising side floats having an intermediate sluice, track-rails upon each float on opposite sides of said sluice, a car upon said track-rails and a hollow shaft connected with said car having a telescopic portion adapted to be extended to the bed of the stream, a motor and mechanism connected with said motor, actuating said car and adjusting the position of said telescopic portion of said shaft simultaneously.

5. In a submarine-mining apparatus, a water-carriage comprising side floats having an intermediate sluice, track-rails upon each float on opposite sides of said sluice, a car having a platform upon said track-rails, and a frame connected with the platform of said car and extending within said sluice, a material-conveying hollow shaft supported within said frame, having a telescopic portion adapted to be extended to the bed of the stream, a feathered gear and a slot in the telescopic portion of said shaft, a shaft upon said frame, and a gear upon said shaft engaging with the gear on the telescopic portion of said shaft and a worm, a collar on the telescopic portion of said shaft engaging with the said worm, a motor upon the platform of said car, having a driving-shaft and shaft-reversing devices connected with the shaft carrying said worm and the shaft of said motor.

6. In a submarine-mining apparatus, a water-carriage comprising side floats having an intermediate sluice, a track-rail upon each float upon opposite sides of said sluice, a car upon said track-rails, and an oscillating frame upon said car and a material-conveying hollow shaft supported within said frame and having a telescopic portion adapted to be extended to the bed of the stream, and a suction and force apparatus on said car, a conductor having a flexible joint connected with the induction-opening to said suction and forcing apparatus and also with said hollow shaft, and adjusting devices upon said car for changing the angle of oscillation of said shaft-supporting frame.

7. In a submarine-mining apparatus, a water-carriage comprising side floats having an intermediate sluice a track-rail upon the top of said float and upon opposite sides of said sluice, a platform-car upon said track-rails above said sluice, and a frame connected with the under side portion of the said platform, a material-conveying hollow shaft having a telescopic portion adapted to be extended to the bed of the stream, and a track-rail upon the inner side of each float, and guide-wheels upon the frame carrying said hollow shaft adapted to bear against the under side of said rails.

8. An apparatus for removing auriferous and other material, comprising a frame and a hollow rotary shaft within said frame, having gear upon one end and a number of cutting-blades at the other end, a driving-shaft within said frame having gear meshing with the gear on the hollow rotary shaft and a motor having a suitable source of power upon said frame actuating the said driving-shaft.

9. An apparatus for removing auriferous and other material, comprising a frame, a fixed shaft within said frame, and a hollow shaft telescoping with the fixed shaft having a coupling and a feather-gear upon said telescopic portion of said shaft, said shaft having a slot through which the feather slides, a separate shaft having a gear meshing with the gear on the telescopic hollow shaft and a worm on said shaft and a collar on the said telescopic hollow shaft engaging with said worm, a motor upon said frame actuating the shaft having said worm and having a driving-shaft and power-conveyers connected with said driving-shaft and the source of power, and means for reversing at will the movement of the power-shaft of the motor.

10. An apparatus for removing auriferous and other material comprising a frame, a fixed shaft within said frame and a hollow shaft telescoping with the fixed shaft having feathered gear, said hollow shaft having a slot in which the feather slides, a separate shaft having a gear meshing with the gear on the hollow shaft and a worm on said shaft and a collar or stud on the said hollow shaft engaging with said worm, a motor upon said frame actuating said separate shaft having said worm and suitable conductors of power connected with the source of power and said motor and a switch for reversing the said motor, and a movable rod on said frame having separate disks or studs in the path of and contacting with the disk on the hollow shaft and also connected with said switch.

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