O. H. & A. L. ELIEL.

DREDGE.

APPLICATION FILED JUNE 15, 1908.

**918,302.** Patented Apr. 13, 1909.

3 SHEETS—SHEET 1.

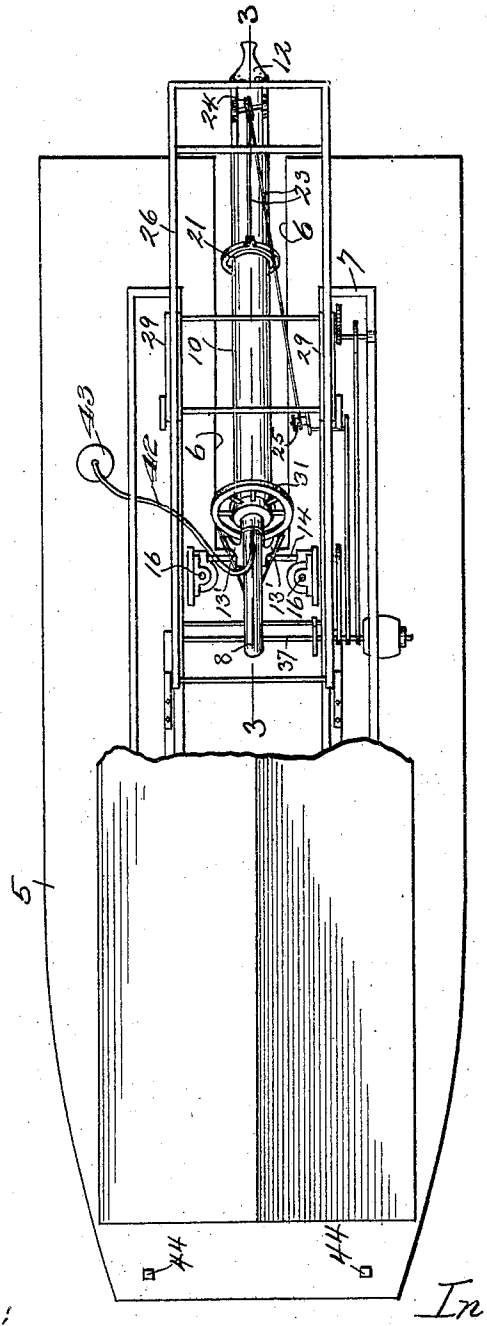



Fig. 1.

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Fig. 3.

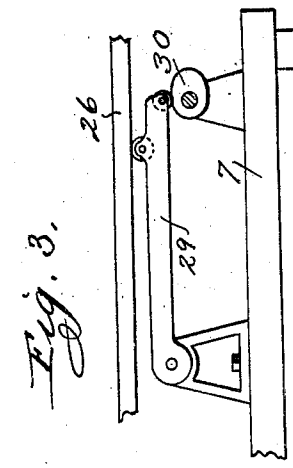
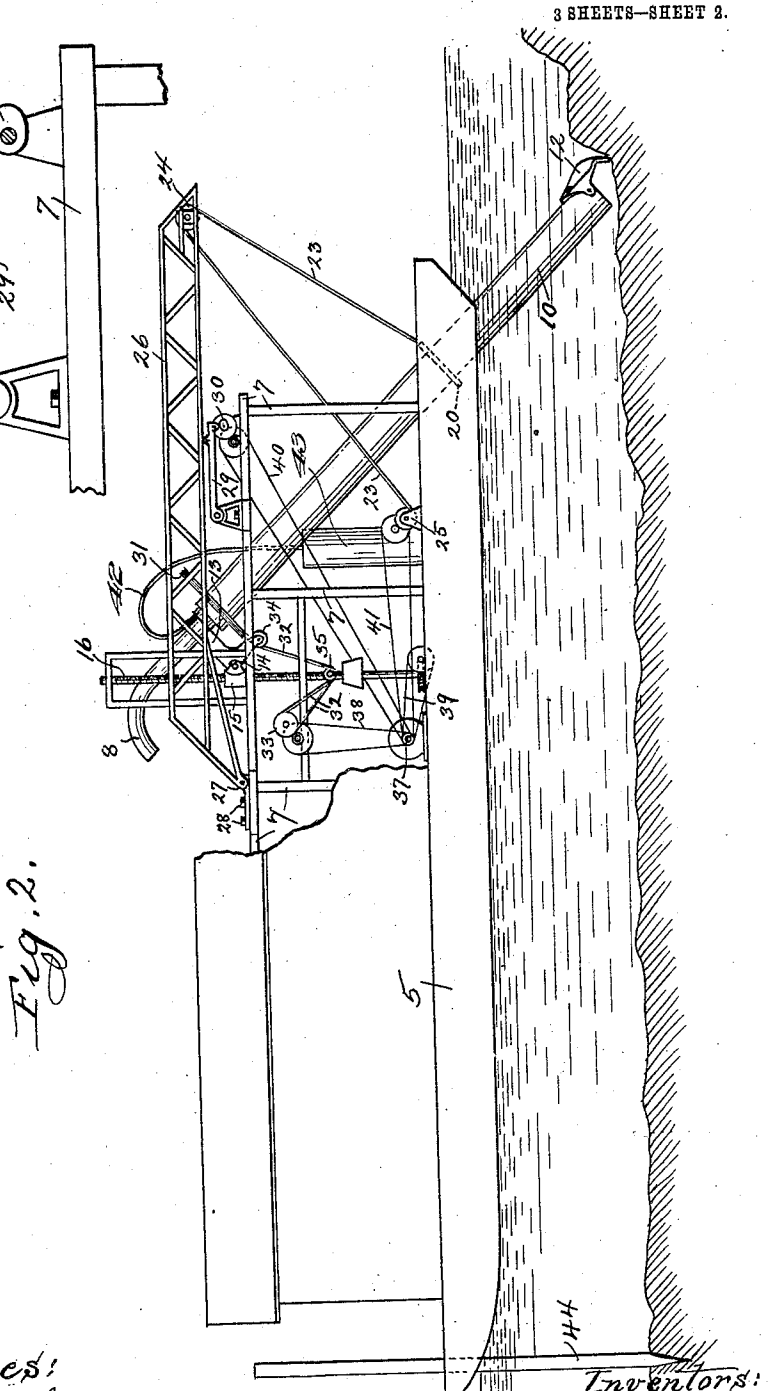


Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 4.

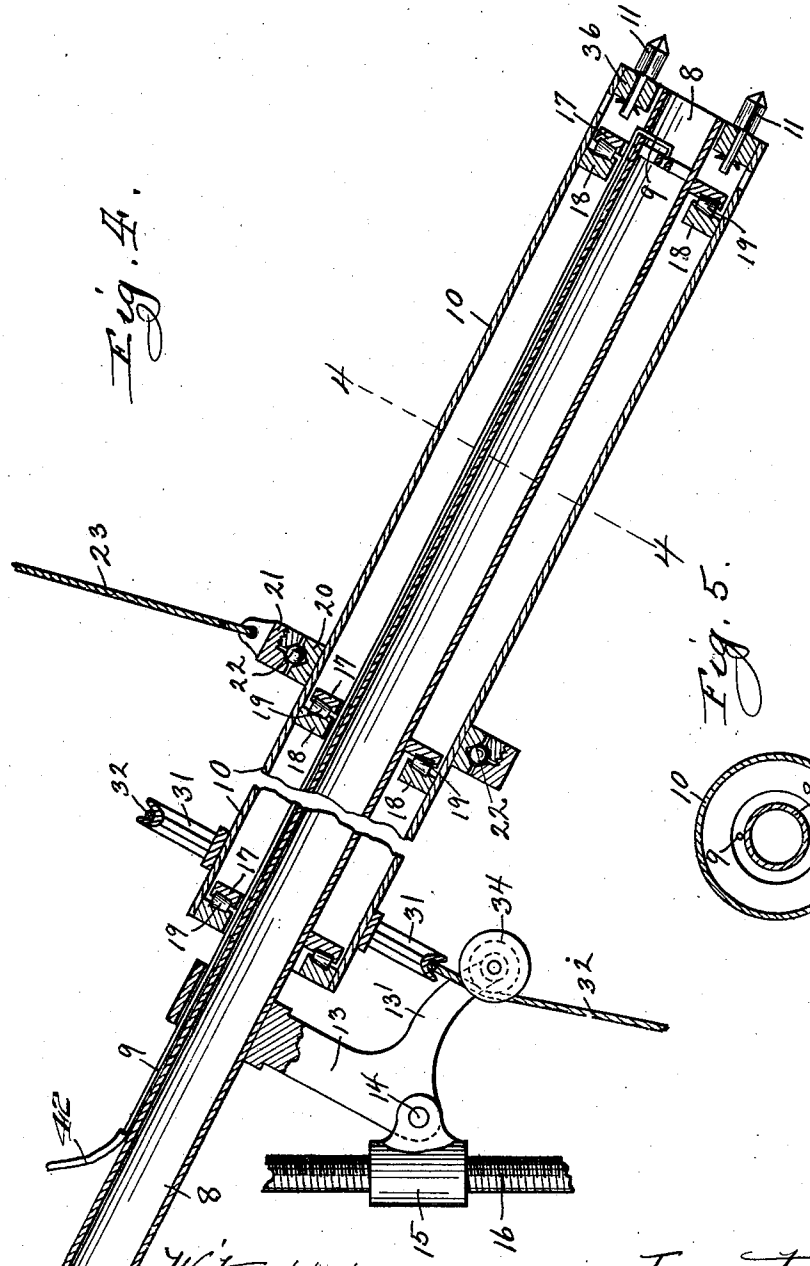



Fig. 5.




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# UNITED STATES PATENT OFFICE.

OSCAR H. ELIEL, OF LA SALLE, ILLINOIS, AND ALBERT LEE ELIEL, OF SAN FRANCISCO, CALIFORNIA, ASSIGNORS OF ONE-THIRD TO LEWIS E. AUBURY, OF SAN FRANCISCO, CALIFORNIA.

## DREDGE.

No. 918,302. Specification of Letters Patent. Patented April 13, 1909.

Application filed June 15, 1908. Serial No. 438,477.

*To all whom it may concern:*

Be it known that we, OSCAR H. ELIEL, of La Salle, in the county of Lasalle and State of Illinois, and ALBERT LEE ELIEL, of San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Dredges, of which the following is a specification.

Our invention relates to apparatus used for dredging submerged earth beds or channels containing gold or other metal-bearing deposits of silt, sand or gravel, as in placer streams and the like.

One of the objects of our improvements is to provide an open-ended lifting-tube with means for dislodging, reducing and stirring up the deposits from the bed beneath and about the submerged lower end of the tube in conjunction with a jet or jets for introducing a compressed elastic agent into the tube at its lower end for drawing the commingled water and suspended solid materials into the lifting-tube at the induction-end and forcibly lifting the mixture up through the tube and causing it to flow out at the discharge-end above the water surface.

Another object is to provide suitable appliances for working such lifter in deep or shallow water.

We have attained these objects by means of the dredge constructed, as illustrated in the accompanying drawings in which—

Figure 1— is a plan view, showing a dredge-boat having out improved apparatus as mounted thereon. Fig. 2— shows a side elevation of the same. Fig. 3— is an enlarged detail in elevation showing a cam for working a bridge-frame. Fig. 4— is a detail showing an enlarged section taken on the axial line of the lifting-tube, or at the line 3—3 of Fig. 1. Fig. 5— is a cross section on the line 4—4 of Fig. 4—. Like signs marked on the drawings refer to like parts throughout the several views.

The numeral 5— designates a dredge-boat which may be of any suitable construction and preferably be provided with a centrally-located well or opening, 6, for the digger to swing in, and a main-frame structure 7, on the deck for supporting the digger and its operating mechanism. The digger comprises an open-ended lifting-tube 8 pivotally mounted on the main-frame near one end and provided with an air-pipe 9 for jetting compressed air into the bore of the same, a hollow member, preferably a tubular shaft, 10 arranged about the lifting-tube and adapted to revolve around the same, plows 11 (Fig. 4) or scrapers 12 (Fig. 2) on the free end of said shaft, means for lowering the free end to the river bed, moving it about upon the same and raising it, and means for revolving the said shaft upon or about the lifting-tube.

The pivotal mounting of the lifting-tube is effected by means of an arm or piece 13 having one end rigidly connected therewith near its upper end, as best shown in Fig. 4, and the other end conected to a rod or bar 14, which swivel in lugs on nuts 15 threaded upon upright shafts, 16 which are journaled at top and bottom in the main-frame, so as to be rotatable therein. By this means the upper end of the tube is supported so that the opposite end can swing in the well, and the hinging point may be raised or lowered when desired.

At intervals the lifting-tube is provided with outwardly extended radial projections 17 (Fig. 4) which correspond with similar inward projections 18 of the shaft 10. These projections are provided with ways in which are placed conic rollers 19, which afford anti-friction bearings for the shaft 10 upon the lifting-tube, permitting the former to revolve freely around the latter and preventing endwise movement of the one relatively to the other.

An exteriorly-grooved ring 20 is secured to the outside of the shaft 10 and is used with an interiorly-grooved outer ring 21, the grooves of the two rings affording a ball bearing-way and permitting the inner ring to revolve within the outer one, upon ball bearings 22.

To the outer ring 21 is attached a cable 23 which is extended up over a sheave 24 and thence to a windlass 25, the free end of the lifting-tube within the shaft 10 and said shaft are suspended by the cable and their elevation in the well may be adjusted by the operation of the windlass.

The sheave 24 is supported upon a vibrating bridge-frame 26 which is pivoted at 27 to the main-frame so as to allow the free

end to be worked up and down. The hinges at 27 by which this bridge-frame is connected with the main-frame are adjustably secured to the main-frame by bolts 28 threading into holes therein or otherwise for adjusting the bridge-frame back and forth on the main-frame.

The bridge-frame is supported near its free end on vibratory track-rails 29 pivoted to brackets on the main-frame and having their free ends resting on rotating eccentric cams 30 by means of which the bridge-frame may have its free end raised and let down for working the scraper 12 to give a hoeing effect on the bank or inclined bottom where desired. This scraper is adapted to be detached or attached as occasion may require.

Near its upper end the shaft 10 is provided with a grooved pulley 31, which is keyed to said shaft, and upon which a cable belt 32 is applied and extended to a working pulley 33 geared with a power shaft. The hinged arm 13 is provided with branches 13′ which carry idlers 34 for guiding the belt 32 to weighted idlers 35 for taking up any slack of the belt 32, which may be produced by the turning of the said arm on its pivot at 14, or the adjustment of the elevation of the lifting-tube at either or both ends. By this means the shaft 10 may be revolved about the lifting-tube for operating plows, scrapers or stirring devices of any desired kind mounted on the lower end of said shaft and adapted to dislodge, break and stir up either loose or solid deposits about the induction-end of the lifting-tube. The lower end of said shaft is preferably provided with an interior annular fitting 36 provided with sockets for receiving the shanks of the stirring devices designed to be held in the sockets by split pins, there being hand-openings in the wall of the shaft just above the fitting, affording access for applying and removing the pins. (Fig. 4.)

An operating shaft 37 is provided and designed to be connected by belt or other suitable gearing with a motor (not shown) or any suitable source of power. This shaft is provided with the requisite number of pulleys and clutch mechanisms and with belts, as 38, 39, 40 and 41 for individually operating the shaft 10 revolving it about the lifting-tube to work the plows etc. about the induction-end when stationary, the threaded shafts 16 for vertically adjusting the rear end of the lifting-tube, the cam 30 for working the bridge-frame and producing the hoeing effect as described, and the windlass 25 for letting the digger down to the water bed or raising it out of the water as desired.

A flexible hose 42 is used to connect the upper end of the air-pipe 9 in communication with a tank 43 for holding compressed air to supply said air-pipe, said hose permitting movement of the digger relative to the tank without interfering with a continuous supply of the compressed air.

The lifting-tube is shown as curved downward at the upper or discharge-end and designed to discharge the raised water and suspended detritus into a receptacle provided and arranged in any obvious way to receive it in order that it may be treated according to any of the known methods used for separating precious metals found suspended in water of mixed detritus.

The lateral or horizontal movement of the digger may be effected by swinging the bow of the dredge-boat from side to side by any ordinary means which may be used for turning it on a spud 44 at the stern for pivotally securing it to the water-bed.

What we claim, is,

1. In a dredging apparatus, the combination with a pivotally mounted open-ended lifting-tube of an air-pipe arranged to jet into the bore of said tube near the induction-end, a hollow member arranged about the lifting-tube and adapted to revolve about the same, a stirring device on said revoluble member, and means for revolving said revoluble member about the lifting-tube.

2. In a dredging apparatus, the combination with a pivotally mounted open-ended lifting-tube provided with means for producing an air-jet, of a revoluble hollow member provided with stirring means, mechanism for producing revolutions of said revoluble hollow member and means for producing swinging movement of said lifting-tube.

3. In a dredging apparatus, the combination with a pivotally mounted, open-ended lifting-tube provided with means for producing an air-jet therein, of a revoluble tubular shaft provided with stirring means at its free end, mechanism for producing revolution of said shaft, and means for adjusting the elevation of said lifting-tube at the point of its pivotal mounting.

4. In a dredging apparatus the structure comprising the open-ended lifting-tube, a tubular shaft arranged about the lifting-tube, anti-friction-bearings arranged between the exterior of said tube and the interior of said shaft, and adapted to prevent longitudinal movement of said shaft upon said tube.

5. In a dredging apparatus the combination with a supporting main-frame and bridge-frame pivotally connected at one end to the main-frame, of a vibrating support, between the bridge-frame and the main-frame near the free end of the bridge-frame, eccentric cams under said vibrating support, an open-ended lifting-tube pivotally mounted on one end on the main-frame and pro-

vided with an air-jet pipe, and means for suspending the free end of the lifting-tube from the free end of the bridge-frame.

6. In a dredging apparatus, the digger comprising an open-ended lifting-tube and means for producing suction therein, a pivotal mounting of said lifting-tube near one end, a tubular shaft about said lifting-tube below the pivotal mounting means for revolving the tubular shaft about the lifting-tube, means for suspending the free end of said tubular shaft, and a ball-bearing connection between said shaft and said suspending means.

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