

May 20, 1941.

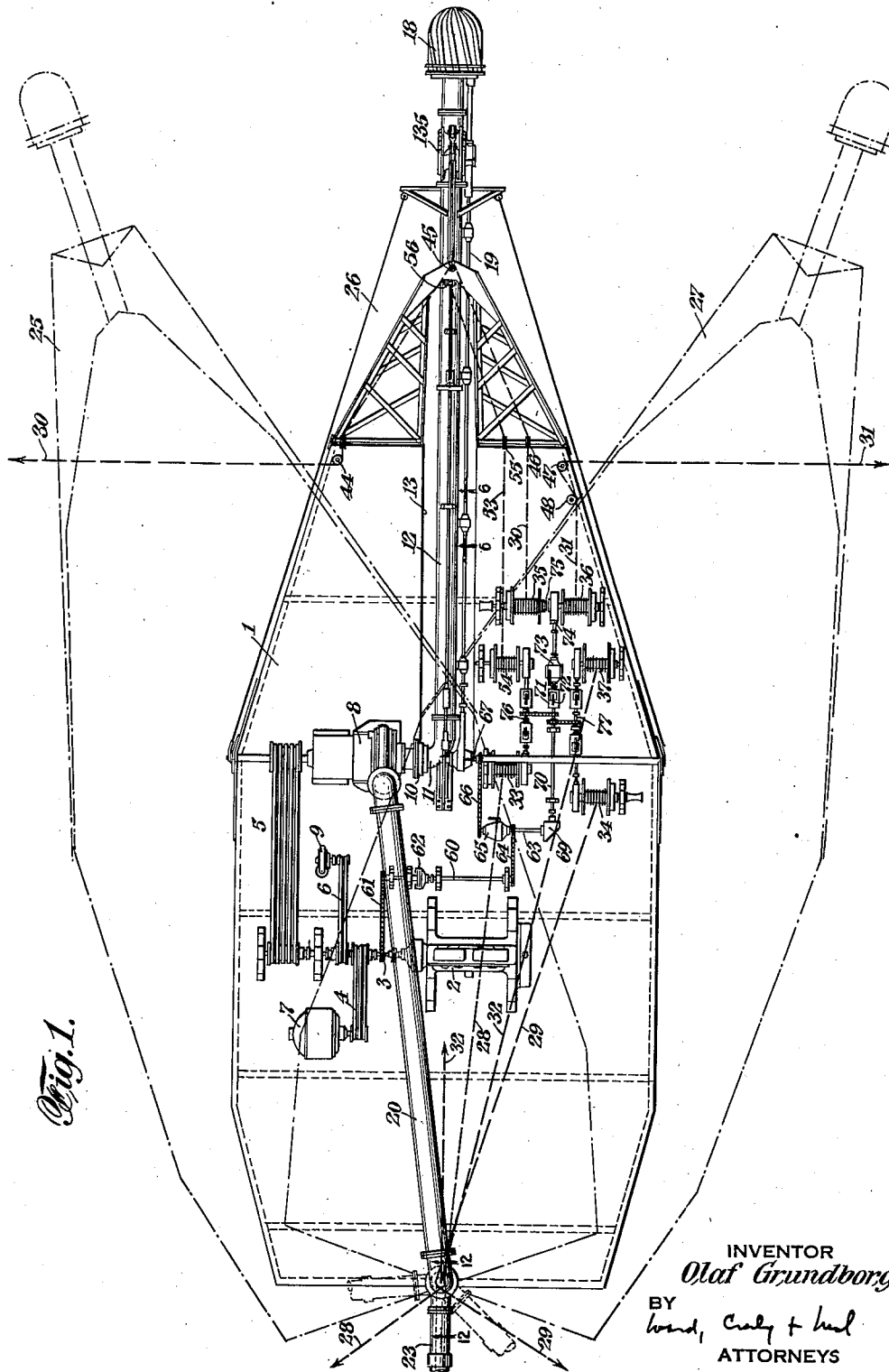
O. GRUNDBORG

2,242,520

HYDRAULIC MINING APPARATUS

Filed Sept. 9, 1937

8 Sheets-Sheet 1



May 20, 1941.

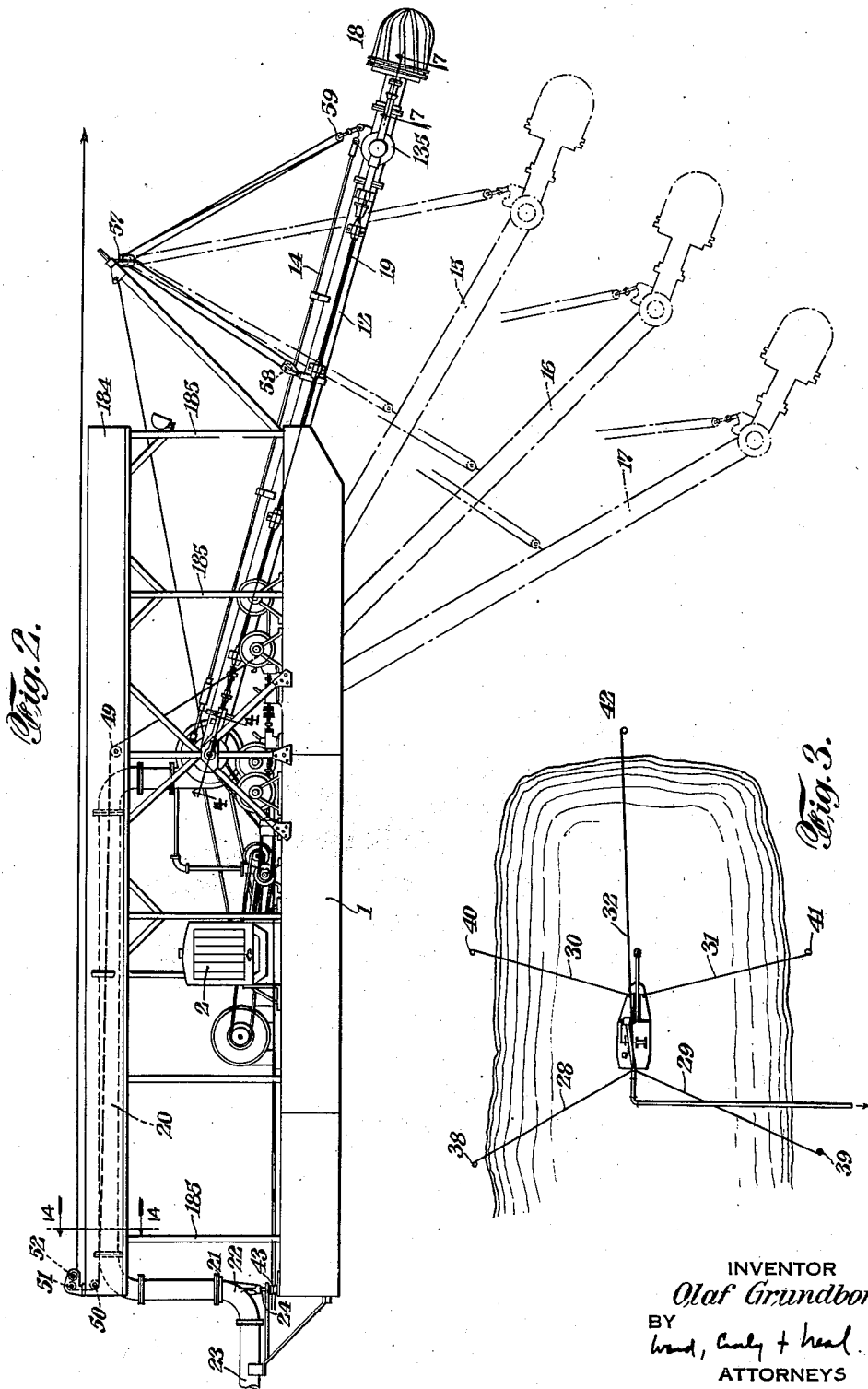
O. GRUNDBORG

2,242,520

HYDRAULIC MINING APPARATUS

Filed Sept. 9, 1937

8 Sheets-Sheet 2



May 20, 1941.

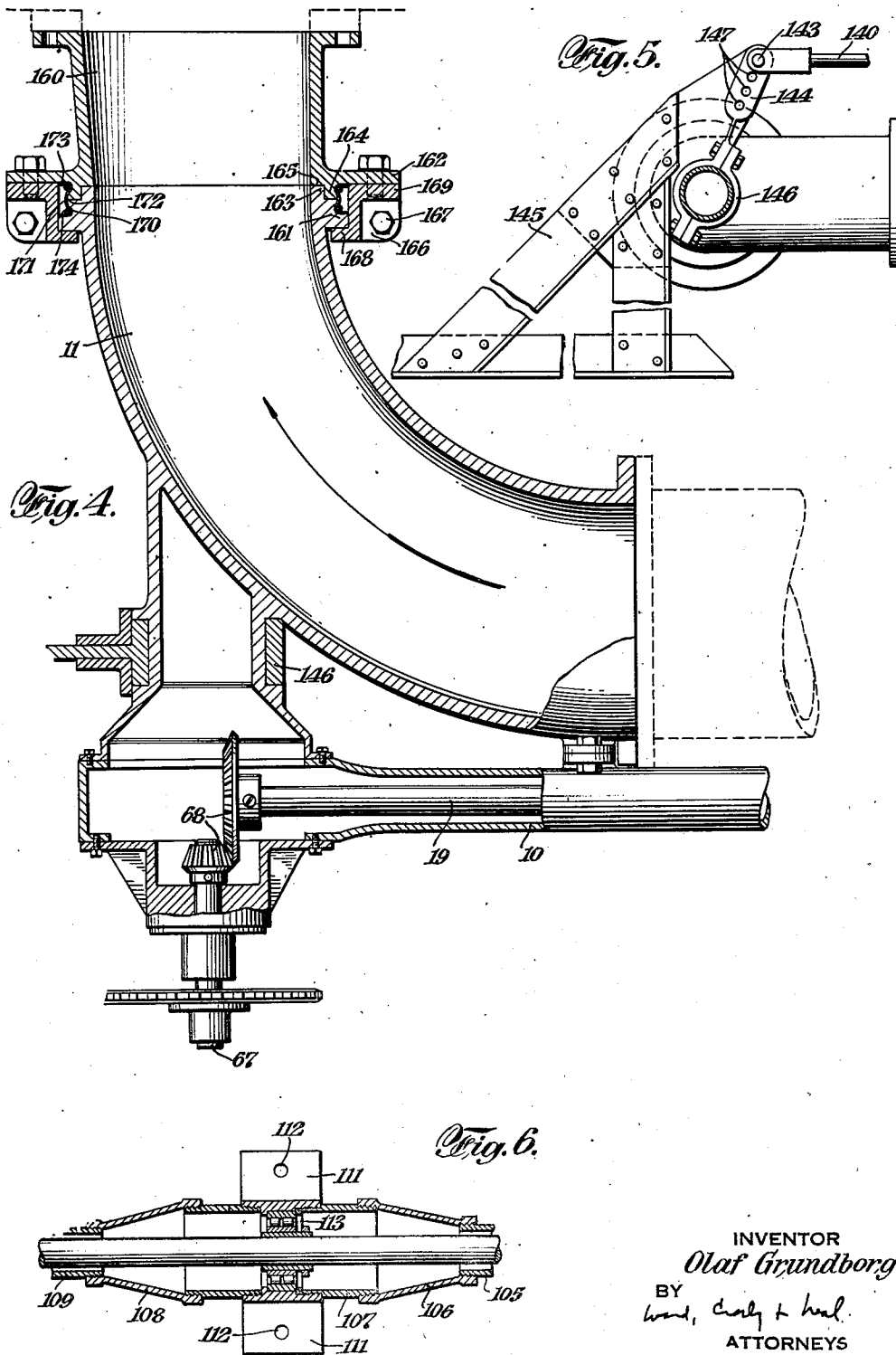
O. GRUNDBORG

2,242,520

HYDRAULIC MINING APPARATUS

Filed Sept. 9, 1937

8 Sheets-Sheet 3



INVENTOR
Olaf Grundborg
BY
Ward, Crosby & Ward
ATTORNEYS

May 20, 1941.

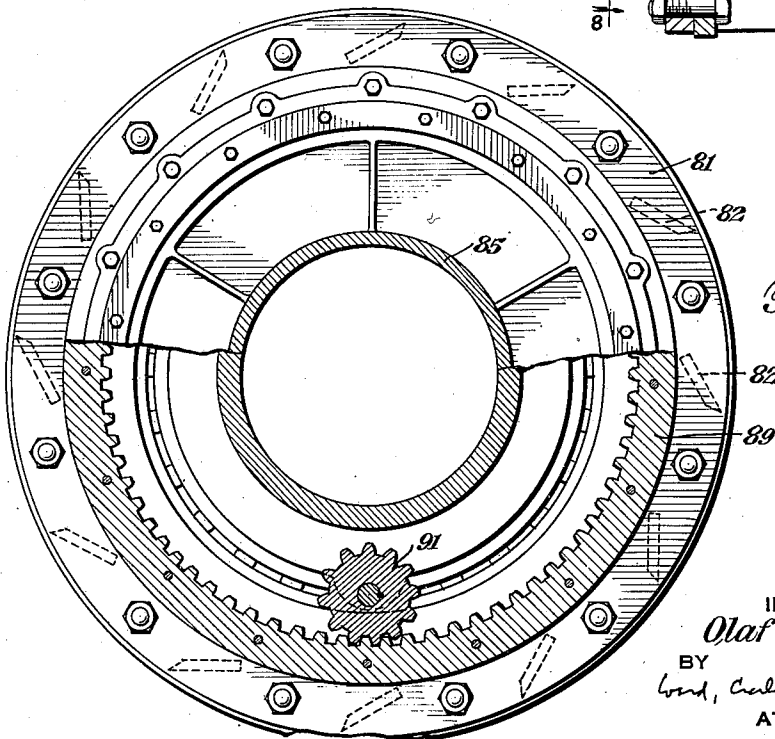
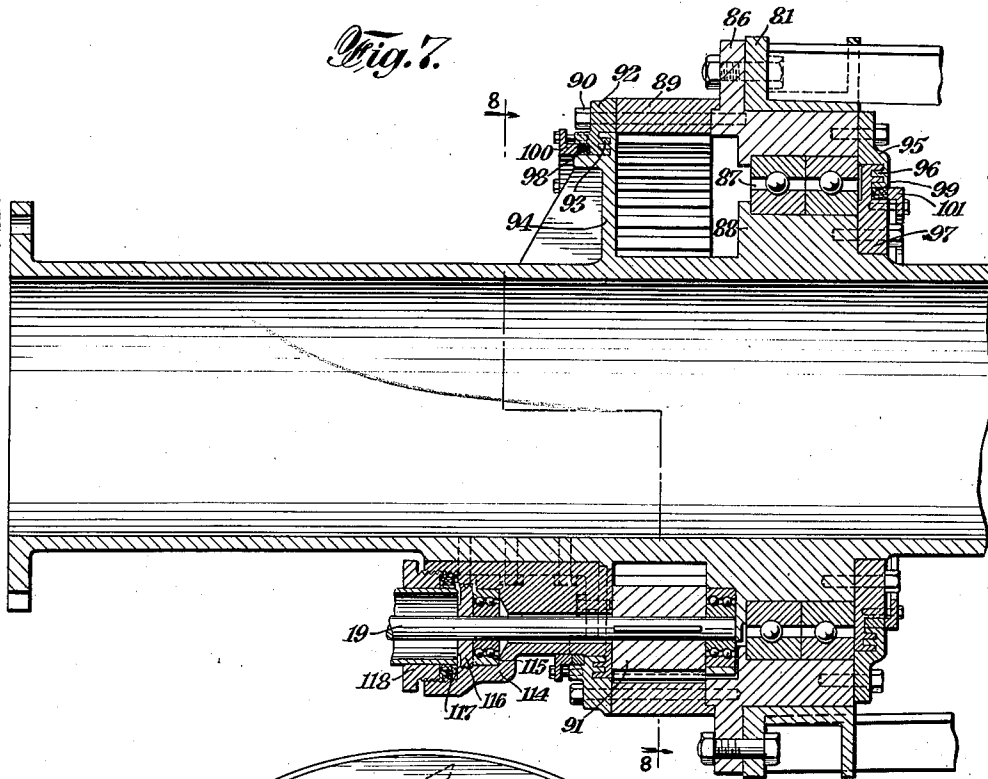
O. GRUNDBORG

2,242,520

HYDRAULIC MINING APPARATUS

Filed Sept. 9, 1937

8 Sheets-Sheet 4



INVENTOR
Olaf Grundborg
BY
Ward, Cady & Ward
ATTORNEY

May 20, 1941.

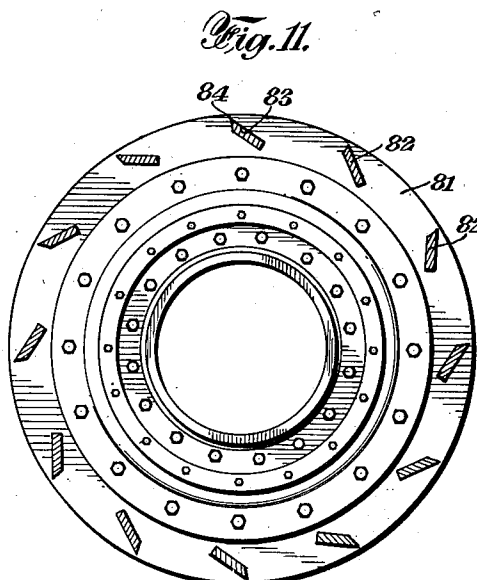
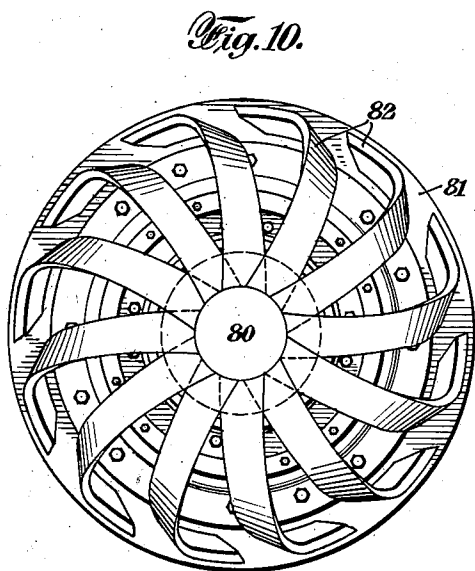
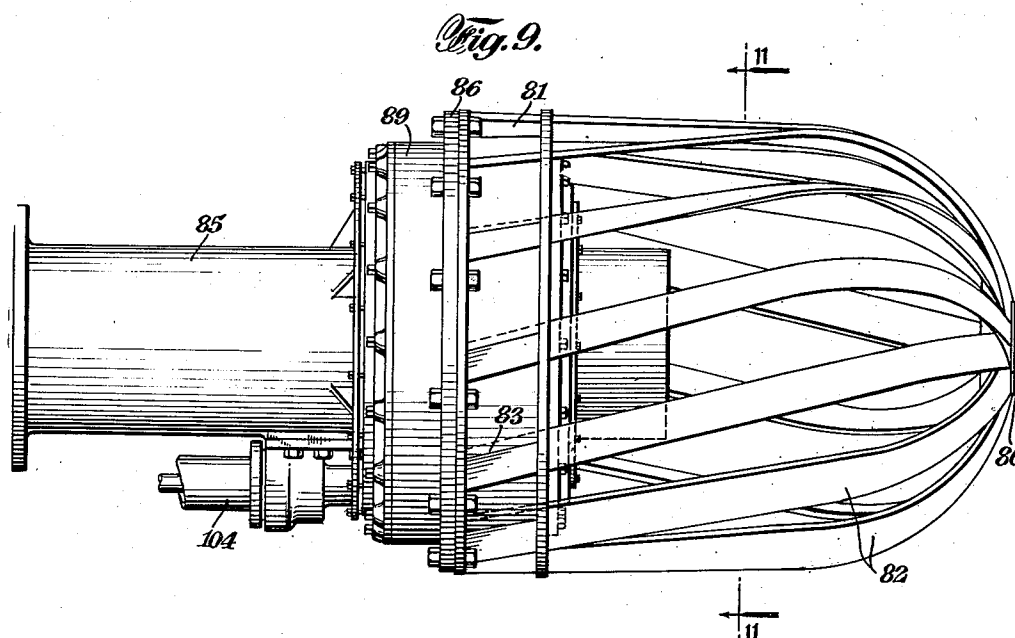
O. GRUNDBORG

2,242,520

HYDRAULIC MINING APPARATUS

Filed Sept. 9, 1937

8 Sheets-Sheet 5



INVENTOR
Olaf Grundborg
BY
Wood, Clark & Reed
ATTORNEYS

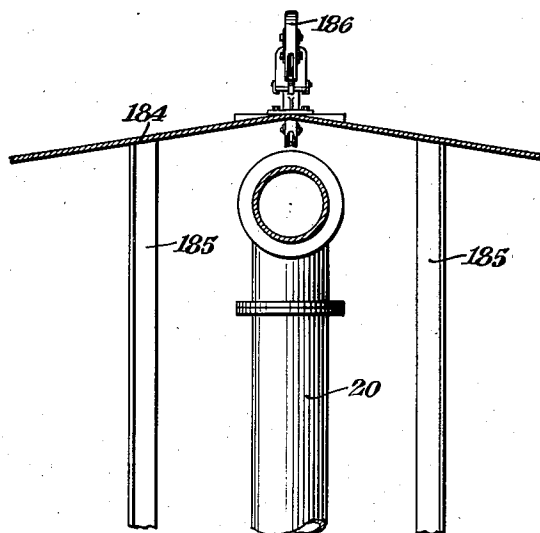
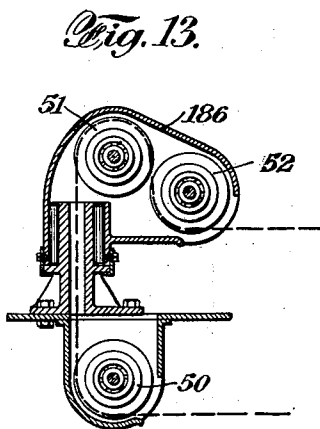
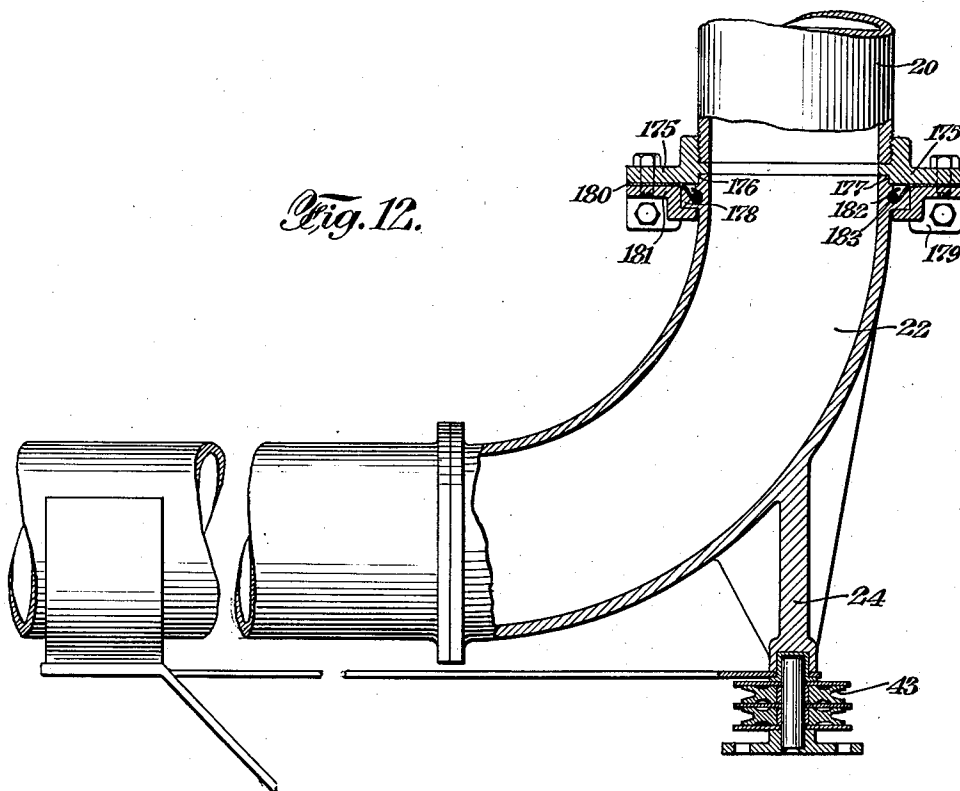
May 20, 1941.

O. GRUNDBORG
HYDRAULIC MINING APPARATUS

2,242,520

Filed Sept. 9, 1937

8 Sheets-Sheet 6



May 20, 1941.

O. GRUNDBORG

2,242,520

HYDRAULIC MINING APPARATUS

Filed Sept. 9, 1937

8 Sheets-Sheet 7

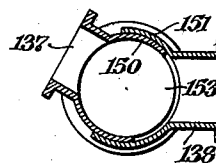
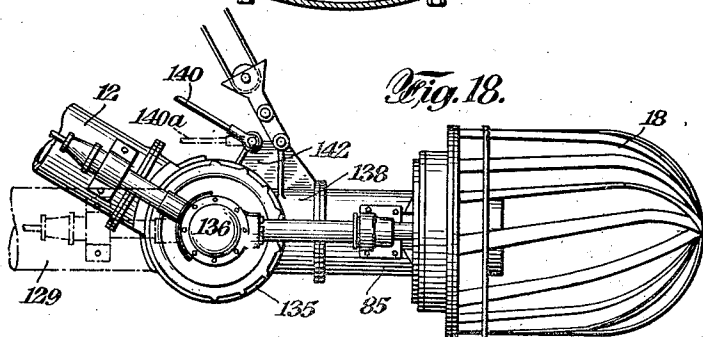
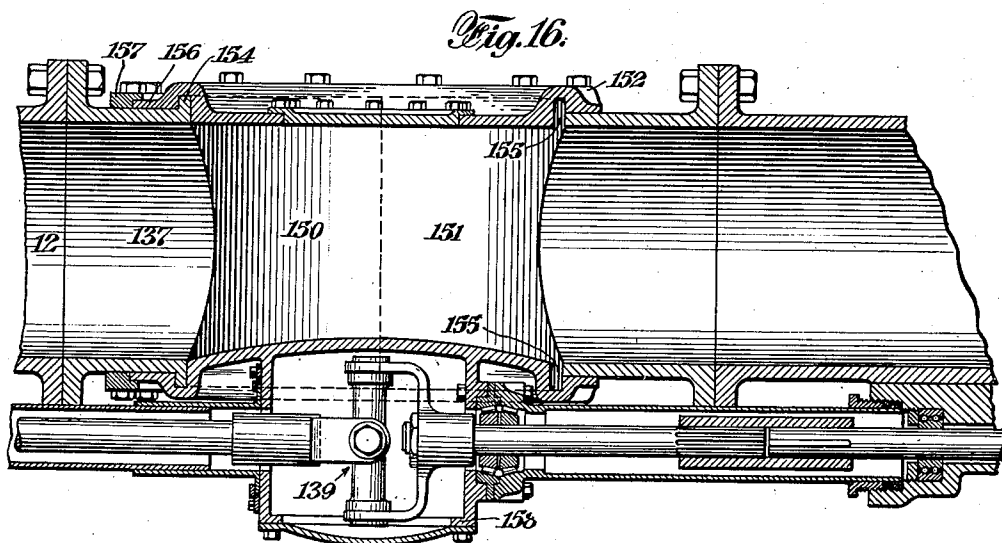
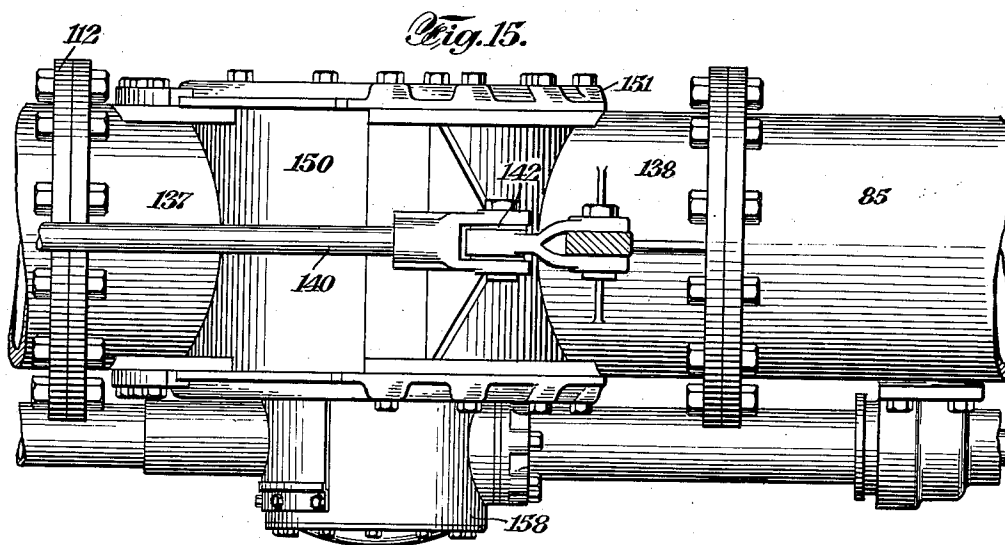


Fig. 17.

INVENTOR
Olaf Grundborg
BY *Wood, Conley & Hill*
ATTORNEYS

May 20, 1941.

O. GRUNDBORG

2,242,520

HYDRAULIC MINING APPARATUS

Filed Sept. 9, 1937

8 Sheets-Sheet 8

Fig. 19.

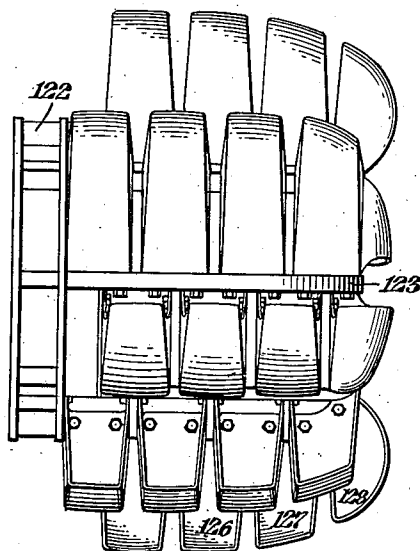


Fig. 20.

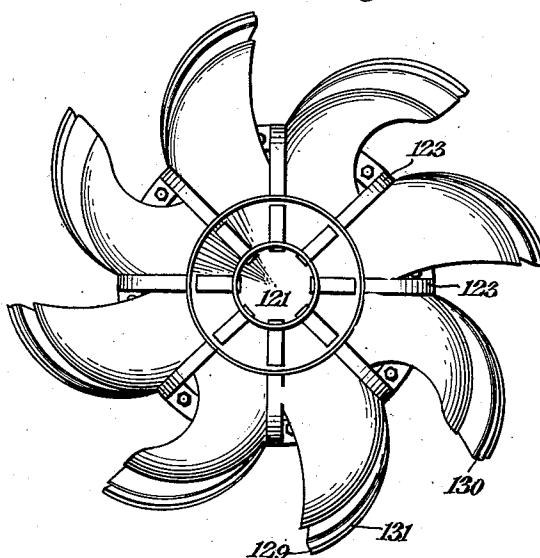
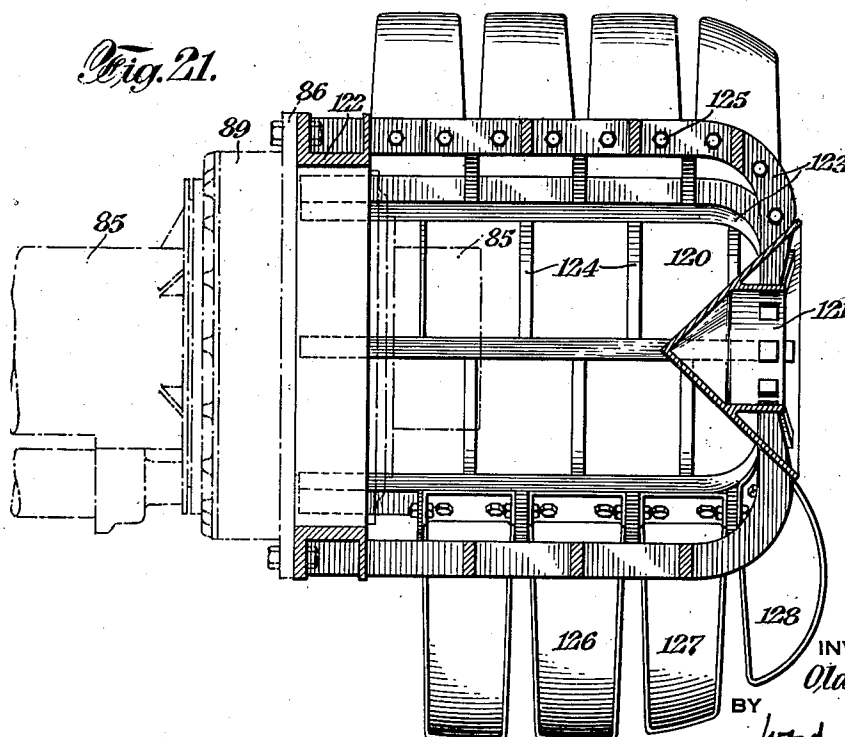


Fig. 21.



INVENTOR
Olaf Grundborg
BY *Ward, Cady & Neal*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,242,520

HYDRAULIC MINING APPARATUS

Olaf Grundborg, Fairhaven, N. J.

Application September 9, 1937, Serial No. 163,012

5 Claims. (Cl. 37—67)

This invention relates to improvements in hydraulic mining dredges and apparatus therefor.

A primary object of the invention is to provide such apparatus which is especially suited to the mining and reduction to a silt-like consistency of submerged gold bearing deposits of clay and the like, which, owing to the mutually adherent and agglomerative tendencies of the particles comprising the same, cannot by known methods be mined efficiently and effectively and reduced to the silt-like consistency required for recovery of the gold.

This object is accomplished in accordance with the invention by employment of a dredge having a pivotally elevatable suction pipe projecting therefrom and terminating in a power driven rotary excavator of special construction such that it functions to excavate the clay-like earth in the form of thin shavings which are immediately broken up, in passing over the excavator cutter blades, into particles of such fineness that they are easily reduced to a fine silt due to the churning action to which they are subjected in transit along with large quantities of water through the suction pipe, etc. to the gold extracting apparatus.

The relatively soft clay-like deposits referred to usually occur as surface layers which are backed by much harder, denser and richer gold bearing beds, requiring an excavator of more rugged and different construction and operation from that which is best adapted to disintegration of the clay-like surface layer. Accordingly a further object of the invention is to provide a power driven rotary excavator of novel construction for the mining of such denser deposits, such excavator being capable of moving and casting aside rocks of sizes larger than those which may safely be passed through the suction pump.

Another object of the invention is to provide a mechanism for so operating the excavator, particularly the type last referred to, that the axis of the excavator will automatically be maintained substantially horizontal as the suction pipe is elevated and depressed, this being the position in which the latter type of excavator operates most effectively on such deposits.

A still further object of the invention resides in the provision of novel means for so maneuvering the dredge that excavation may be carried on with little or no interruption. This consists of a series of cables extending from power driven drums on the dredge to appropriate moorings whereby the dredge may be advanced, retarded or

laterally displaced or may be pivoted about its stern for swinging the bow back and forth and with it the suction pipe projecting from the bow, so that the excavator may be swung back and forth continuously across an area to be mined.

To permit of elevating and depressing the suction pipe and also of pivoting the dredge about its stern, certain joints in the pipe line conveying the excavated material from the excavator to the recovery equipment must be articulated in such manner as to provide substantially water- and-air-tight swivel joints between pipe sections. A further object of the invention is to provide novel arrangements for effecting such junctions.

These and other objects of the invention will be explained more in detail hereinafter with reference to the accompanying drawings, wherein:

Fig. 1 shows schematically a plan view, and Fig. 2 a side elevation of a dredge in accordance with the invention, these figures also depicting in dashed lines various positions which may be assumed by the dredge and the elevatable suction pipe during excavation.

Fig. 3 is a schematic plan view of the dredge primarily illustrative of the arrangements of the mooring cables above referred to, employed for maneuvering the dredge.

Fig. 4 is an enlarged partial section at 4—4 of Fig. 2 showing the details of the water- and-air-tight articulated joint between the elevatable suction pipe and a stationary pipe section. This view also includes some of the details of the power drive for the rotary excavator.

Fig. 5 shows in side elevation on an enlarged scale, a strut and collar arrangement for rotatably supporting the articulated pipe and power drive junction shown in detail in Fig. 4. Fig. 5 also shows a portion of the mechanism for maintaining the axis of the rotary excavator substantially horizontal when required.

Fig. 6 is an enlarged fragmentary section at 6—6 of Fig. 1 showing the details of a water-tight anti-friction bearing for the excavator drive shaft.

Fig. 7 is an enlarged fragmentary section at 7—7 of Fig. 2 showing the manner in which the excavator is journaled to the suction pipe terminus, and also the gearing whereby the excavator is rotated by the power drive shaft; while Fig. 8 is a section at 8—8 of Fig. 7 showing the arrangement of the excavator in rear elevation and the gearing arrangement in sectional elevation.

Figs. 9, 10 and 11 are respectively a side ele-

vation, a front end elevation and a section at 11—11 of Fig. 9, of the excavator in accordance with the invention for excavating the soft clay-like surface layer.

Fig. 12 is an enlarged partial sectional elevation at 12—12 of Fig. 1 showing the manner in which the outlet pipe from the suction pipe mechanism is articulated about a vertical axis at the stern of the dredge to permit of pivoting the same about the stern.

Fig. 13 is likewise a partial side-section at 12—12 of Fig. 1 showing a sheave arrangement for passing one of the mooring lines of the dredge from a power driven drum to a mooring off the bow; this sheave arrangement being also shown in front elevation in Fig. 14 comprising a section at 14—14 of Fig. 2.

Figs. 15, 16, 17 and 18 are respectively a plan view, a longitudinal transverse section, a longitudinal vertical section, and a side elevation of a portion of the mechanism for maintaining the axis of the rotary excavator substantially horizontal as the suction pipe is raised or lowered.

Figs. 19, 20 and 21 show the construction of the rotary excavator in accordance with the invention required for excavating the harder and more impervious gold bearing stratum referred to which lies beneath the softer layer of surface clay; Fig. 19 being a side elevation of the same, Fig. 20 a front end elevation and Fig. 21 a transverse longitudinal section.

Referring to the drawings the dredge comprises a barge 1, on which are mounted a prime mover 2, such as a Diesel engine, having a drive shaft 3, driving through belts 4, 5, 6, an electric generator 7 for supplying light, etc., a centrifugal suction pump 8, and a sealing water pump 9. The intake of the suction pump 8 is coupled through a water tight swivel joint 10 to a pipe elbow 11 connected to a suction pipe 12 projecting through a slotted opening or well 13 in the bow of the barge whereby the suction pipe may be elevated and depressed about the horizontal axis of the swivel joint 10, and thus may assume positions such as 14, 15, 16, 17, Fig. 2. A rotary excavator 18 is journaled to the projecting end of the suction pipe, and is rotated by a power driven shaft 19, paralleling the suction pipe, as will be explained more in detail hereinafter.

The outlet of pump 8 comprises a pipe line 20 extending upward from the pump, thence horizontally to the stern of the barge, and thence downwardly to a water tight swivel junction at 21 with a pipe elbow 22 joined to a flexible outlet pipe line 23 of rubber hose or the like, extending to the gold extracting equipment located on the shore, or to a floating recovery and tailing disposal unit. By virtue of this arrangement the barge may be pivoted about a stern post 24, coaxial with the vertical axis of the pipe swivel joint 21, whereby the barge may be pivoted about its stern to positions such as 25, 26, 27, Fig. 1.

For maneuvering the barge to positions such as 25, 26, 27 as well as for advancing, backing or laterally displacing the same, a series of cables 28 to 32 inc. are provided extending from power driven drums 33 to 37 inc. respectively to moorings 38 to 42 inc., Fig. 3, respectively. Cables 28, 29 pass about opposite sides of a sheave 43, Figs. 2 and 12, journaled to the stern post 24 of the barge whereby the barge may be pivoted about the same. Also by taking up on one of the drums 33, 34 and slacking off on the other the barge may be displaced laterally in either direction. Cables 30, 31 pass over pulleys 44, 45,

46 and 47, 48 to the moorings 40, 41 off the port and starboard bows, whereby upon taking up on one of the drums 35, 36 and slacking off on the other the barge may be swiveled to port or starboard about its stern post 24. Cable 32 comprising a headline passes over pulleys 49 to 52, Figs. 2 and 13, to a mooring 42 off the bow, whereby upon taking up or slacking off on drum 37 the barge may be advanced or backed up, this movement entailing also a slacking off or taking up on drums 33, 34 controlling cables 28, 29. It will be observed that the headline pulleys 50 to 52 are substantially vertically in line with the stern post 24, and that after passing over these pulleys the headline entirely clears the roof of the dredge so as not to interfere with the pivoting of the dredge about its stern post as above described. Thus the barge may be maneuvered as desired in the manner explained.

For elevating or lowering the suction pipe 12 about its swivel joint 10, to positions such as 14 to 17 inc., a cable 53 passes from a power driven drum 54 over pulleys 55, 56, and sheaves 57, 58, 59.

The cable drums 33 to 37 inc. and the rotary excavator 18 are driven from a shaft 60 which in turn is chain driven at 61 through a clutch 62 from shaft 3 of the Diesel engine. A shaft 63 is in turn chain driven at 64 from shaft 60, and in turn drives through a variable speed gear 65 and a chain drive at 66, a shaft 67, Figs. 1 and 4, which in turn drives through bevel gears 68, Fig. 4, the drive shaft 19 extending to the rotary excavator 18.

Shaft 63 also drives through bevel gears 69 a shaft 70 which drives drums 35, 36 through a reversing gear 71, manipulated by a gear shift lever 72 having a neutral position for disengaging the gears, a variable gear 73, and a worm gear 74. Drums 35, 36 are coupled through a clutch 75 whereby they may be simultaneously or independently driven. Shaft 70 also applies chain drives as shown to shafts 76 and 77 geared through the reversing gears and worm gears shown to drums 33, 54 and 34, 37. Drums 35, 36 containing the port and starboard mooring cables 30, 31 are ordinarily driven simultaneously through engagement of clutch 75, so that by extending cables 30, 31 oppositely about their respective drums, the simultaneous rotation of these drums in either direction will slack off on one cable to the same extent that it takes up on the other.

Referring more particularly to Figs. 7 to 11 inc., the rotary excavator applicable to the disintegration of the relatively soft surface layer of clay-like earth consists essentially of a crown member 80, preferably circular, a coaxial, flanged ring member 81 of larger diameter axially displaced therefrom, and a plurality of cutting blades such as 82, preferably of metal strip, extending between the crown and ring members and equally spaced about their peripheries. The blades are welded to the crown member at an angle to the axis thereof providing effective cutting and are curved outwardly from the axis toward the ring member and thence downwardly and peripherally forwardly in the direction of rotation of the excavator to terminate in slots 83 of the ring member, the slots being directed at an angle to the outer periphery of the ring member, as shown more particularly in Fig. 11, for providing more effective cutting. The blades are secured in the slots preferably by welding. The

projecting edges of the blades 82 are chamfered as at 84 to provide sharp cutting edges.

The excavator as thus assembled, which is of dome-like configuration, is rotatably mounted over the terminal orifice of a pipe section 85 forming a continuation of the suction pipe 12, this being accomplished by detachably bolting the flanged portion of ring member 81 as shown in Fig. 7, to an opposing flange of an inner ring 86 rotatively supported by anti-friction bearings, such as the ball bearings 87, on a flanged portion 88 of the pipe section 85.

For applying a power drive to the excavator an internal gear 89 is bolted, as at 90, to the inner ring member 86. Gear 89 meshes with a spur gear 91 keyed to the drive shaft 19.

Since the excavator operates while submerged, the gears and bearings above referred to are provided with a water-tight housing consisting of: a ring 92 bolted to ring 86, and having concentric peripheral grooves and ribs 93 fitting into conforming ribs and grooves of a flange 94 of the suction pipe; a ring 95 bolted to ring 86 and having concentric ribs and grooves 96 fitting into conforming ribs and grooves of a ring 97 bolted to flange 88; together with packing rings 98, 99 held in place by rings 100, 101 bolted to rings 92, 97 respectively, the arrangement being thus such as not to interfere with rotation of the excavator.

The drive shaft 19 for the rotary excavator is likewise provided with a water-tight housing and is mounted in anti-friction bearings as shown in Figs. 4, 6 and 7. The housing comprises tubular segments such as 105 to 109 inc. threaded together as shown. The segments such as 107, Fig. 6, are provided with lugs 111 having eyelets 112 for bolting the drive shaft housing to the suction pipe 12 as shown in Fig. 1. Segments 107 are also provided with anti-friction bearings 113, through which the drive shaft 19 is journaled.

The drive shaft 19 enters the excavator bearing and gearing housing through a housing 114 containing an anti-friction bearing 115 supporting the shaft, the housing being sealed on the shaft entry side by a bushing 116 threaded to housing 114, and a packing 117 disposed about the end of the bushing and about the shaft, held in place by a packing nut 118.

The form of excavator shown in Figs. 19, 20, 21 which is adapted more particularly for excavating the hard substratum, comprises a drum-like cage 120 consisting of a crown member 121 and a coaxial flanged ring member 122 of larger diameter spaced therefrom, a plurality of ribs such as 123, extending radially outward from the crown member and thence longitudinally to the ring member, the ribs being equally spaced peripherally thereabout and braced at intervals by members 124 extending between adjacent ribs. Bolted to the ribs 123 as at 125 are a plurality of scoop-like bucket members such as 126, 127, 128, presenting cutting edges, such as 129, 130, in a common direction of rotation, and being of arcuate contour as shown at 131, for directing excavated material toward the interior of the excavator and thence to the orifice of the pipe section 85. To this end this excavator may be substituted for that shown in Figs. 7 to 11 inc., by unbolting the latter from the flanged ring member 86, and bolting the flange of this member to the flange of ring member 122, as shown in Fig. 21.

For proper operation of the excavator shown in Figs. 19 to 21, inc., its axis should be maintained substantially horizontal as the suction

pipe is elevated and depressed. A mechanism for accomplishing this is shown in Figs. 1, 2, 5, 15, 16, 17 and 18. It consists essentially in a hollow knuckle joint 135 articulatable about a horizontal axis 136, and having an arm 137 joined to the terminus of the suction pipe 12; and a finger 138 bolted to pipe section 85 which carries the rotary excavator; a universal joint 139, coaxial with the knuckle joint, interposed in the drive shaft 19, and an equalizing rod 140 having one end pin-connected to an arm 142 of the knuckle joint finger 138, the opposite end of the equalizing rod 140 being pin-connected at 143 to a stationary arm 144 attached to a strut 145 mounting a bearing housing 146 rotatively supporting a portion of the pipe elbow 11 forming part of the swivel joint 10 as shown in Fig. 4.

The equalizing rod 140, suction pipe 12, and the arms 142 and 144 thus form in effect the sides of a parallelogram which is pin-connected at the joints, and hence which elongates as the suction pipe is elevated and contracts in length as the suction pipe is depressed, and in so doing rotates the arm 142 attached to the knuckle joint finger 138 in such manner as to maintain the axis of the excavator substantially fixed in direction, for example horizontal. The positions of the excavator in relation to the suction pipe and equalizing rod when the pipe is elevated and when it is depressed are illustrated at 12a, 140a and 12, 140 respectively of Fig. 18. Arm 144, Fig. 5, is provided with a series of eyelets 147 progressively spaced from the pivotal axis of the suction pipe swivel joint 10, so that the direction in which the axis of the excavator is maintained may be altered by shifting the point of pivotal attachment of the equalizing rod 137 from one eyelet to another. The type of excavator shown in Fig. 9 operates best when its axis of rotation is maintained substantially coaxial with the suction pipe. This is accomplished by pin-connecting the equalizing rod 140 to the lowermost eyelet 147. With this connection the position of the excavator for various elevations is about as shown at 14 to 17 inc. of Fig. 2.

Considered somewhat more in detail, the knuckle joint 135 takes the form of a split drum consisting of an inner member 150 rotatable within an outer member 151. As shown more particularly in Fig. 17, the inner member 150 is integral with and opens into the arm 137; while the outer member 151 is integral with and opens into the finger 138, the outer member being bolted to the finger as shown in Fig. 16 at 152. Referring to Fig. 17, the inner member is of such extent peripherally as to provide an opening 153 into the finger 138 for all positions of articulation, the angle throughout which articulation is possible being determined by the peripheral extent of the outer member 151 in relation to the size of the arm 137, as is evident from Fig. 17. The inner member is outwardly flanged along its arcuate edges as shown at 154, the flanges being housed in conforming inner arcuate grooves 155 of the outer member. The outer member overlaps the inner member as shown more particularly at 156, Fig. 16, and a hold-down segment 157 is also provided which is bolted to the inner member as shown and which overlaps the portion 156 of the outer member to hold down the portion 156 of the outer member in such manner as to permit of free rotation between the outer and inner members. The outer member is also provided with a water-tight casing 158 which houses

the universal joint as shown more particularly in Fig. 16.

Reverting to Fig. 4, the air-tight swivel joint 10, which is a suction joint, comprises a pair of pipes 11, 160 each having an outer flange 161, 162 spaced slightly from a terminus 163, 164 thereof, the terminus of pipe 160 having an inner peripheral recess 165 articularly housing the terminus 163 of pipe 11. A split ring 166 the halves of which are detachably bolted at 167, is provided at one end with an inner flange 168 lockingly engaging flange 161 of pipe 11, and having at its opposite end an exteriorly projecting flange 169 bolted to flange 162 of pipe 160. The exterior surfaces of the pipes between their flanges and their termini are preferably flared outwardly slightly as shown at 170. An annular gasket 171 of flexible sheet material, such as rawhide, leather, rubber, etc. encircles this portion of the pipes including the outer junction 172 between them. The opposite ends of this gasket lie along the flanges 161, 162 as shown, the gasket being thus maintained snugly overlying the pipe joint by a pair of resilient metal rings, such as rings of helically coiled spring wire, 173, 174 extending about the pipes respectively.

A compression form of swivel joint employed for swivel joint 20, Fig. 2, is shown in detail in Fig. 12. In this modification the upper pipe 20 terminates in a flange 175 having an inner peripheral recess 176 articularly housing the terminus 177 of pipe elbow 22, which is provided with a flange 178 spaced from the terminus. A split ring 179 of the type previously described, houses flange 178 of pipe 22 and is bolted to flange 175 of pipe 20. An annular gasket 180 of flexible sheet material, such as, rawhide, leather, rubber, etc., is interposed between flanges 175, 181, the inner edge of the gasket engaging pipe elbow 22 as shown, and is held snugly against the same by a resilient metal ring 182 of helically coiled spring wire or the like. Pipe elbow 22 is preferably provided with a peripheral groove 183 for seating ring 182.

As shown in Figs. 2 and 14, the barge is provided with a sloping roof 184 mounted on supports 185 for protecting the machinery and workmen. To the same end the headline pulleys 50, 51, 52 are provided with a housing 186.

Operation of the dredge consists in allocating the barge over an area to be mined by taking up or slacking off on the various drums 32 to 37 inc. controlling the mooring cables until the barge is in the position desired. Thereafter the drums controlling the stern and headline cables 28, 29, 32 are locked in position by adjusting the gear shifts controlling the same to their neutral positions. The gear shifts controlling drums 35, 36 and 54 are thereupon manipulated appropriately to adjust the excavator 18 to proper elevations as the barge is swung alternately to port and starboard about the pivoted stern mooring whereby the excavator removes the earthy material in successive and preferably contiguous arcuate furrows, so that the mining may be carried on uninterruptedly. The disintegrated material thus removed passes up the suction pipe 12, through pump 8, and through the outlet pipe 23 which extends to shore, or to a floating recovery and tailing disposal unit, as shown in Fig. 3, where the mined material is delivered in the form of a water borne fine silt to the recovery equipment.

What I claim is:

1. In an hydraulic mining dredge of the character described, the combination of: a suction pipe journaled at one end through a stationary bearing member for pivoting said pipe about a horizontal axis, a rotary excavator, a hollow knuckle joint articulatable about a horizontal axis, the free end of said suction pipe terminating in the arm of said knuckle joint, said rotary excavator being journaled to the finger thereof, an equalizing rod paralleling said suction pipe, said rod being pivoted at one end to the finger of said joint, said rod being adjustably pivoted at its opposite end to said stationary bearing member whereby the axis of said excavator may be adjusted to remain substantially fixed in direction as the free end of said suction pipe is elevated and depressed.

2. In an hydraulic mining dredge of the character described, the combination of: an elevatable suction pipe projecting therefrom, said suction pipe terminating at one end in an elbow journaled through a stationary housing mounted on said dredge for pivoting said pipe about a horizontal axis, a hollow knuckle joint having an arm joined to the opposite end of said suction pipe and a finger articulatable about a horizontal axis with respect to said arm, a rotary excavator journaled to said finger, an equalizing rod paralleling said suction pipe and having one end pivoted to said finger and its opposite end pivoted to said housing, and means for altering the points of attachment of said equalizing rod to said finger and said housing in relation to the said axes of rotation of said suction pipe and knuckle joint for altering the direction in which the axis of said excavator is maintained.

3. In an hydraulic mining dredge of the character described, the combination: a suction pipe having a portion journaled at one end through a stationary housing for rotating said pipe about a horizontal axis, a hollow knuckle joint having an arm joined to the opposite end of said pipe and a finger articulatable about a horizontal axis, a rotary excavator journaled to said finger, an equalizing rod paralleling said suction pipe and having one end pivoted to said housing and its opposite end pivoted to said finger thereby to maintain the axis of said excavator substantially fixed in direction as said suction pipe is raised and lowered, a drive shaft for said excavator having a portion paralleling said suction pipe and a portion paralleling said finger, and a universal joint coaxial with the axis of said knuckle joint, coupling said shaft portions.

4. In an hydraulic mining dredge of the character described: a pivotably elevatable suction pipe, a rotary excavator, and a hollow knuckle joint having an arm joined to said suction pipe and a finger rotatably supporting said excavator, said knuckle joint including a split-drum having an outer sector integral with said finger and an inner sector integral with said arm, said inner sector being articularly housed in said outer sector, said sectors providing an internal passage between said arm and finger for all positions of articulation of said joint.

5. In an hydraulic mining dredge in combination: a suction pipe having a portion journaled at one end through a stationary housing for rotating said pipe around a horizontal axis, a hollow knuckle joint having an arm joined to the opposite end of said pipe and a finger articulatable about a horizontal axis, a rotary excavator anti-frictionally journaled to said finger over the orifice thereof, an equalizing rod paralleling said

suction pipe and having one end pivoted to said housing and its opposite end pivoted to said finger, thereby to maintain the axis of said excavator substantially fixed in direction as said suction pipe is raised and lowered, a drive shaft 5 for said excavator having a portion paralleling said suction pipe and a portion paralleling said finger, a universal joint coaxial with the axis of

said knuckle joint, coupling said drive shaft portions, means gearing said drive shaft to said excavator, a water-tight housing enclosing said shaft, gearing means and anti-frictional bearings, and the means anti-frictionally supporting said drive shaft in said housing.

OLAF GRUNDBORG.