

April 9, 1935.

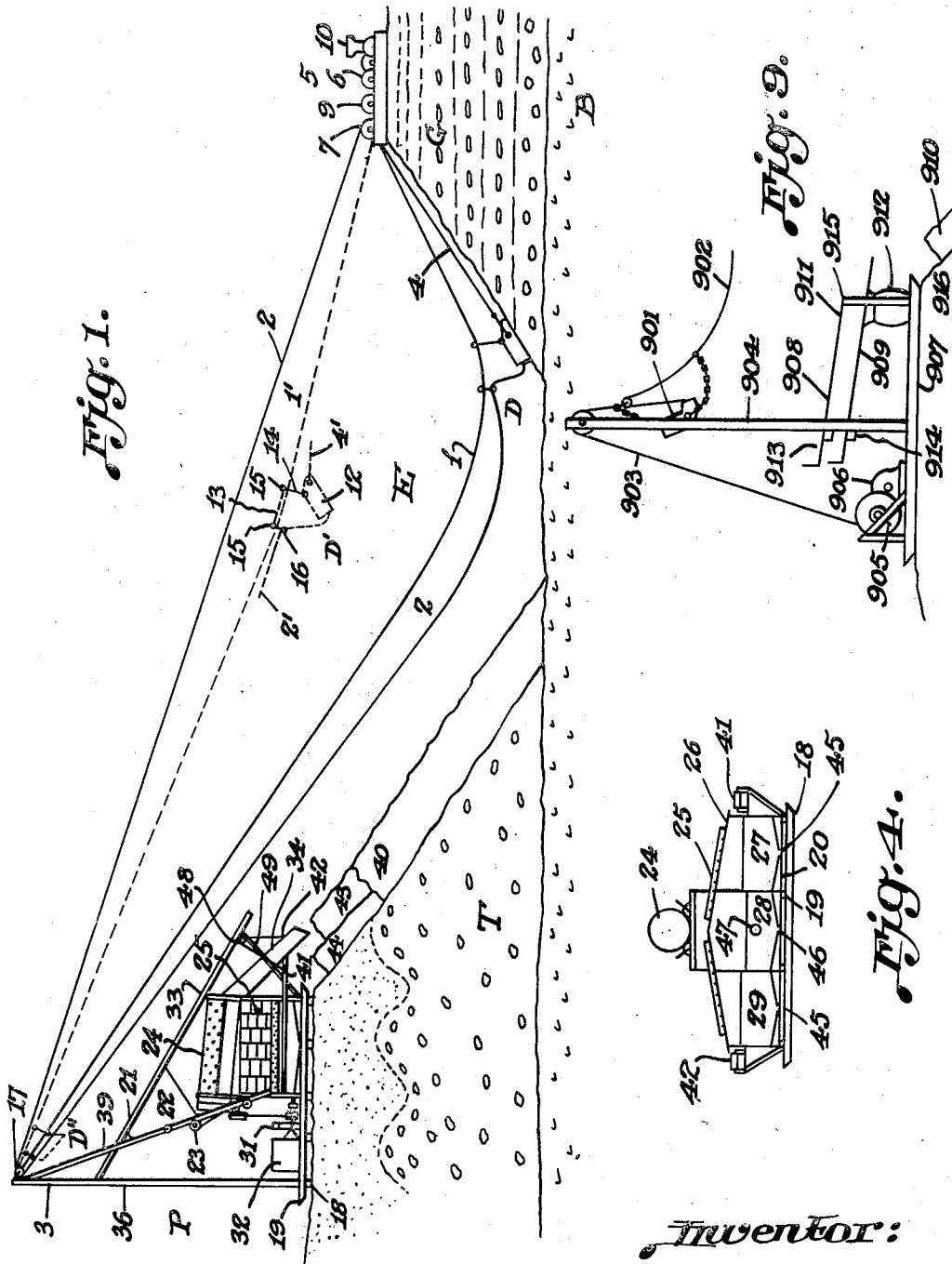
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METHOD AND APPARATUS FOR PLACER MINING

Filed Oct. 11, 1933

3 Sheets-Sheet 1



Inventor:
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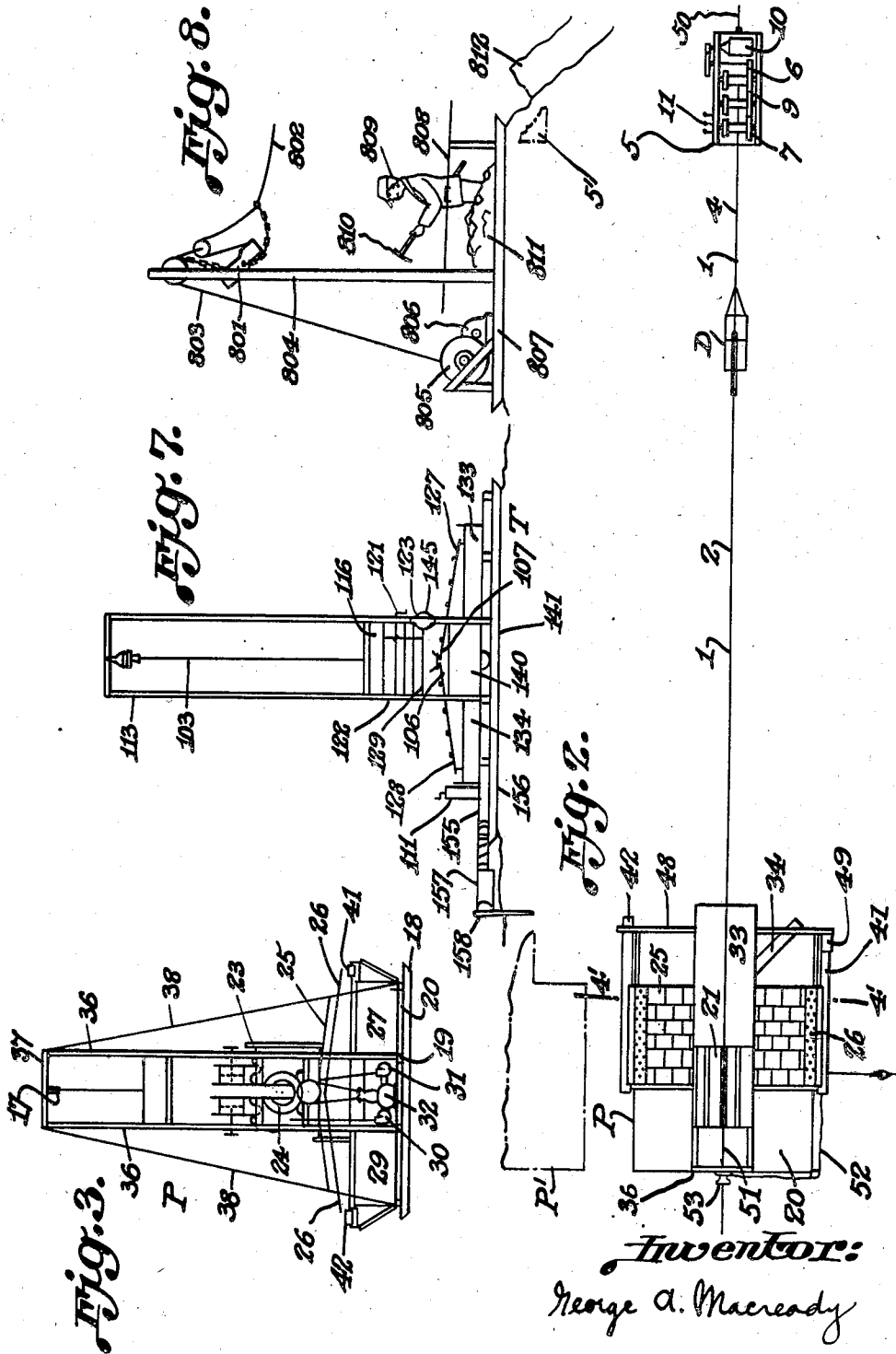
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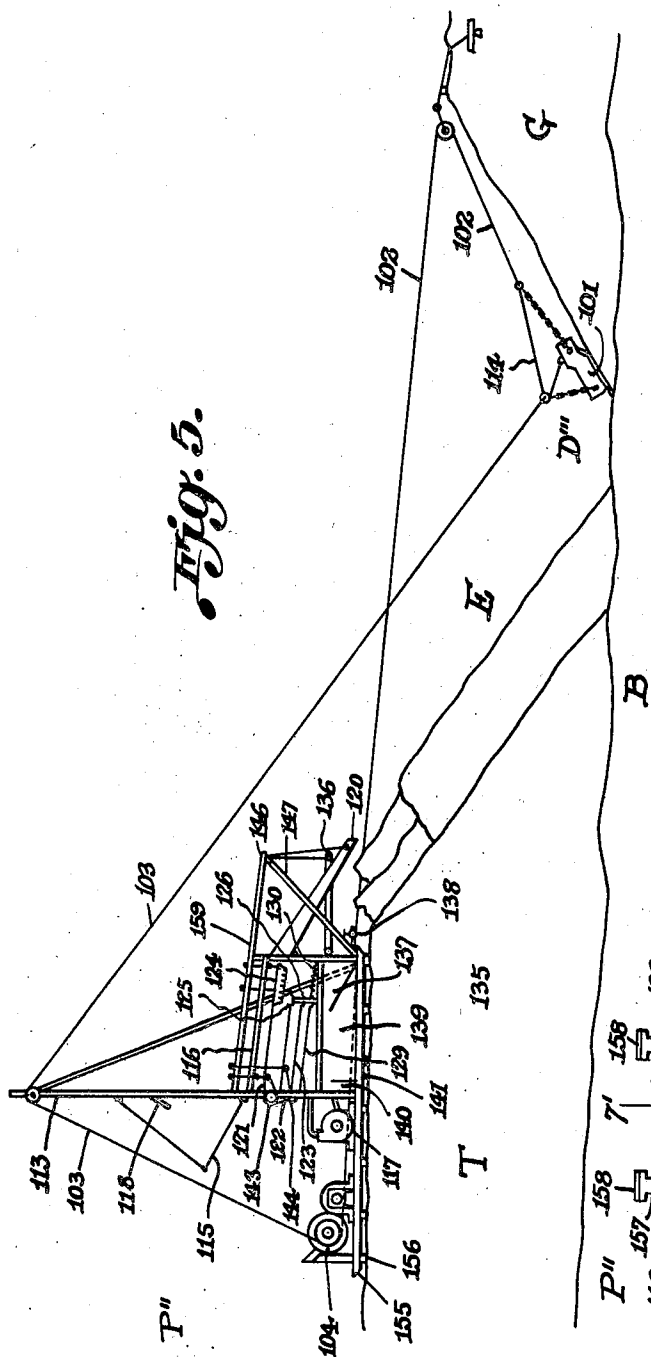
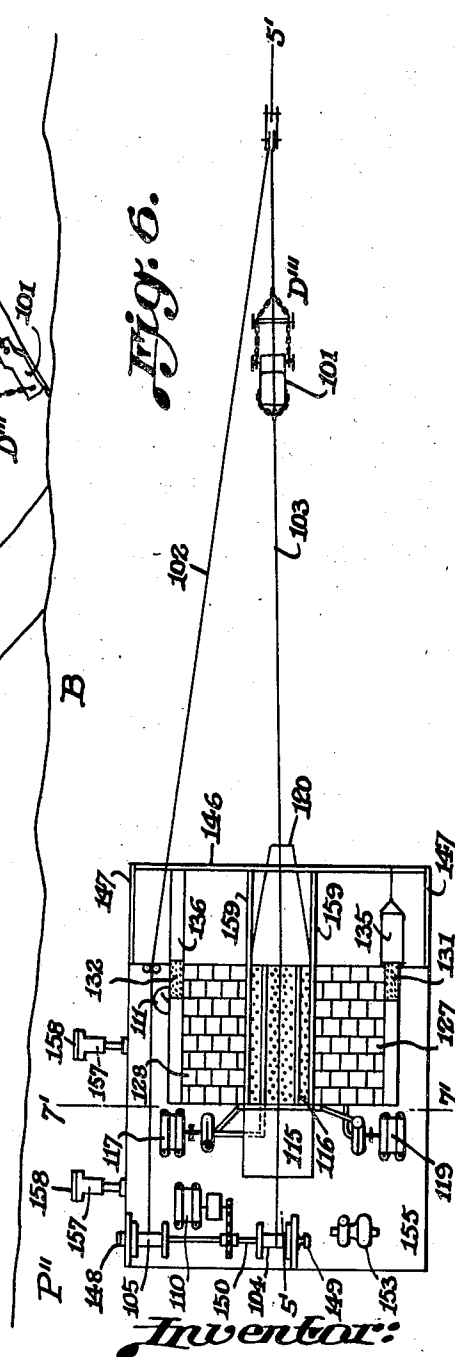
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UNITED STATES PATENT OFFICE

1,996,771

METHOD AND APPARATUS FOR PLACER MINING

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Application October 11, 1933, Serial No. 693,210

9 Claims. (Cl. 262—2)

My invention relates to a method and apparatus for mining shallow ores in open excavations, extracting the valuable portion therefrom, and disposing of the tailings or rejected portion.

My invention is particularly adapted to the working of low grade placer gold deposits formerly worked by hydraulic mining, to the "dry placer" gold gravels of arid regions, to tin and platinum gravels, and to other deposits in which the volume of tailings greatly exceeds the volume of values extracted.

An object of my invention is a method of mining and treating ore or gravel in such a way that the tailings are economically disposed of by depositing them in a pile or heap and using the deposited tailings as a foundation for a treating plant over which said plant may be advanced bodily as the tailing pile is extended to follow the working face of the ore or gravel.

An object of my invention is a method of disposing of tailings without the expense of transporting them to a dump after treatment. To accomplish this I discharge the tailings directly from a treatment plant onto the flank of a tailing pile to extend the pile and advance the plant bodily over the surface of the pile to follow the extension of the pile, using the tailing pile as the foundation for supporting the plant.

Objects of my invention are a method and an apparatus for economically mining placer ore, extracting values therefrom, and disposing of the tailings.

An object of my invention is an apparatus for open cut or placer mining consisting of a drag line excavator and a bodily movable unit including a platform carrying a mast from which the excavator is operated and a separator to extract values from ore and reject tailings over the side of the platform.

An object of my invention is a method and apparatus by which valuable mineral is washed from a gravel ore by water treatment and a large proportion of the water salvaged for use again.

An object of my invention is a method and apparatus for treating clayey gold gravels by screening the fine clay particles from the sand and treating each separately to recover gold. It is well known that clay has a habit of picking up gold from sluices and interfering with good recovery.

In the treatment of gold placer gravel the proportion of valuable product (gold) is extremely small in comparison to the rejected worthless material (tailings). For example, gravel containing

ten cents gold per cubic yard contains only one part of gold to about 100,000,000 parts of worthless material (by volume). This condition introduces a factor into mining placer gold that is often overlooked with disastrous results: namely, the economical disposal of enormous quantities of worthless tailings.

The most important problem peculiar to the mining of low grade gold placer gravels is: economical disposal of large quantities of worthless tailings.

This problem does not trouble gravel mining for road or structural material because the material mined is a marketable product disposed of by sales. Neither does it trouble the underground miner because only higher grade rock can be profitably mined underground and the proportion of tailings to values is less.

But in the mining of low grade placer gravels for gold it is necessary to handle and dispose of an extremely large yardage of worthless tailing material at a low cost in order to show a profit. For example, hydraulic mining could dig ore very cheaply in large quantities, could extract the gold cheaply, but was unable to survive because of inability to dispose of tailings when enjoined by courts in 1884 against dumping tailings into navigable rivers. Hydraulic mining which had been a flourishing industry in California before 1884 practically ceased within a few years after the injunction.

Gold dredging from floating dredges became successful largely because the disposal of tailings was solved by stacking them in the rear of the pond in which the dredge floats. Stacking can be done economically from a dredge because the dredge floats on water near the top of the tailing pile and the stacker is not called on to lift an excessive height. In arid regions the difficulty in maintaining a pond in which to float a dredge usually prohibits dredging.

Throughout the mining districts of California, Arizona and other regions there still remain enormous deposits of low grade gold placer gravel unsuitable for dredging or hydraulic mining which await the development of an economical method for mining and treating. This is particularly true of large gravel deposits formerly hydraulicked in the Sierra Nevada mountains and of deposits in dry desert regions where conditions are not suitable for maintaining a dredge pond or where hydraulic mining is prohibited.

Applicant's invention provides a method and apparatus suitable for economical handling of

many of the deposits referred to in the preceding paragraphs.

By the use of the well known drag line principle the digging of gravel can be done cheaply. By the use of gold saving sluices or tables similar to those used in hydraulic mining and dredging the gold can be extracted economically. The disposal of large quantities of tailings is solved by dropping them over the side of the treatment plant into the excavation formed by digging ore, and periodically moving the treatment plant across the surface of the tailing pile as the pile is extended so that the plant is kept close enough to the edge of the pile for the tailings to roll down the slope and also at the same time advancing the plant to keep up with the advancing face from which gravel or ore is being dug. There is no transportation cost for tailing disposal by applicant's method because tailings are left where they fall.

By the use of dewatering screens or vats water can be salvaged for use again and again and by the use of vats mounted on the portable or slidable frame floor the loss of water by seepage into the ground is avoided so that it becomes possible to handle desert placers cheaply by large scale wet methods.

Applicant provides for discharging the oversize material from the screens so that it will roll to the bottom of the tailing pile and then covering the oversize with finer moist undersize material so that the upper surface of the land is a nearly level boulderless surface perhaps even better for agricultural use than before mining. This is a desirable contrast to the debris strewn bouldery surfaces left by hydraulic, dredge or dry placer mining methods.

By screening the gravel into graded sizes the sands can be treated separately with clear water used repeatedly without becoming foul with clay which tends to "rob" gold from the riffles. Muddy water can also be used repeatedly to disintegrate the gravel because in applicant's apparatus the fine or flour gold is recovered by amalgamation separately from the coarse material.

With the foregoing and other objects in view which will be made manifest in the following detailed description and especially pointed out in the appended claims, reference is had to the accompanying drawings for illustrative embodiment of my invention, wherein:

Figure 1 is a cross section through a mine showing a view of the equipment thereon, including treatment plant,

Figure 2 is a plan of said mine and equipment, Figure 3 is an elevation view of the treatment plant from the tailing pile side.

Figure 4 is a cross section through the treatment plant at 4-4,

Figure 5 is a cross section through a mine and a modified form of treatment plant at 5-5,

Figure 6 is a plan of a modified form of treatment plant corresponding with Figure 5,

Figure 7 is a cross section of the same modified form of treatment plant at 7-7,

Figure 8 is a side elevation of a simple form of a treatment plant, and

Figure 9 is a side elevation of another simplified form of a treatment plant.

Similar numerals refer to similar parts throughout the several views.

In the accompanying drawings the general idea of my method is illustrated in the drawings wherein the ore or gravel G may or may not rest on a bedrock B. Gravel or ore is dug from the ore

or gravel deposit G by drag bucket D, D', D'', or D''', transported in the bucket across the excavation E to the mast on treatment plant P, P' or P'' where it is dumped into the plant for treatment. The reject waste material or tailings from the plant is discharged therefrom onto the side of tailing pile T so that excavation E is refilled and the tailing pile T extended toward gravel deposit G as mining progresses. The treatment plant P is mounted on skids (or wheels or rollers) on the top of tailing pile T so that as the pile is extended the plant can be moved bodily at intervals so as to be kept close enough to the edge of the tailing pile to permit free discharge of tailings onto the slope of the pile.

By my method the ore can be delivered to the plant cheaply by drag line methods, passed through the plant cheaply by gravity, and the tailings disposed of without any transportation expense by simply dropping them from the plant directly into the excavation formed by mining. The tailing pile builds up toward the ore at approximately the same rate as the ore is mined so that mining can proceed under uniform conditions without costly delays for re-arrangement of plans and equipment.

The equipment with which my method is carried out consists of two principal portions; first, a drag line excavator which digs, transports and delivers the ore and, second, a treatment plant mounted on a movable platform on the top of the tailing pile which extracts gold or other values from the ore and discharges the rejected material or tailings over its side to extend the tailing pile.

The drag line excavator may be one of several conventional forms having a drag bucket which digs a load of gravel when dragged against the gravel bank, a power hoist having two or three drums for operating the necessary cables, and a mast (or boom) on said treatment plant to which the loaded bucket is hoisted to dump its load into the treatment plant.

The treatment plant consists of a foundation floor or frame mounted on skids (or wheels or rollers) so that it can periodically be moved short distances and carrying the following principal elements: the mast or boom from which the drag line is operated, one or more screens by which the gravel is separated into coarse and fine constituents, pumps for supplying water to the gravel and sluices, separators, sluices or tables for saving gold or other values from the gravel, dewatering screens or vats for salvaging water from tailings, vats for retaining water, and chutes or conveyors arranged to discharge the tailings over the side and onto the tailing pile.

Applicant's method can be described more in detail with a description of one form of apparatus illustrated in Figures 1, 2, 3 and 4 as follows:

Gravel or ore is dug from bank or deposit G by dragging a bucket D over the face of the working cut. When the digging bucket has gathered its load track cable 1 is tightened to raise the bucket clear of the ground and it is then dragged by means of a cable 2 along the track cable 1 to the top of mast 3 where the bucket automatically dumps its load.

In the illustration, Figure 1, the bucket is dragged up the slope of the working face by means of cable 4 operated by a drum 6 on hoist 5. The track cable 1 is tightened by another drum 7 on the same hoist, and the bucket with

its load is hauled along track cable 1 by cable 2 operated from the third drum 9 of the same hoist. The hoist 5 is illustrated on top of gravel bank G near its edge and consists of three cable drums or reels 6, 7 and 9 driven through clutches by motor 10. The clutches and brakes of each drum can be operated by control levers such as at 11.

The form of dumping bucket D illustrated in Figure 1 consists of a receptacle 12 hung by pivot 14 from a carrier frame 13 which in turn is mounted on roller sheaves or wheels 15 to roll along track cable 1. A third sheave wheel 16 is mounted on the carrier 13 and cable 2 passes thereover. When bucket D is hoisted clear of the ground by tightening cable 1 to position 1' and is hauled along track cable 1 the load receptacle 12 takes a position illustrated at D' in which the bucket is suspended from pivot 14 with the rear end hanging below the mouth. The end of cable 1 is made fast to sheave 17 at the top of mast 3 and cable 2 passes through sheave 17. When the bucket has been hauled to the top of the mast carrier 13 stops against the shackled end of cable 1 but line 2 by continued pulling continues over sheaves 16 and 17 to draw the rear end of receptacle 12 up toward sheave 16 until it assumes a position as at D' with the rear end elevated to dump the load. When the load has been dumped the bucket is hauled back along track cable 1 by reeling in cable 4 and cable 1 is slackened to lower the bucket to the gravel bank for another load.

Treatment plant P is mounted on a bodily movable floor or frame consisting of skids 18 on which may be cross timbers 19 for stiffness and the floor planking 20. The floor is supported on the top of the tailing pile as a foundation and can be moved bodily by skidding or on rollers so that it is kept close enough to the advancing edge of the tailing pile in order that the tailings may be discharged onto the slope or flank of the tailing pile.

The form of mast or boom 3 consists of two upright posts 36 having a cap cross piece 37 supporting sheave 17. The mast is held steady by guy lines 38 and diagonal braces 39 so that it is fast to the floor.

Ore dumped from bucket D falls on a grizzly 21 which allows the moderate size particles of ore to fall through into hopper 22 and rejects the oversize boulders down chute 33 to the bottom of the tailing pile. Ore or gravel in hopper 22 passes through gate doors and screw feeders 23 so that a moderately uniform rate of feed is delivered to a revolving screen or trommel 24. Screening can also be done with a flat screen but the revolving screen is preferable for some gravels because it acts similar to a ball mill to disintegrate cemented gravel. A jet or spray of water can be supplied to the screen by a pipe or hose from pumps 30 and 31. Oversize from the trommel is rejected and discharges through chute 34 to "sub pile" 40 to become a part of the tailing pile.

Fines and water passing through trommel perforations go to gold saving sluices 25. The sluices are of types common to dredges and placer mining in general and consist of inclined sluices having riffles on their floors for trapping gold or other heavy mineral product. The sluices are "cleaned up" periodically to obtain the values.

The sluices discharge onto dewatering screens 26 which allow water and fine mud to drop through into vats 27 and 29 and pass the grit and sand oversize onto conveyor belts 41 and 42.

The conveyor belts transport the sand out over the slope of the tailing pile and drop it into "sub piles" 43 and 44 to form the upper portion of the main tailing pile T. The top surface of the pile can be kept level by occasional strokes of a hand shovel so that the finished tailing dump will have a smooth surface of the fine material. Leveling is aided by having conveyors 41 and 42 project unequal distances.

The heaviest portion of the mud settles to the bottom of vats 27 and 29 from which it can be discharged continuously or at intervals through valves or outlets 45. Partially cleared water overflows into central vat 28 where additional mud settles and is drawn off through outlet 46. The clearest water in the top of vat 28 is drawn off through suction 47 by pumps 30 or 31 and pumped into the sluices for use in the process again. Additional clear water must of course be supplied to make up for that drawn off from the bottoms of the vats and for water clinging to the tailings. The mud and water drawn off from settling vats can be run into settling ponds or tanks if in arid regions and some of the water reclaimed. Since the mud carries a large proportion of fine slimes it will quickly seal a pond against leakage and for that reason it is easier to reclaim the water than if the entire discharge from the sluices were run into a pond.

Power for operation of the trommel, pumps, ore feeder and conveyor can be supplied by shafts and belting from a single gasoline or electric motor 32 or by individual electric motors wherever required.

Grizzly 21 and chute 33 are supported on a cross piece on braces 39 and a cross piece 48 resting on angle braces 49. The outer ends of chute 34 and conveyors 41 and 42 are suspended from piece 48.

Hoist 5 and plant P can be anchored against shifting by cables 50 and 51 attached to stumps or dead men. Lateral shifting is done by wrapping a rope 52 around a cat head 53 and pulling on a cable such as 54.

There is considerable option in the direction in which operations can be carried. The plant P and tailing pile can be moved directly toward hoist 5 to cut and fill a narrow trench. If the deposit is wide it is better to zig zag across a wide cut as illustrated in Figure 2 where previous positions of plant P and hoist 5 were at P' and 5'. If the deposits are high benches along a gulch or valley the tailing pile can be deposited as a strip parallel to the gulch and the drag line operated at right angles to the pile to bring down material from the hill sides.

For mining uneven or sloping ground the treatment plant can be provided with sills of unequal or tapered thickness so that the floor and vats can be maintained level on a tailing pile having a sloping upper surface. It is therefore evident that applicant's method is adaptable to areas which are too rough for a floating dredge.

A modified form of apparatus embodying the same principles for carrying out applicant's method is illustrated by Figures 5, 6 and 7, described as follows:

The digging element D'' consists of a bucket 101 such as the conventional "Page" or "Sauer-mann" types operated by two cables 102 and 103 from drums 105 and 104 respectively on shaft 150. The drums are driven by an electric motor 110 and are controlled by brakes and clutches operated by levers at 111 where the operator has a clear view of the excavation, sluices and

screens. The bucket 101 gathers a load of gravel when dragged against bank G by cable 102. Cable 103 is next reeled in hoisting the bucket 101 to the top of mast 113, cable 102 being kept tight while paying out by brake or clutch so as to suspend the bucket above the ground. Cable 102 is slacked off completely when the bucket reaches the top of the mast which in turn slacks dump cable 114 to drop the forward end of bucket 101 and discharge its load.

The load is dumped onto sheet 115 and grizzly 116. Jets of water supplied by an electrically driven centrifugal pump 117 through nozzle 118 sprays on the gravel to disintegrate it and wash the fines through the grizzly 116 and the oversize to chute 120 down which boulders are discharged to tailing pile T. Fines drop through to finer mesh screens 121, 122, 123 which separate the material into graded sizes, each to be treated separately for recovery of gold or other valuables.

The number of screens and coarseness of each grade should be selected to suit the gravel or ore of each individual mine. A typical grading scheme is as follows:

The first grizzly 116 discharges larger than 3-inch pieces to tailings. The second screen 121 discharges 1- to 3-inch material to a nugget trap or jig 124 where large nuggets may be captured. Third screen 122 discharges $\frac{1}{8}$ th to 1 inch material to launder 125 and thence to one set of sluices 127. Fourth screen 123 discharges $\frac{1}{60}$ th to $\frac{1}{8}$ th inch material to launder 126 and thence to another group of sluices 128. Fines smaller than $\frac{1}{60}$ th inch passing through screen 123 drop onto an amalgamated plate 129 and thence over sluices or amalgam traps 130.

Nugget trap 124 consists of a chute or box having a few coarse riffles and discharges all material to chute 120 and thence to tailing pile T except the few large nuggets which may or may not be present.

Water supplied by electrically driven centrifugal pump 119 to launders 125 and 126 washes the material into distributors 106 and 107 which feed sluices through individual doors or outlets similar to the standard practice of floating gold dredges. Sluices 127 and 128 are equipped with the conventional riffles commonly used on floating dredges for recovery of gold and discharge to dewatering screens 131 and 132 which allow water to drop through into vats 133 and 134 and discharge the sand and gravel onto conveyors 135 and 136 which extend over the slope of the tailing pile and discharge the solids onto the pile T.

The pulp passing through screen 123 (the last grading screen) drops onto amalgamated plate 129 where the fine and flour gold reacts with the amalgam and sticks. Overflowing pulp passes over a short section of riffles or amalgam traps 130 to prevent loss of gold or amalgam which may accidentally have dislodged from plate 129 and discharges into vat 137. Grit and heavy mud settle in vat 137 and are discharged periodically or continuously by a suction pump or through valve 138. Fluid from the top of vat 137 overflows into vat 139 where additional mud settles and may be withdrawn through outlet 141 or by suction pump. Vat 139 overflows nearly clear water into small vat 140 which is the suction vat for pump 117. Clear water from a water supply should be added to vat 140 to compensate for water withdrawn with the mud and lost clinging to oversize so that water can be continuously supplied to the grizzly by pump 117.

The mud drawn off through outlets 128 and 141 may be run to waste or if in a desert region diverted to settling ponds to salvage water.

In order to give maximum capacity the screens 116, 121, 122 and 123 may be suspended by stirrups from frame piece 159 so that they may be given a shaking motion. Pitmen 143 and 144 driven by electric motor 145 are provided for shaking the screens and also jig or nugget trap 124. Conveyors shown are operated by electric motors as self contained units and the dewatering screens may also be provided with motors to give vibration for increased capacity. Auxiliary pump 153 may also be provided together with a length of flexible hose for miscellaneous use including pumping heavy mud from vats.

Electric motors are illustrated with this form but where electric power is not available steam or internal combustion motors can be used.

A cross piece 146 supported by angle braces 147 and frame piece 159 provided a support out over the slope of the tailing pile from which the outer ends of chutes and conveyors may be suspended in order to extend their discharge. Cat heads 148 and 149 on the ends of drum shaft 150 provide means for exerting pull on ropes for miscellaneous purposes.

The entire plant including mast but excepting the drag line excavator is mounted on a platform or floor 155 provided with skids 156 (or wheels or rollers) as a bodily movable unit supported on the top of the tailing pile so that it can be moved bodily across the surface thereof. Force for moving is applied by ordinary lifting jacks 157 braced against posts or deadmen 158.

It is readily seen that the tailings discharged from the plant onto the side slope or flank of the tailing pile build up or extend the pile about as fast as mining proceeds. Whenever the discharge from chutes or conveyors builds up above the desired level of the tailing pile a few strokes of a hand shovel or small drag scraper pulled by rope from the cat head serve to level the top of the pile. The entire plant is advanced bodily, either continuously or at intervals, by pulling with a cable or by pushing with jacks 157 so that as fast as the tailing pile is extended the discharge is kept close enough to the edge of the tailing pile for tailings to discharge onto the flank of the pile.

Figure 8 shows a simple apparatus for applying applicant's method to ore of a different type in which the values are chunks or pieces which can be separated by hand and visual observation (hand sorted). It consists of a drag line excavator 801 operated by cables 802 and 803 from mast 804. Cables are operated by drums 805 driven by motor 806. Mast 804 is carried on platform 807. The excavator dumps its load on a table 808. An operator 809 by means of a hoe 810 or other tool drags the valuable pieces off the platform onto pile 811 or other convenient place and pushes the valueless tailing material off the end of the platform to drop on the flank of tailing pile 812. Platform 807 is pushed or pulled bodily across the top of tailing pile 816 on which it is supported so as to follow the extension of the growing pile and discharge tailings onto the flank of the pile. The method of extracting the valuable portion of ore in this case is hand sorting and the separator is a platform and hoe.

Figure 9 shows another simple apparatus for applying applicant's method to ore of still another type in which the values are the oversize material, such as phosphate nodules or concretions of

valuable material in a loose matrix. It consists of a drag line excavator 901 operated by cables 902 and 903 from mast 904. The cables are operated by drums 905 driven by motor 906. Mast 904 is carried on a platform or floor 907. The excavator dumps its load on screen or grizzly 908. Fines drop through the chute 909 which in turn discharges them as tailings to tailing pile 910. Oversize material rolls down the screen to chute 911 from which it is taken by hand or diverted to sacks as at 912. Chute 909 and screen 908 are supported on cross pieces 913 and 914 on the legs of mast 904 and on support 915. The entire floor 907, with screen, mast and drums, is pushed or pulled bodily as a unit across the top of tailing pile 916 upon which it is supported so as to follow the extension of the growing tailing pile and discharge tailings onto the flank of the pile. In this case the separator is a simple screen and chute.

Numerous other modifications, accessories and details of construction and operations can be described but will be omitted because it is believed that sufficient description has already been given to teach applicant's invention to others.

In résumé of the foregoing pages it is seen that an important advance has been made in the art of placer mining by applicant's novel and economical method and apparatus for disposal and use of tailings, briefly described as follows and in the appended claims.

Ore is dug from open cuts by a drag line excavator, transported directly to the top of a mast, and delivered to a separator (such as sluices or screens) at the foot of the mast wherein valuable portions are extracted from the ore and tailings discharged directly onto the flank of a tailing pile. The mast and separator are carried on a platform or floor as a bodily movable unit or treatment plant. The plant is supported on the top of the tailing pile near the edge so that tailings discharge direct from the plant onto the flank of the pile extending the pile. As fast as the tailing pile is extended the plant is advanced bodily to follow the extension and continue to discharge onto the flank of the extended pile. Obviously the tailing pile can be extended to approximately follow the working face of the mine so that the distance for hauling or transporting the ore need not increase as mining proceeds.

It will be understood that various changes in detail may be made without departing from the spirit or scope of the invention as defined in the appended claims.

I claim as my invention:

1. A method of mining and treating placer ore which consists of dragging a digging receptacle against a bank of placer ore to load said receptacle with ore, transporting said receptacle with its load bodily to a mast carried by a treatment plant supported on the top of a pile of tailings from previously treated ore, dumping said load from an elevation near the top of said mast into said plant, returning said receptacle to the bank repeatedly for additional loads of ore, extracting valuable portions from said ore in said plant, discharging the rejected tailings over the side of said plant onto the flank of said tailing pile to extend said pile, and moving said plant bodily as a single unit across the top surface of said tailing pile to follow the extension of said pile closely enough for all tailings to discharge onto the flank of said pile.

2. An apparatus for placer mining consisting

of a drag line excavator and a bodily movable unit including a platform carrying thereon a mast from which said excavator is operated and a separator adapted to extract values from ore delivered by said excavator and reject tailings over the side of said platform.

3. An apparatus for mining and treating placer ore consisting of a drag line excavator operated by cables and a bodily movable foundation floor supporting thereon a mast from which said excavator is operated to dig ore from a placer deposit and deliver said ore to a separator supported on said floor adjacent said mast, and a separator, adapted to extract the valuable portions from said ore and discharge the tailings rejected over the side of said floor.

4. An apparatus for mining and treating placer ore consisting of a drag line excavator operated by cables and a bodily movable foundation floor supporting thereon a mast from which said excavator is operated to dig ore from a placer deposit and deliver said ore to a screen adjacent said mast, a screen adjacent said mast adapted to separate and discharge oversize material from said ore over the side of said floor, a separator adapted to receive undersize material from said screen, extract the valuable portions therefrom and discharge tailings rejected over the side of said floor adjacent the discharged oversize, and motive power for operating said separator.

5. An apparatus for mining and treating placer ore consisting of a drag line excavator operated by cables and a bodily movable foundation floor supporting thereon a mast from which said excavator is operated to dig ore from a placer deposit and deliver said ore to a screen adjacent said mast, a screen adjacent said mast adapted to separate and discharge oversize material from said ore over the side of said floor, a separator adapted to receive undersize material from said screen and extract valuable portions therefrom, a pump connected to supply water to wash material through said separator, dewatering means adapted to salvage water discharged from said separator and discharge solids separated therefrom over the side of said floor adjacent the discharged oversize, and motive power for operating said pump, separator and dewatering means.

6. An apparatus for mining and treating placer ore consisting of a drag line excavator operated by cables and a bodily movable foundation floor supporting thereon a mast from which said excavator is operated to dig ore from a placer deposit and deliver said ore to a screen adjacent said mast, a screen adjacent said mast adapted to separate and discharge oversize material from said ore over the side of said floor, a separator adapted to receive undersize material from said screen and extract valuable portions therefrom, dewatering means adapted to salvage water discharged from said separator and discharge solids separated therefrom over the side of said floor adjacent the discharged oversize, vats receiving said salvaged water provided with outlets for discharging mud settlements from the water, a pump connected to pump water from said vat to said separator, and motive power for operating said pump, separator and dewatering means.

7. A method of mining and treating placer ore which consists of digging and transporting ore from a placer deposit to a treatment plant supported on top of a pile of tailings from previously treated ore, extracting the valuable portions from said ore, discharging the tailings rejected by said

plant directly onto the flanks of said tailing pile, the large pieces being deposited near the bottom of the pile and the small pieces near the top of the pile, and moving said plant bodily across the top of said pile to follow the extension of said pile closely enough for tailings to discharge onto the flank of said pile.

8. A method of mining and treating placer ore which consists of dragging a digging receptacle against a bank of placer ore to load said receptacle with ore, transporting said receptacle with its load bodily to a mast carried by a treatment plant supported on a pile of tailings from previously treated ore, dumping said load from an elevation adjacent the top of said mast into said plant, returning said receptacle to the bank repeatedly for additional loads of ore, screening the ore in said plant, discharging the oversize over the edge of said plant onto the flank of said tailing pile, treating the undersize in said plant to extract valuable products therefrom, discharging the tailings from the treated undersize over the edge of said plant adjacent the oversize discharge directly onto the flank of said tailing pile, and moving said treatment plant bodily as a single unit across the top surface of said tailing pile to follow the extension of said pile closely

enough for all tailings to discharge directly from the treatment plant onto the flank of said pile.

9. A method of mining and treating placer ore which consists of dragging a digging receptacle against a deposit of placer ore to load said receptacle with ore, raising said receptacle clear of the ground surface, transporting said receptacle with its load bodily and above the ground surface directly from said deposit to a mast carried by a treatment plant supported on a pile of tailings from previously treated ore, dumping said load into said plant from an elevation adjacent the top of said mast while supporting weight of said receptacle by said mast, returning said receptacle to said deposit repeatedly for additional loads of ore, sizing the delivered ore into portions in said plant, extracting valuable products in said plant from one of the sized portions, discharging tailings of spent ore over the side of said plant directly onto the flank of the tailing pile, and moving said treatment plant bodily as a single unit across the upper surface of said tailing pile to follow the extension of said pile closely enough for all tailings to discharge directly from said plant onto the flank of said pile.

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