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UNDERWATER PLACER MINING METHOD AND APPARATUS

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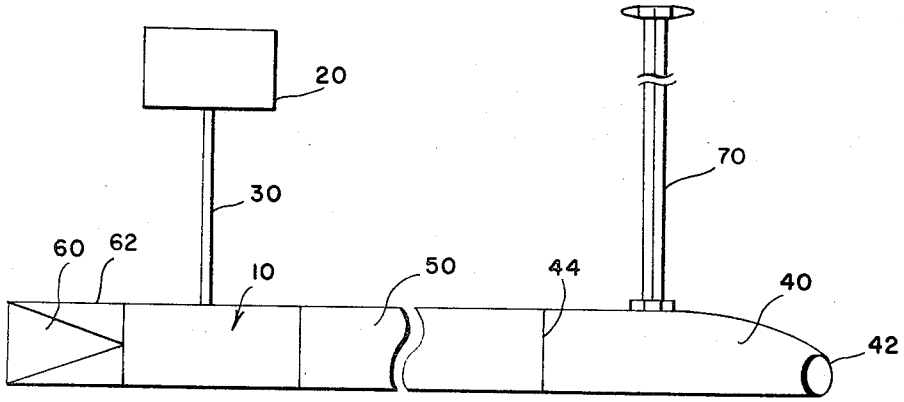


FIG. 1

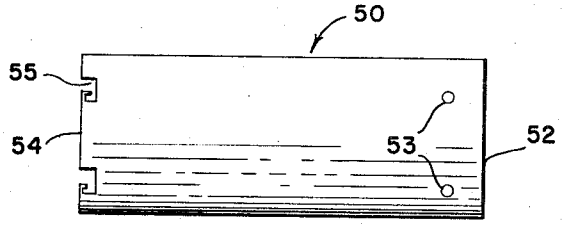


FIG. 2

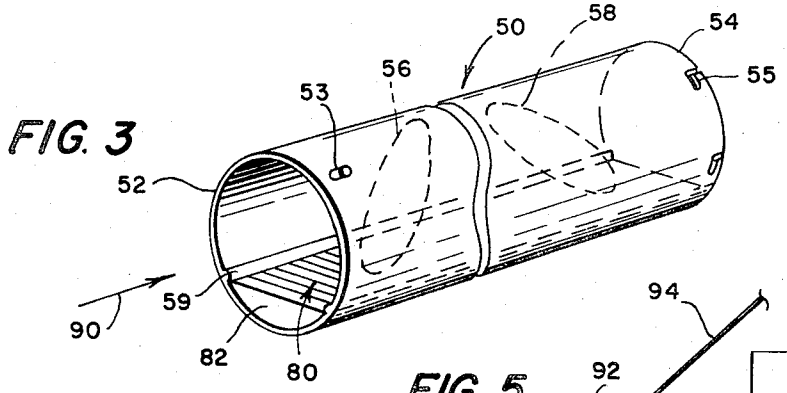


FIG. 3

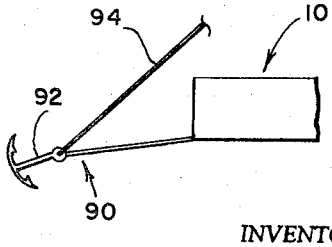


FIG. 5

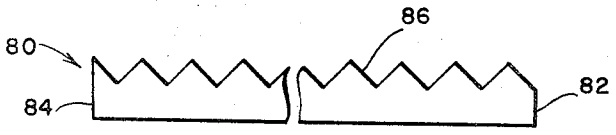


FIG. 4

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UNDERWATER PLACER MINING METHOD AND APPARATUS

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ABSTRACT OF THE DISCLOSURE

A process and apparatus for underwater placer mining in which water is pumped through a fixed position separating tube to effect gravity separation and collection of heavy particles in the tube. The device comprises an inlet and exhaust end and is divided into a plurality of separable sections. A probe comprises the intake end and is followed in serial order by the separating section, pump section and exhaust section. The probe section includes a handle for manipulating the device, the separating section may be composed of several parts and includes means to alter the direction of flow and a removable, serrated gold trap and the exhaust section comprises flow deflection means to restrict movement of the device.

This application concerns placer mining methods and apparatus. Described herein are methods and apparatus useful for underwater placer mining in which only guide means and flexible power transmission means extend above the surface of the water from the mining apparatus.

Although placer mining has many uses, the extracting of ore from alluvial material beneath bodies of water is best known in gold mining. The traditional method of placer mining is well-known; a miner shovels material into a pan and swirls water, sand, gravel and gold about the pan until the water washes the sand and gravel out of the pan, leaving the relatively heavy gold deposits. The use of sluiceways has improved the old method, and recently underwater mining means have been developed to move great quantities of water and material through completely submerged equipment.

Several drawbacks are found in known placer mining equipment. Providing sufficient power to the mining apparatus is an extremely perplexing problem. While power requirements are substantial, the equipment is often used in places so remote that it is difficult to provide power. Moreover, known machines tend to separate ore from ore bearing material before it is entrained in the equipment. This results in leaving the desirable heavy particles on the floor of the body of water rather than in recovering all of the valuable heavy materials, which is the primary purpose of the placer mining process.

The present invention overcomes the problems of heretofore known devices by providing placer mining apparatus which is readily operated with portable power equipment. Water and ore bearing alluvial material are picked up at a high rate of speed and are passed along a uniform line of travel until they reach the separating tube where the heavy ore particles are removed. Thus, all of the sand and gravel and loose material on the bottom of the body of water is picked up and is removed through the equipment.

The mining device consists of a long, bendable separating tube with a suction pump at one end and an open probe at the other end. The apparatus is placed in water of a stream, river, lake or pond in which gold bearing sand or gravel is suspected. When the pump is started, it draws water through the tube at high velocity. The probe is restricted at its free open end to increase velocity of the water and to improve suction characteristics of the

device. As water, sand and gravel pass through the tube, they are rotated, preferably clockwise and counter clockwise by appropriately spaced baffles. This action quickly and thoroughly causes heavy gold grains and nuggets to drop in the bottom of the tube into a removable serrated gold trap.

After operating the pump and the probe for a period of time, the probe is raised for drawing in clear water to clean out any sand or gravel remaining in the tube. The entire apparatus is then removed from the water and grains and nuggets of gold are recovered by separating the tube and probe and by removing the serrated gold trap from the tube.

Using a separating tube with a six inch inner diameter, using a probe with a three inch intake, and pumping to create velocities of from 15 to 20 miles per hour, during a ten hour day the machine processes more than thirty thousand cubic feet of sand and gravel laden water. In terms of the popularized panning for gold, one machine performs the equivalent combined work of three thousand miners, each doing a hard day's work. The overall length of the mining apparatus is approximately fifteen to twenty feet. The separating tube, which is preferably ten feet long, may be constructed in detachable sections. The separation tube is sufficiently long to separate the ore from the aqueous suspension of ore bearing material; additional sections may be added, as required.

The tube is made of relatively tough, abrasion resistant material, such as rubber. Teflon coated materials may be used. The probe is a short, restricted tube of similar construction. The pump is a rotary pump having exposed surfaces lined with a friction free and abrasion resistant material such as Teflon. Alternatively, a jet pump having lined friction free surfaces may be used. Deflectors at the pump exhaust balance the thrust of the pump, allowing the device to be moved with an elongated handle which is attached to the probe. Conversely, an anchor and rope may be used instead of the deflector and handle.

The invention may be better understood by referring to the remainder of the specification and to the drawings, which disclose by example one embodiment of the invention.

One objective of this invention is the provision of placer mining methods comprising entraining water and ore bearing alluvial materials along a uniform path, altering direction of flow of the water and ore bearing alluvial material, thereby separating heavy ore particles from the water and the material, exhausting the spent alluvial material and water, and deflecting the exhaust or anchoring the tube to control movement of the tube through the water.

Another objective of this invention is the provision of a method for separating ore from a suspension of sand and gravel in water by swirling the combined material about a uniform flow path, first in one direction and then in another direction.

This invention has as a further objective, the provision of placer mining apparatus comprising: a probe having a restricted intake, a separating tube having flow altering baffles, a pump to draw an aqueous suspension into the probe and the separating tube, means to counteract the thrust of the pump, and portable power means. Other objectives of the invention will be apparent from the specification and from the drawings in which:

FIGURE 1 is an elevation of the placer mining apparatus;

FIGURE 2 is a detail of a separating tube section;

FIGURE 3 is a perspective view of a tube section; and

FIGURE 4 is a side elevation of a serrated gold trap which has been removed from a separating tube section.

FIGURE 5 represents an alternative method of controlling movement of the device, in which an anchor and

a line may be substituted for the deflection means **60** in FIGURE 1.

Referring to FIGURE 1, pump **10** is operated by a power supply **20**, which is connected to the pump with a power transmission line **30**. When pump **10** is operated by a submergible electric motor, power supply **20** comprises a source of electric power, usually a generator; and power transmission line **30** comprises electrical wires. When pump **10** is driven by a gasoline engine, power supply **20** may comprise the engine; and power transmission line **30** may be a flexible cable. The pump may be driven by a direct coupled gasoline engine with an integral fuel supply and snorkel breathing apparatus. Alternatively, **20** may represent a source of fluid under pressure, and **10** may represent a jet pump.

Probe **40** has a restricted first end or inlet **42**. The larger or second end **44** of probe **40** is connected to separating tube **50**. Pump **10** draws water and ore-bearing alluvial material through probe **40** and separating tube **50** and exhausts water into exhaust section **62** and past deflecting means **60**, which balances the thrust of the pump to control movement of the device through the water.

An extension handle **70** is attached to probe **40** to position the placer mining apparatus about the bottom of a body of water.

FIGURE 2 is a detail of a tube section **50** having inlet end **52** and outlet end **54**. Pins **53**, which are attached to the separating tube adjacent inlet end **52**, cooperate with grooves **55** in outlet end **54**, so that several tube sections may be joined. Additionally, complementary grooves and pins in the second end of the probe and in the intake of the pump assemble the separating tube sections in the mining apparatus.

As shown in FIGURE 3, baffle **56** deflects fluid in a counter clockwise direction, and baffle **58** deflects the material in a clockwise direction. Ribs **59**, extending throughout the length of the tube, hold the removable serrated gold trap **80** in place. FIGURE 4 is a side elevation detail of the gold trap **80**. The front of the trap is indicated by numeral **82**; **84** indicates the rear; and serrations are designated **86**. Fluid travels in the direction shown by arrow **90**.

FIGURE 5 illustrates alternative apparatus **90** for controlling movement of the placer mining device through the water. Anchor **92** and line **94** and the reaction of the jet exhaust from pump **10** hold the mining device in equilibrium. Paying out or hauling in line **92** moves the mining device through the water.

I claim:

1. The method of underwater placer mining comprising: axially pumping fluid through a chamber having a uniform axis, thereby creating suction at a first end of the chamber, and creating exhaust at another end of the chamber; sucking fluid and alluvial material through the first end and along a uniform axis of the device; altering direction of flow of fluid and alluvial material from along the uniform axis, thereby precipitating insoluble heavy particles of the alluvial material from the water, and collecting heavy particles in the device; exhausting fluid and remaining alluvial material from the second end of the device; and restraining the device from moving along an axis of the device.

2. The method of underwater placer mining of claim **1**, wherein altering direction of flow comprises swirling fluid and alluvial material first in one direction and then in another direction.

3. The method of underwater placer mining of claim **1** wherein said restraining step comprises deflecting water and remaining material from an axis of the device.

4. Underwater placer mining apparatus comprising:

(1) a probe first and second open ends,

(2) a separating tube having first and second open ends, the first end of said separating tube being connected to the second end of said probe,

(3) a pump having intake and exhaust, the intake of said pump communicating with the second end of said collecting tube,

(4) a source of power for operating said pump, connected to said pump, and

(5) travel restraining means connected to the exhaust end of the pump.

5. The underwater placer mining apparatus of claim **4** wherein said first open end of said probe is relatively smaller than the second open end of said probe.

6. The underwater placer mining apparatus of claim **4** further comprising baffle means mounted within said collecting tube.

7. The underwater placer mining apparatus of claim **6** wherein baffles are sloped in a first direction and then in a second direction.

8. Underwater placer mining apparatus of claim **4** further comprising serrated gold-trap removably mounted in the bottom of said separating tube.

9. The underwater placer mining apparatus of claim **4** wherein said probe, said separating tube, said pump and said collecting means are substantially cylindrical, and wherein said probe, said collecting tube, said pump and said separating tube define a substantially uniform axis.

10. The underwater placer mining apparatus of claim **4**, wherein the first end of said probe is diminished with respect to the second end of said probe, thereby increasing suction and velocity of fluids and alluvial materials at the first end of said probe and decreasing velocity of water and alluvial materials at the second end of said probe.

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