No. 675,514. Patented June 4, 1901.

A. W. LOCKHART.

GOLD SAVING APPARATUS.

(Application filed Sept. 4, 1900.)

(No Model.) 3 Sheets—Sheet 1.

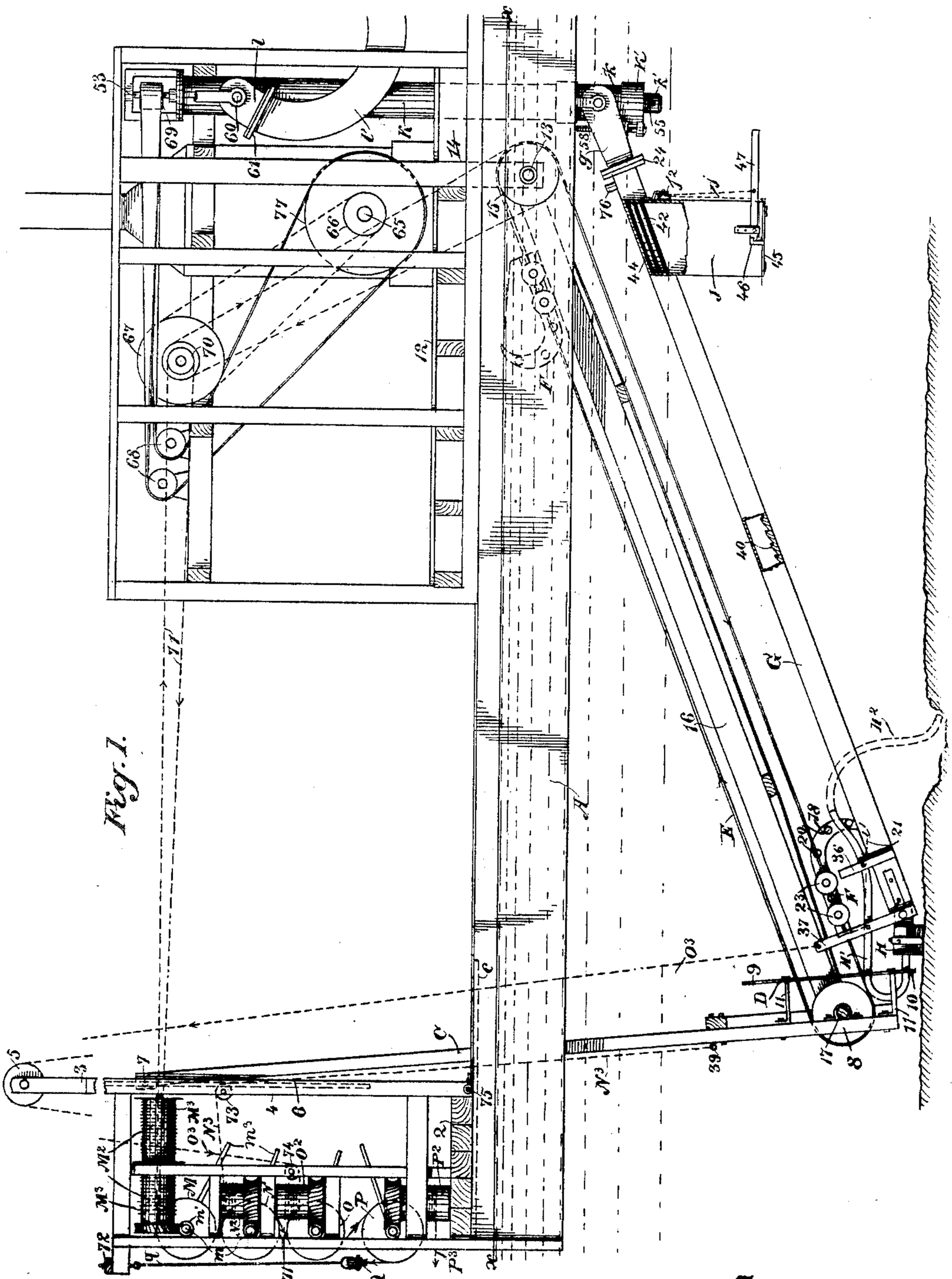

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

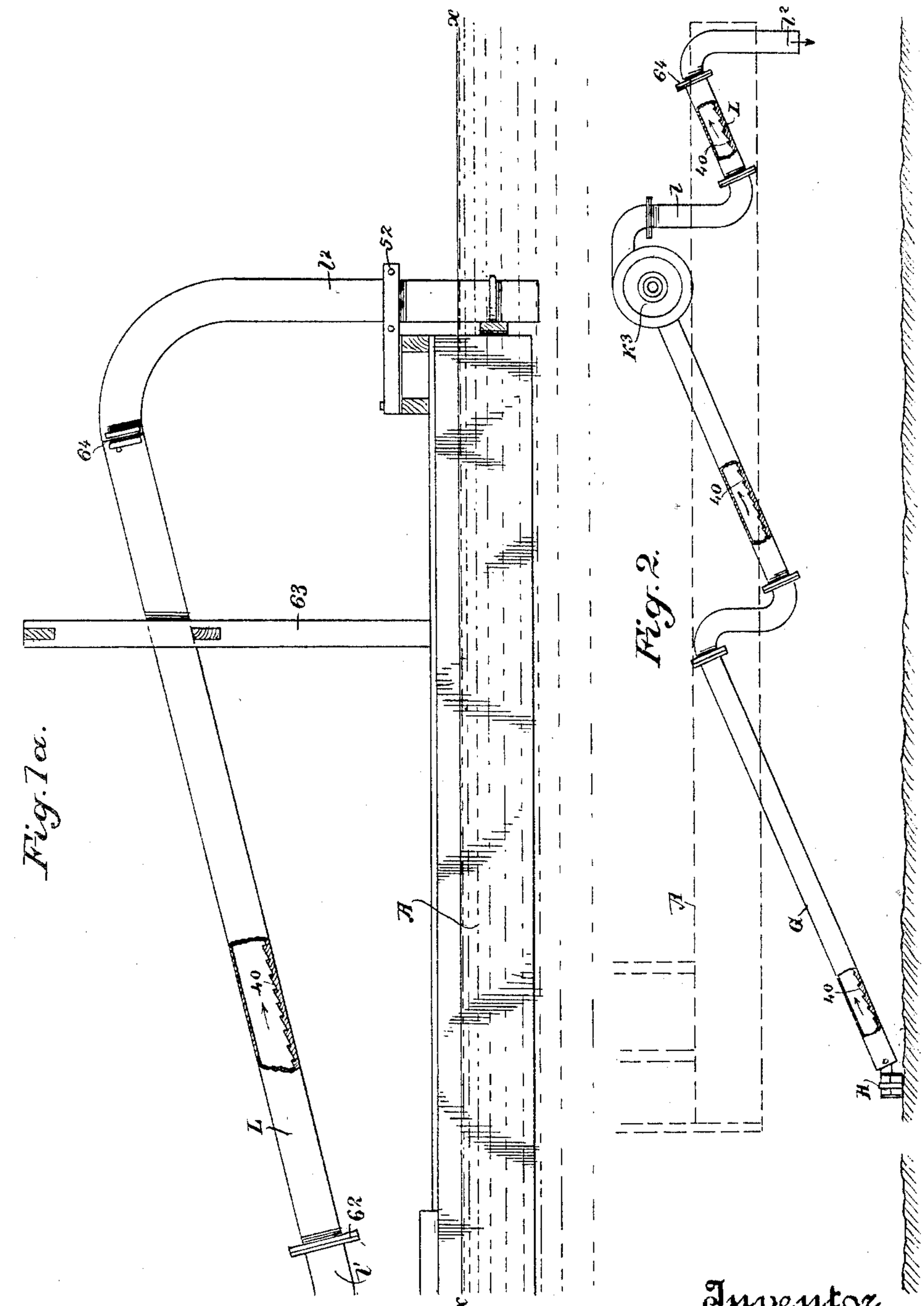

Fig. 1a.

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 3.

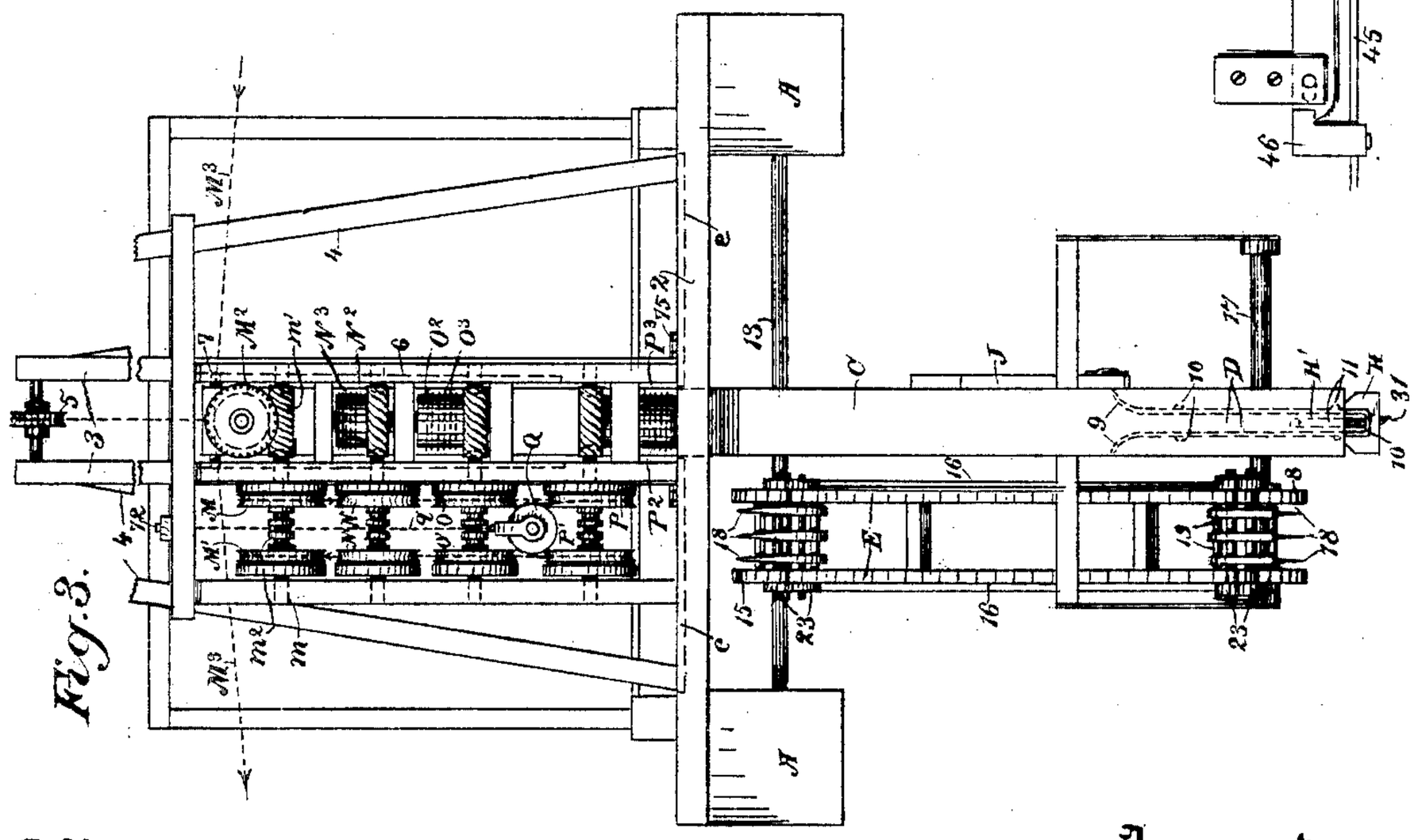


Fig. 4.

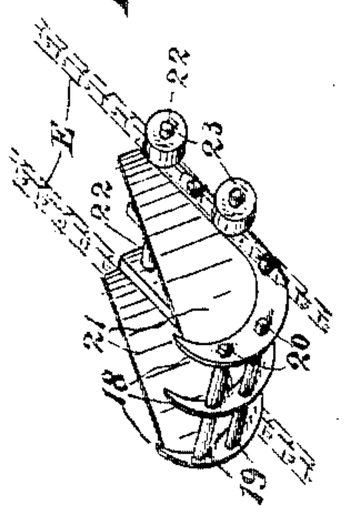


Fig. 5.

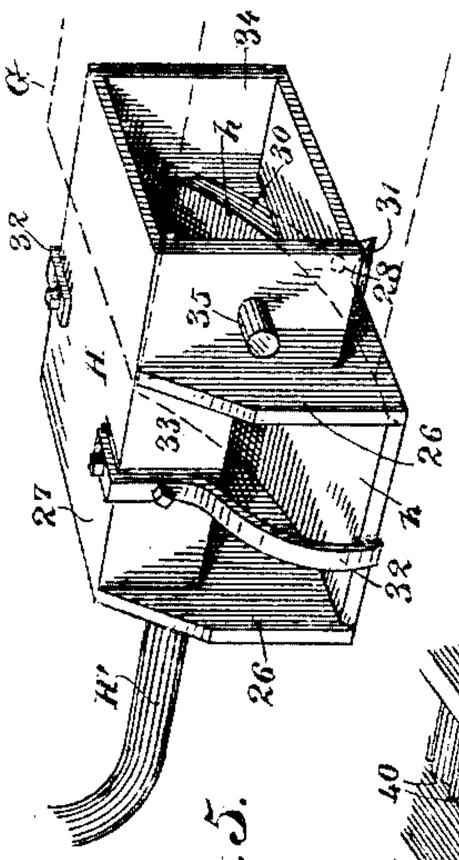


Fig. 6.

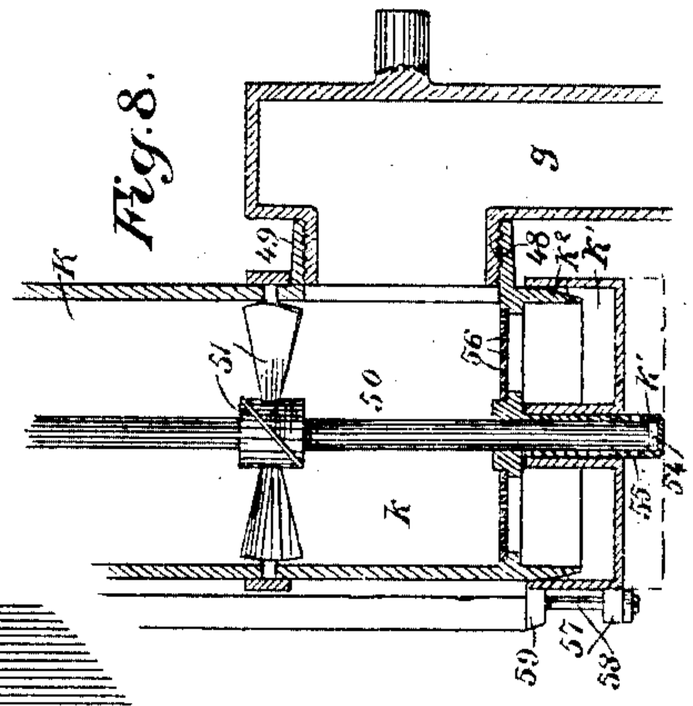


Fig. 7.

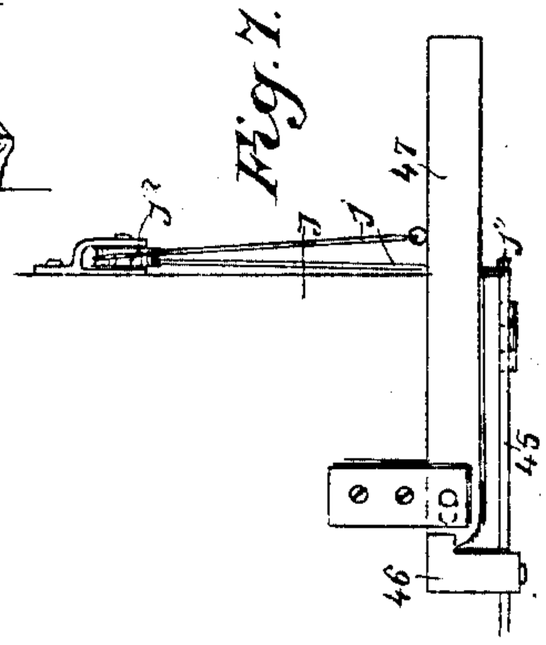
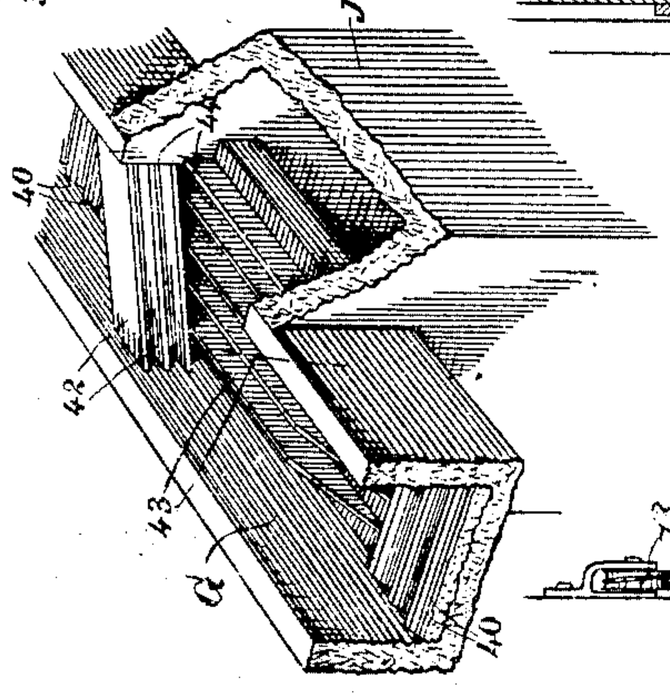


Fig. 8.



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H. F. Ascheck

Inventor
Alexander W. Lockhart,
By Dewey Strong & Co
Attys

UNITED STATES PATENT OFFICE.

ALEXANDER W. LOCKHART, OF SAN FRANCISCO, CALIFORNIA.

GOLD-SAVING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 675,514, dated June 4, 1901.

Application filed September 4, 1900. Serial No. 28,923. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER W. LOCKHART, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Gold-Saving Apparatus; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to an improved apparatus for the saving of gold.

It consists, essentially, of an inclosed inclined riffled sluice through which gravel and water are forced to travel upwardly and through the sluice and its extensions, of an endless-chain conveyer or excavator operating in relation to the position of the sluice, a support for the mechanism and means for adjusting and operating the various parts of the mechanism, and of details and peculiarities of parts and construction more fully to be set forth in the following specification and drawings, in which—

Figure 1 is a side elevation of the front part of the machine. Fig. 1ª, Sheet 2, is the rear portion of the machine. Fig. 2 is a modification of the sluice arrangement. Fig. 3 is a front end view of the machine. Fig. 4 is a detail of the fingered bucket. Fig. 5 is a detail of the scraper. Fig. 6 shows that part of the sluice when rocks are delivered into the discharge-box, the top being removed. Fig. 7 is a detail of the automatic device of the dump-box. Fig. 8 shows a vertical section through the lower part of the pump-cylinder and its connections.

My machine is intended particularly for working the auriferous deposits of present river-channels or wherever there is too much water to be diverted to permit of the ordinary working of the gravel and bed-rock by hand. To this end I mount my apparatus upon two floats, that for all ordinary conditions are parallel and securely bridged together at the ends, or instead of two floats I may use one, with a proper central longitudinal opening. I desire the same latitude in the use of a stationary platform.

The floating platform is moored at any point and in any position desired in the stream by three cables, one at the end holding it in the direction of the current and the others running from the sides toward the shores, as will be later shown.

A represents a float or floats substantially bridged or platformed at the ends, leaving an open space between them. Upon the platform 2 is a hoist comprising the uprights 3, properly supported by braces 4. The uprights 3 are connected at the top, carrying between them a pulley-wheel 5. These uprights are slotted or grooved at 6 through their length on their opposing parallel sides. One end of a hoist-arm C slides between the uprights 3, being supported by the pins 7 in the guides 6. The lower end of this arm C carries a drum 8. Adjacent to this drum and upon C is a sluice-guide D. This guide is composed of the bars 9, having their upper ends outwardly flared, connected by the bar 10 at the bottom, and supported away from the arm C by the standards 11. At the opposite end of the float is the platform 12, conveniently carrying the driving mechanism, engines, &c. Journaled at 13 in the supports 14 is a drum 15. Attached pivotally to 14 also by these journals 13 is a beam 16, which is likewise pivotally connected with the arm C by the journals 17, which also carry the drum 8.

Around the drums 8 and 15 extends the endless-chain conveyer or excavator E, having the toothed or fingered carriers F. These carriers or buckets are composed of the curved fingers 18, separated by the sleeves 19, through which pass securing-bolts 20, firmly joining the parts together. The two outer fingers 18 have wings or walls 21. F is held in the links of the chain by bolts 22, having large roller-heads 23. As the beam 16 lies between the two planes of this endless chain, these rollers 23 are adapted to run upon the upper side of the beam, and so support the load of heavy rock carried by the carrier F on its upward movement.

G is an inclined lift or closed sluice resting at its lower end by its connections in the guide D. At its upper end it is flanged and bolted at 24 to a similarly-flanged piece *g*. At the lower end of G is attached the scraper H. (Shown in Fig. 5.) H is made as follows: The walls 26, having their upper corners cut away, have secured between them a box-like struc-

ture 27, whose bottom is open. The depth of 27 is less than the height of 26. Central of and just above the lower edge of 26 is swung the scoop *h* upon the pins 28. This scoop has a concave bottom, and its sides 30 have angular projections 31. Fastened upon 27 are pieces 32, extending down to the outer edge of 29. There may be one or more pieces 32 upon each side of 27. The lower edges of the downward extensions 33 of 27 are so arranged as to contact with one or the other of the edges of 29. In other words, whichever way the scoop *h* may tilt upon its pivots 28 one or the other of its outer edges will rest against the edge of the relative side 33. One of the walls 26 has an opening corresponding approximately to the size of the end section of the box 27. About this opening is a flange 34, fitting into the end of the closed sluice G, to which it is attached by the pins 35 and turnable thereon. Through the opposite wall is admitted a pipe H′. This pipe, with its connections, is sufficiently stable to support the end of G and H in the guide D and is further supported by the braces 36 upon G. At the end of H′ is attached a hose H^2, intended to reach into the crevices and unevennesses of the bed-rock that would be passed over by the scraper H.

By the upward suction in the closed sluice G finer and more valuable portions of gravel are drawn in through H^2.

About the end of G is a strap 37, having a suitable connection with the rope O^3, which latter, passing over the pulley 5 and upon a suitable drum O^2, further supports and regulates the position of G.

The position of H and E is such that the points of the hooks F at the lowest point on their downward movement are level with the bottom of H or even a little lower than the bottom of H. Under some conditions, where the stream is being worked from side to side, it is found desirable to have an excavator E, with its hooks, supports, &c., on either side of the closed sluice G.

The construction of G is of particular importance in my invention. The gravel throughout most of its travel in the machine is forced to move contrary to the law of gravitation. As the object of sluicing in whatever form of machine is to save the gold, there must be riffles or pockets of some form in the gravel-carriers. These riffles 40 I have shown as transverse angular depressions in the bottom of G, having a vertical wall and inclined in the direction of the current. Thus instead of the gold lodging against a riffle on the side toward the source of the current, as in all gravity-sluices, the gold falls into these depressions 40 and away from the source, and the gravel is allowed to pass on through the machine. By making the riffles in this manner the friction of the gravel and water in the sluice is very greatly reduced. Quicksilver is admitted to the sluice and the riffles through a stoppered opening, as 76.

Near the upper end of G and attached thereto is a "dump-box" J, having a greater width than and extending upon one side of G. The wall of G upon the side retaining J and within the confines of the latter is cut away at 44, leaving about one-third of the height of the wall above the bottom of the sluice. From the edge of this cut-away wall extend parallel pieces 42 diagonally across to the opposite solid wall of G and in the direction of the lower end of G. Upon the bottom of G are parallel and longitudinal riffles 43, their front ends terminating beneath the cross-bars 42 and extending in the sluice a distance about equal to the length of the opening 44. The bottom 45 of J is hinged and has a catch 46 engaging with the weight-lever 47. The bottom or door 45 is closed and worked in unison with the lever by the cord *j*, attached to 45 at *j′* and running through the pulley j^2 on the longer vertical end of J.

The piece *g*, forming the upper end of G, is turnably connected with the part *k* of the vertical conveyer K or extension of G by the exteriorly-threaded nipple 48 upon the former, *g*, engaging with the interiorly-threaded nipple 49 on *k*.

Within K is arranged a suction-pump of any approved and desired pattern. I have shown a simple propeller-pump having a shaft 50, carrying the blades 51. The shaft extends through the upper end of K, surrounded by suitable packing and journaled at 53. At its lower end it is stepped at 54. The lower part of K is made with the casting *k*, having a central downwardly-extending hollow projection *k′*, in which is the step 54. There are openings 55 in *k′*, by which water is drawn in around the shaft 50 and the bearings kept clean and prevented from cutting by the gravel that would otherwise settle around the shaft, as will be more fully explained. The bottom of *k* has openings or perforations 56.

Surrounding *k′* and ordinarily abutting against the bottom of *k* is an annular cup or quicksilver-reservoir K′. This is held in place by an adjusting device, such as the lugs 57, through which passes a screw 58, attaching to similar lugs 59 upon *k*. This annular cup K′ incloses an inwardly-tapered cylindrical extension k^2 of the walls of *k*.

Pivotally attached to the upper part of K at 60 is the head *l* of the closed sluice L. This connection is similar to that of *g* and *k* and need not be again detailed. *l* is flanged and attached at 61 to a flanged curved extension *l′*, which latter is flanged at 62 and attached to the longer inclined sluice L. L is suitably supported at its upper end by a brace, as 63. To L is bolted at 64 a flanged "dump" extension l^2, which is firmly held in the supports 52. In the bottom of L are arranged riffles similar to those in the sluice G. The shape of these sluices may be either square or round. I prefer, with the arrange-

ments shown, to have the sluice G of square or rectangular shape and the sluice L of rounded form.

The driving mechanism and its connections for operating the various parts of the machine may be of any form suited to the work. I have shown the power derived from an engine upon the platform 12, having mounted upon its shaft 65 a pulley 66. From this power is transmitted through the pulley 67 to the drum 15 and the excavator E. Power is also delivered to the suction-pump through the pulley 77, the pulley 68, and the pulley 69 upon the shaft 50.

Power is transmitted to the hoisting and various adjusting devices on platform 2 by the pulley 70 and its belt or cable 71, which latter, as shown, passes alternately over, between, and under the four pulleys M, N, O, and P and around a sheave Q. The adjustment of this cable 71 is made by tightening or loosening the connection *q*, by which the sheave is secured to the framework at 72. The cable 71 returns over in alternate fashion the pulleys M′ N′ O′ P′. Both these sets of pulleys turn freely upon respective shafts *m*. Each shaft has a respective worm *m′*, operating respective drums M^2 N^2 O^2 P^2. Fixed upon these shafts and between the pulleys M M′ N N′, &c., are clutches m^2, by which either set of pulleys may be engaged, as desired, and the shafts, worms, and drums revolved in either direction desired, for the purposes shortly to be shown. The clutches m^2 are operated by respective levers m^3.

The float is secured by three cables: P^3, suitably anchored upstream at 25, passes around the drum P^2. To each side of the float are cables M^3, which pass around the longitudinally-disposed drum M^2. M^3 may be a single cable wrapped a number of times around the drum M^2 to prevent slipping. As the drum M^2 is revolved the cable upon one side of the float is wound up and the other unwound, and the vessel, swinging in an arc of which the anchor-point is the center, is moved or directed in any desired position.

To the drum N^2 is attached the rope N^3, by which the hoist-arm C and its connections are raised or lowered. The rope N^3 is suitably attached to C, as at 39, and passes over guide-pulleys, as 73. Around the drum O^2 is the rope O^3, by which the elevation of sluice G is operated. O^3 passes through suitable guides, as 74, in winding upon the drum.

That the hoist-arm C may be properly supported intermediate of its ends it is held in narrow longitudinal guides *c*. These guides prevent any side movement or strain. These guides are hinged or pivoted centrally, as at 75, and are ordinarily secured at their ends. When it is desired to raise the hoist-arm and sluice G to or above the level of the float, the guides *c* are loosened at their ends, and, turning on their pivots 75, made to lie in a vertical position and out of interference with the parts to be elevated.

Having described the various parts and their relation to each other, the operation of the machine would be as follows: The float is moored over the point to be worked. The hoist-arm C, carrying the lower end of E, is lowered, as is G, to a proper position upon the gravel-bed. The purpose of E, with its fingered buckets F, is to loosen the gravel and to take up the larger rocks and boulders too large to pass through G and carry them out of the way of the scraper H and dump them over the upper end of the beam 16 upon the tailings-pile or into the portion of the river already worked. As stated, the parts E and G are closely correlated. By the movements of the drums M^2 and the cables M^3 the float is swept gradually back and forth across the channel. The continual revolution of E loosens the gravel and sorts out the larger rocks ahead of the scraper H. Ordinarily the hooks F will remove all rocks above a certain size—say four inches. The strips 32 upon H prevent any rock of undesirable dimensions that may escape the hooks entering and possibly clogging the machine. The constant action of the force-pump in K draws in the gravel that is scooped up by H as the end of G is advanced. The downward projections 31 of the scoop *h*, which is pivoted at 28, resting upon the ground, keep the scraper H always open in the direction of the movement of the float back and forth across the stream. It is usual in the operation of the machine to have a diver working continually near the scraper H and directing the movements of the scraper and excavator by any desired system of signals to the operator on the float. The diver has particularly to do with the operation of the suction-pipe H^2 in the crevices, &c. If this suction-pipe should not be desired, the end of H′ could be closed by a cap. The gravel lifted up through the inclined and closed sluice is further subjected to sorting by the action of the riffles 43 and the cross-strips 42. The coarse gravel that is not desired to have go through the rest of the machine strikes these riffles and is diverted by the cross-strips into the dump-box J. The distance between the longitudinal riffles and between the cross-bars determines the fineness of this second sorting. In J the rocks accumulate till their weight is sufficient to lift the weight-lever 47, release the catch, and discharge the load beneath upon a barren or marked part of the river-bed. The moment the load is dumped the lid closes by the action of the weight-lever upon the cord *j*. With each of these opening periods occurs a momentary checking of the travel of gravel in the lower part of G, as water is admitted to the machine through the part J in larger volume than through the scraper's opening. The gravel is then passed on into the vertical cylinder K and to the succeeding closed sluice L and finally discharges at the end of l^2.

x x upon the side of the float may represent the water-line. Consequently the lower end

of l^2, k, K', G, and the greater part of E are ordinarily submerged.

The suction through the openings 55 in k' prevents the accumulation of grit in the bearing of the propeller-shaft. Much of the finer gravel coming into k falls temporarily upon the perforated grating or bottom of k and contacts more or less with the mercury beneath. That this mercury may be kept clean and the gravel occasionally carried from it, it is possible by the adjusting mechanism 58 to lower the mercury-reservoir K', whereupon water is drawn in through the annular opening thus formed between the inner wall of K' and the tapered flange k^2.

Attention is called to the siphon form of L and connections, which aids greatly in forcing the water and gravel through the machine.

To "clean up," the lower end of G is raised by the rope O^3 to a level with or above the float. The quicksilver and amalgam in the riffles then runs or is washed forward and falls into the reservoir K'. Thus is seen the reason for making and shaping the riffles in the particular form shown.

To secure the amalgam in the riffles of L, it is simply necessary to disconnect l^2 at 64 and release the brace connections 63. As the forward end of L is pivotally connected through l at 60 the free end of L is lowered to the deck and the amalgam caught in any proper receptacle.

In Fig. 2 I have shown a modification of my sluice and suction device in which the principle is the same, but I have interposed a centrifugal pump, as K^3.

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

1. The combination in a gold-saving apparatus of a support, an inclined, inclosed, riffled sluice, a suction-pump imposed in an extension of the sluice whereby submerged gravel is lifted and forced through the sluice said sluice pivotally hung at one end and means whereby the opposite end is capable of being elevated to discharge the contents of the riffles into the suction-chamber.

2. The combination in a gold-saving apparatus of a support, a sluice having transverse riffles consisting of angular depressions in the bottom of the sluice, one of the walls of said depressions being approximately vertical and the other inclined in the direction of the discharge end of the sluice, a suction-pump imposed in an extension of the sluice whereby submerged gravel is lifted and forced through the sluice, means pivotally connecting the end of the sluice proximate to the pump, and means whereby the opposite end of the sluice may be raised to discharge the contents of the riffles.

3. In a gold-saving machine, the combination of a support, an inclined inclosed sluice having riffles, pockets extending below the surface of the bottom of the sluice, and communicating with the latter through a side opening, and a discharge-outlet upon the sluice, which is automatically opened and closed, and means for forcing the water and gravel upwardly through the sluice.

4. A gold-washing sluice consisting of a conduit, inclosed except at the ends, intended to rest at an incline, and through which water and gravel are made to traverse it from its lowest point to a higher discharge-point, transverse riffles disposed upon the bottom of the conduit, longitudinal riffles interposed between its ends, diagonal cross-bars in vertical planes above the longitudinal riffles, an overflow-opening in the side of the conduit adjacent to these riffles and cross-bars, and upon the side toward which the cross-bars incline, an inclosure for this overflow-opening, the bottom of which inclosure is automatically opened and shut.

5. In a gold-saving device, the combination of an inclined inclosed, riffled sluice pivotally hung at its upper end whereby its opposite end may be raised and lowered in vertical planes, a scraper extension at the lower and submerged end of the sluice said scraper having a concaved bottom approximately at right angles with the projection of the sluice, and pivotally mounted between opposite ends, whereby gravel is passed into the sluice from either side desired of the sluice, and means for forcing gravel and water upwardly through the sluice.

6. In a gold-saving apparatus, the combination with a floating support, of a sluice, a suction-pump in an extension of the sluice, means pivotally connecting the said extension whereby the opposite end of the sluice may be raised and lowered about this pivotal connection, and an upwardly-traveling, endless conveyer, operating proximate to the inlet end of the sluice and serving to separate the rocks from the gravel and transport the larger rocks to a distant point.

7. The combination in a gold-saving device of an inclined, inclosed riffled sluice, an upwardly-traveling endless-chain conveyer having buckets operating proximate to the inlet end of the sluice and consisting of curved hooks or fingers, whose outer fingers form walls to the buckets, pins attaching these buckets to the links of the chain having large roller-heads adapted to sustain in their upward travel, the chain and buckets upon a support intervened between the upper and lower portions of the chain, said conveyer separating the gravel for admission to the lower end of the sluice, and means for operating the conveyer and of forcing water and gravel upwardly through the sluice.

8. In a gold-saving apparatus, the combination of a floating support, and means whereby the support is adjustable of position in the stream, an inclosed, inclined, riffled sluice having an automatic overflow-discharge, a suction-pump imposed in an extension of the sluice, a mercury-reservoir below the upper end of the sluice and capable of admitting

water through or around it from without to the interior of the sluice or its extensions, one or more upwardly-traveling endless-chain conveyers inclined similarly to the sluice, having toothed carriers, for removing rocks from adjacent to the inlet end of the sluice and transporting them to a distant point, the points of these carriers adjacent to and at or below the level of the inlet to the lower end of the sluice, and a mechanism whereby the lower ends of the sluice and conveyers are elevated or lowered.

9. The combination with a gold-washing inclosed suction or hydraulic sluice, of a discharge-box, consisting of a receptacle attached to the sluice and covering an opening in the side thereof, said receptacle having a hinged bottom and a weight-lever, one end of which engages a catch upon the edge of the bottom opposite the hinge, connections between this weight-lever and hinged bottom whereby the load upon the bottom of the box releases the lever and allows the rocks to be dumped and whereby the hinged bottom is closed again as soon as released of its load, and means for projecting rocks or other material from the sluice into the discharge-box.

In witness whereof I have hereunto set my hand.

ALEXANDER W. LOCKHART.

Witnesses:
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CHAS. E. TOWNSEND.