

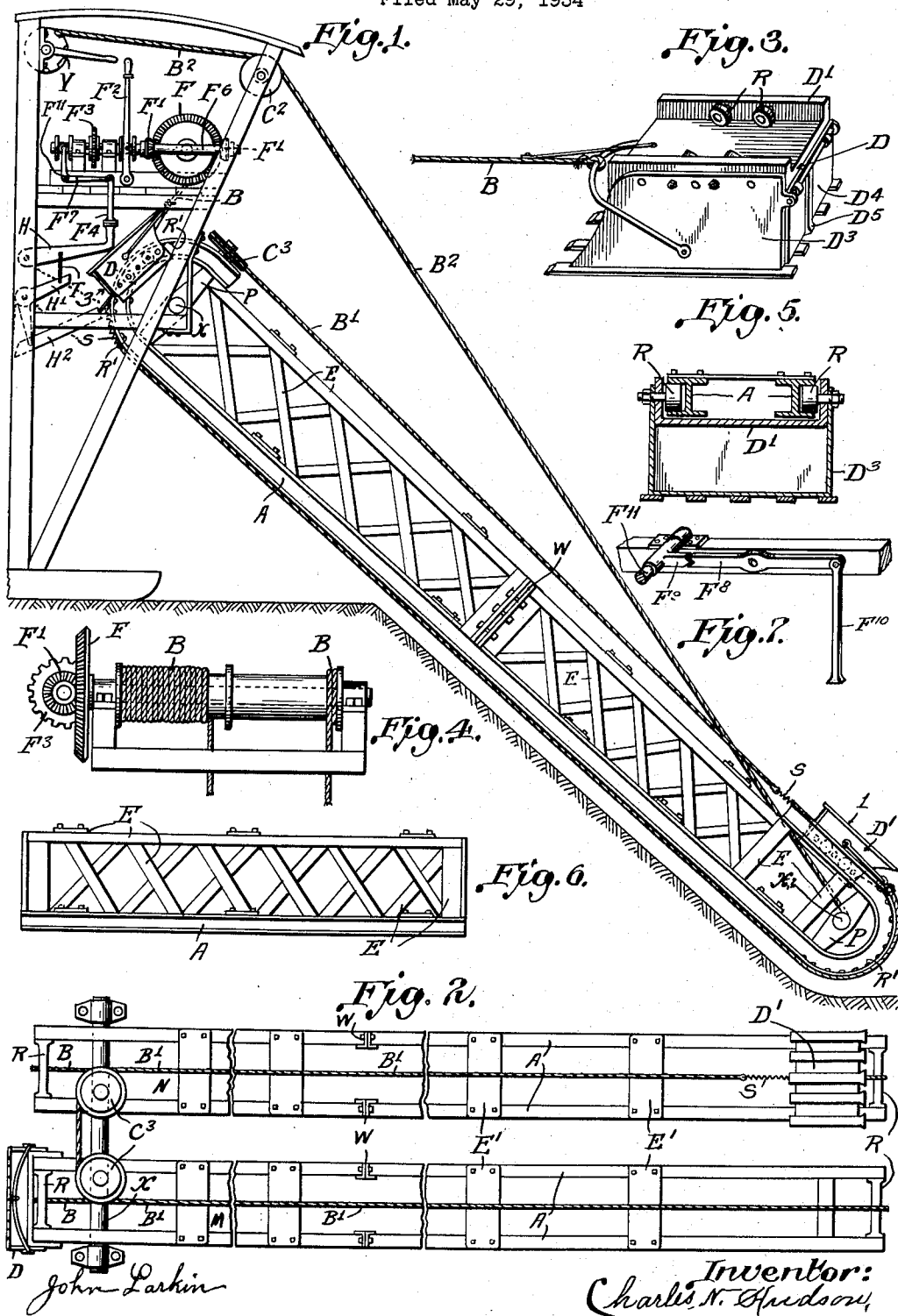
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C. N. HUDSON

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EXCAVATOR

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EXCAVATOR

Charles N. Hudson, Bremerton, Wash.

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1 Claim. (Cl. 37-71)

My invention relates to improvements in that class of excavators employed in dredging water ways, excavating canals, and particularly to excavating and elevating alluvial deposits of sand and gravel in that industry generally known as placer mining.

My object is to provide, by mechanical arrangement, a more efficient means for performing this kind of work than is now used; and by which a gain of 80 to 90 per cent is effected under any and all conditions.

The return of the empty dipper from the point of discharge to the beginning point of the next ensuing cut requires more than half the total time of operation: Therefore the following specifications and provided drawing show an excavator designed to profitably utilize that part of the provided power which is now dormant during the time necessary for the return of the dipper from the point of discharge to the point of cut; and to the end that said dormant power shall be effectively employed during said interim.

To gain my desired objective I replace the single dipper with two dippers, each having the full capacity of the said single dipper, and then provide means by which both dippers are actuated, alternately, by a single unit hoisting gear connected with the original power plant. The result of such arrangement is the excavation of twice the amount of yardage, with the same power and within the same time required for the operation of the single dipper.

The mechanical provisions and connections to enable this proposed economy in excavation are clearly shown in the accompanying drawing, wherein Fig. 1 shows a side elevation of the tram, articulated with the rear end of a suitable frame provided to support it; Fig. 2 is a plan view of the same tram and the two leads, M and N, which comprise it; Fig. 3 shows the dipper in perspective; Fig. 4 shows the hoisting drum and connections; Fig. 5 shows cross section of the dipper; Fig. 6 shows side elevation of one of the four temporary inserts to be used to extend both leads of the tram, if and when required; and Fig. 7 shows a detail of the operating mechanism.

The primal feature of this invention is the tram with its two constituent leads M and N swinging freely upon supporting shaft X, mounted on the frame of the dredge. A plate P, Fig. 1, holds each arc, or curve, forming the ends of the leads in rigid position and provides for the attachment upon shaft X as shown in Fig. 1. The I beams A—A provide the base of each side member of the leads and the outward-facing grooves

are the guides traversed by the dipper rollers R, shown in cross section, Fig. 5.

To fabricate a side member of a lead, two pieces of stock-length angle iron are butted together, as at W, Fig. 1, and held together by a bolted plate, not shown. An arc is turned upon each end of I beams A—A, one of which has greater diameter than the other, and a latticed superstructure E, for rigidity, is fabricated there-with in conformity with the conventional methods employed in construction of booms and derricks, as shown in Fig. 1.

To fabricate a lead, two side members, fully completed with curved beams and superstructure, are placed parallel, approximately two feet apart, and securely tied together by transverse plates, indicated by E', Fig. 2.

Each lead carries a dipper comprised of four parts, the head, the shell, the door, and the bail, shown in Figs. 3 and 5. The head is comparable to a short section of structural channel steel, wide enough between flanges to encompass both guides of the lead and with flanges high enough to cover the guides. Two rollers R, rotative upon and supported by shouldered gudgeon pins, set through the flanges, with threaded ends projecting outwardly, are attached to the inner side of each flange and traverse the outwardly facing channels of the I beams. The shell D3 is formed of a single piece of heavy sheet steel with right angle sides. Vertical slots are cut in the upper edges of each side to permit adjustment to the projecting gudgeon pins. Two additional bolts through the shell and flange on each side hold the shell firmly to the outer sides of the head flanges. Several flat bars of steel, called shoes, are securely riveted to the under side of the bottom and extend a few inches beyond the cutting edge of the shell. These front ends may be sharp and used for cutting but preferably they are used for bases to support short teeth of hard steel which may be inexpensively replaced or removed and sharpened when worn. The door, carrying latch D5, is hingedly mounted on the upper rear end of the bucket. The bail is pivotally connected to the sides of the bucket. The draft rod is attached in the conventional manner, but at a point midway of the width of the head. At the rear end immediately over and above the hinge rod of the door, is attached an adequate spiral spring S, Figs. 1 and 2.

The tail line B' traverses both anchor sheaves C3 and is connected by spiral springs S to the rear end of each dipper. It is of vital necessity in preserving tautness of the head lines B to insure

winding and unwinding of the said cables around the drum barrel. The alternate wrap and unwrap of the head line cables around the drum barrel causes the dippers to ascend or descend their respective leads in like alternating manner, and any looping of either cable, otherwise possible, is prevented by the constant tension exerted by the tail line through its connection with the rear end of each dipper.

10 The hoisting mechanism located upon the deck of the pilot house comprises a single drum of such diameter and length as to accommodate the head line cables of dippers D and D1 in fair alignment and with but a single layer of cable wrap for
15 each, as shown in Fig. 4.

Main gear F is attached to the end of the shaft supporting said drum and athwart the face of this gear F is located the power shaft F6 to which is securely attached two pinions F1 at such distance apart that, when they are in neutral position with connected lever F2 vertical, each is clear of engagement with main gear F, as in Fig. 1.

25 The gear by which power is transmitted to shaft F6 is designated by F3, and may be either cog or sprocket with a keyway cut in the hub. It is held in alignment with its driving member by two substantial bearings. Shaft F6, fitted with a feather key for sliding in the keying of the sprocket, is shifted longitudinally back and forth as pinions F1 are meshed alternately with gear F. The mesh lever F2 is pivoted to the frame and may control the shifting of the shaft by a yoke operating in a collar. It is obvious that the
30 release of either pinion enmeshed with main gear F must per force bring said lever into the vertical position shown and that to mesh the opposite pinion the said lever must be further advanced by the operator. Thus all engagements of gears are made by use of mesh lever F2. All releases are automatically produced by dippers contacting trip lever H which, through link F4 and bell crank F7 secured on shaft F11 operat-
35 ing a yoke in another collar fixed on the shaft, moves the shaft F6 sufficiently to release the enmeshed pinion and bring mesh lever F2 into vertical position. The hoisting drum remains motionless until the operator manipulates lever F2 to enmesh the desired pinion with main gear F.

50 In the automatic stopping of the hoist, shaft F6 must be shifted in one direction by one dipper and in the opposite direction by the other dipper. Figure 7 illustrates the mechanism used for stopping the hoist by the dipper on the far side of Fig. 1. Tripping lever H for that dipper is arranged to actuate thrust link F10 connected to lever F8 which in turn is arranged to swing lever F9 through the cam arrangement. Lever F9 is secured to shaft F11 which in turn is connected to the bell crank F7. From this arrangement it will be seen that an upward thrust on link F10 will produce a clockwise movement of shaft F11 and thence a forward shifting of shaft F6 to stop the hoist.

65 Lever F2 can not be moved, inadvertently, in the wrong direction, because dipper D is still in contact with trip lever H until said lever F2 is thrown to mesh the opposite pinion. As shown in the drawing the top of said lever can not be moved in a direction toward main gear F, but can and must be moved in the opposite direction.

70 A double ratchet drum Y, Fig. 1, is located in the pilot house at a point most convenient to the operator's hand. The extremity of each lead M and N, Fig. 2, is connected with drum Y by its

respective suspension cable B2, by means of which the point of either lead may be raised or lowered at will. Vertical flexibility and independent action of the leads is both desirable and necessary in avoiding boulders, dredging channels, and in
5 meeting various emergencies encountered in excavating placer gravel or cleaning bed rock. The double ratchet drum Y is geared to be easily operable by hand with the tram in horizontal position; and still more easily manipulated at an inclination of about forty five degrees, which is the degree of cutting slope generally maintained by excavators. With the tram leads working at the said inclination of forty five degrees the dead weight of the ends of the leads is about adequate for a proper "feed" of the dippers into the face of the cut, requiring hand manipulation to very little extent except in avoiding large boulders.

The installation and adjustment of the dippers to their respective leads and completion of the
20 necessary cable connections will now be considered. Dipper D1 is first placed in an inverted position upon the point of lead N and advanced until the rollers R are fully entered within the guides whereupon it is temporarily secured. Dipper D is placed in a likewise inverted position upon the extremity of lead M with its rollers R likewise entered into the guides. This dipper D is now pushed downward around the curve, on-
25 ward and upward until the point of automatic discharge is reached, shown at 3, where it is also temporarily secured until the attachment of its headline with the hoisting drum has been made. The head-line attached to the bail of dipper D1 is now passed downward and around the curve
30 at the extremity of lead N, thence centrally upward beneath said lead N to its respective connection with the hoisting drum. While the dippers still occupy these relative positions, one at the point of discharge upon lead M and the other at the extremity of lead N, the tail line B1 is connected to the rear end of each dipper with spiral springs S.

First one end of the said tail line B1 is attached to the spiral spring S which in turn is attached to the rear end of dipper head D1. From this connection the said tail line leads centrally upward over the surface of lead N to and around the anchor sheaves C3, thence downward centrally over the surface of lead M to and around
45 the extremity of said lead M, thence centrally upward along the under side of said lead to the connection with spiral spring S, attached to the rear end of dipper head D.

Thus with the tram swinging upon the shaft
55 X, located centrally through the centers of the curves at its head end, with the extremity of each lead supported by its respective suspension cable B2 and with all cable connections of the dippers completed, the relative and alternate action of the dippers may now be visualized by the manual rotation, back and forth, of main gear F as it functions in the winding and unwinding of head-lines.

By rotating main gear F in contraclockwise direction the head-line connected to dipper D1 winds up while simultaneously the head-line connected with dipper D unwinds at the same identical speed; and because D gives way fully as rapidly as D1 can take it there is no more "pull" exerted upon the head-line of dipper D1 than necessary to cut and fill. Exactly the same condition obtains when dipper D is making the alternate cut and fill under lead M with dipper D1 descending lead N. With continued contraclock-
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wise rotation of dipper D1, with its burden of gravel, will contact trip lever H, release its load in chute H2 by contact of latch D5 with the edge of the chute, disconnect its hoisting pinion F1 from main gear F and stop further motion of the hoisting drum. With clockwise rotation of main gear F, dipper D will be drawn upward while dipper D1 descends, and will contact trip lever H, discharge its contents into the chute H2, release its hoisting pinion F1 and bring the hoisting drum to a full stop, exactly as dipper D1 performed. Lever F2 must be operated by hand, following the contact of either dipper with trip lever H to again start the hoist.

The spiral springs SS, shown attached to the rear end of each dipper and traversing around anchor sheaves, as described, are obviously for the preservation of tautness throughout the entire connection. Therefore, the vertical gudgeon pins, upon which the sheaves rotate, are rigidly set in adjustable slotted plates, (not shown), by means of which the tension of the said springs may be renewed whenever any slackness develops. These anchor sheaves are located and attached to the longitudinal top plates of the superstructure of each lead, immediately over and above shaft X, as being the point causing minimum torsion on the tail line due to the independent raising and lowering of the extremities of the leads.

The curves, or arcs, at either end of each lead should be at least full half circles, and the purposes of each are as follows. Those at the lower extremities of the leads enable the complete inversion of the dippers, which provides more reliable latching of the door without the use of cumbersome counterbalances and gives to the dippers a sweeping motion over the bed rock prior to beginning each cut and fill.

When an up-drawn dipper begins traverse of this curve it is thereafter equi-distant from the

center of the curve at any point of the periphery and enables the establishment of a constant point for discharge. With the dipper held in suspension by its head-line, it is apparent that the extremity of the tram may be raised or lowered to any point between vertical and horizontal without in any way affecting the dipper or the said constant point with which the dipper is in contact: Therefore, regardless of tram inclination, the same point of discharge is always available.

Guiding sheaves may be placed centrally between the curves at each end of each lead to support the cables around the curves and eliminate friction, but preferably a number of small rollers, fitted in suitable bearings, at close intervals, are placed transversely across each lead around the curves at each end, for accomplishing the same purpose, shown at R1.

Manifestly, in its operation, the frame to which my excavator is attached rests upon the ground to be excavated and is moved forward intermittently as the excavation progresses; thus preserving the desired slope of cut and inclination of tram. The arrangement of the independent leads provides means for avoiding boulders until they are taken from the face of the slope and removed from further interference.

Obviously, changes may be made in the form, dimensions and arrangement of my invention without departing from the spirit thereof.

What I claim is:

In a dredging apparatus, the combination of a pair of leads mounted on the dredger for vertical swinging movement independently or together, each of the leads carrying a scoop mounted for reciprocatory movement along the lead, means for reciprocating the scoops and means for connecting the scoops so that they operate alternately in performing their digging operation.

CHARLES N. HUDSON.