C. N. HUDSON.

EXCAVATOR.

APPLICATION FILED FEB. 17, 1916.

1,281,379.

Patented Oct. 15, 1918.

4 SHEETS—SHEET 1.

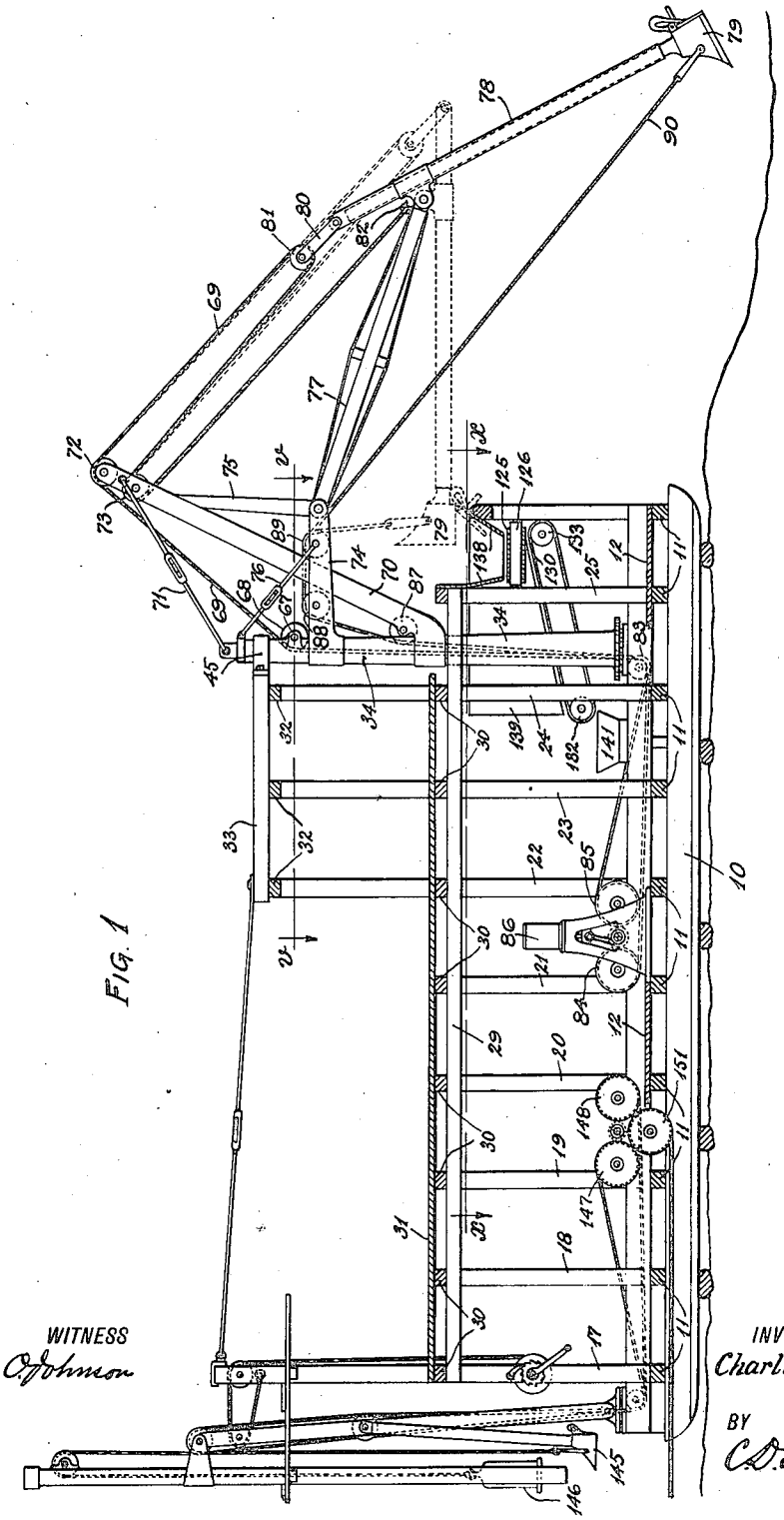


FIG. 1

WITNESS

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4 SHEETS—SHEET 2.

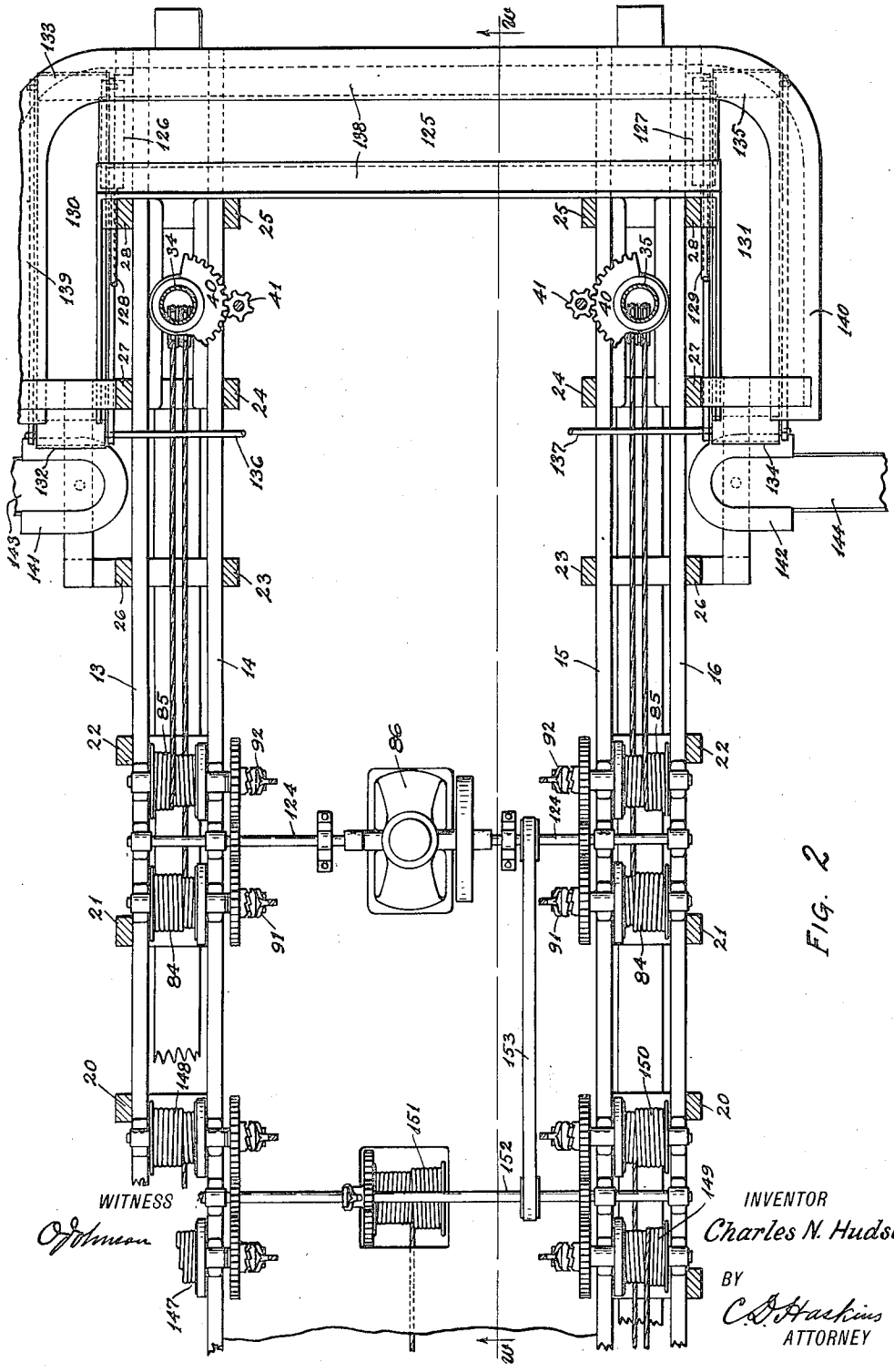


FIG. 2

WITNESS

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4 SHEETS—SHEET 3.

FIG. 3

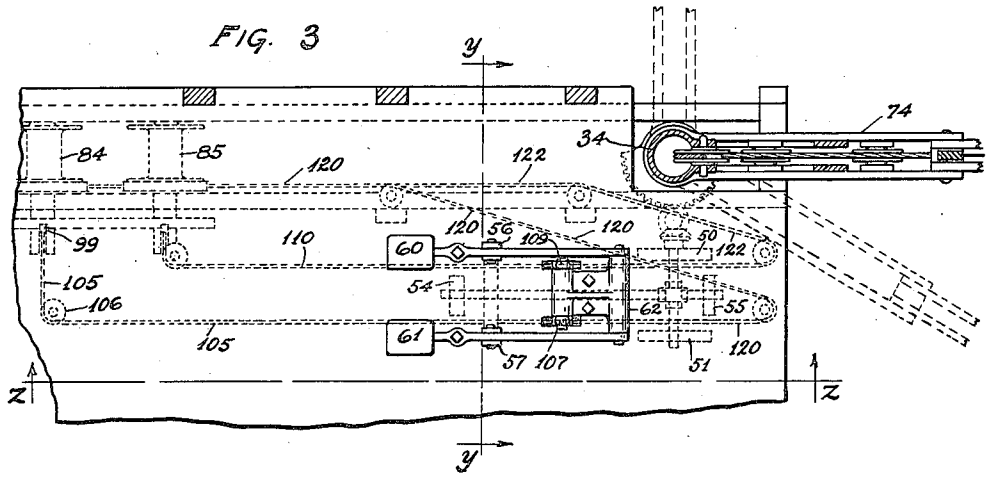
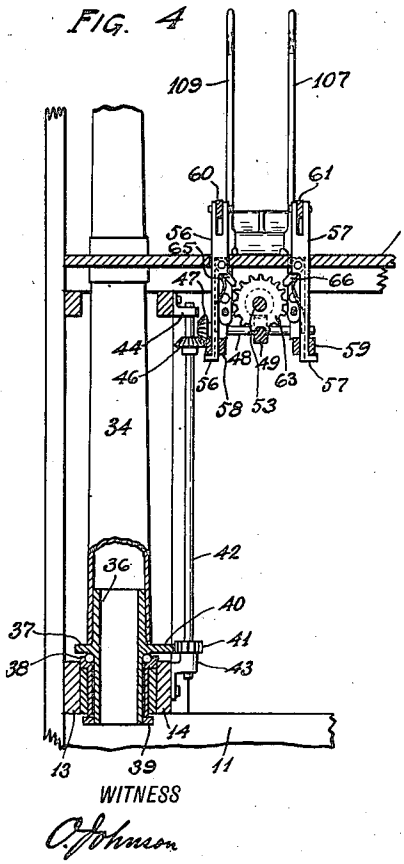


FIG. 4



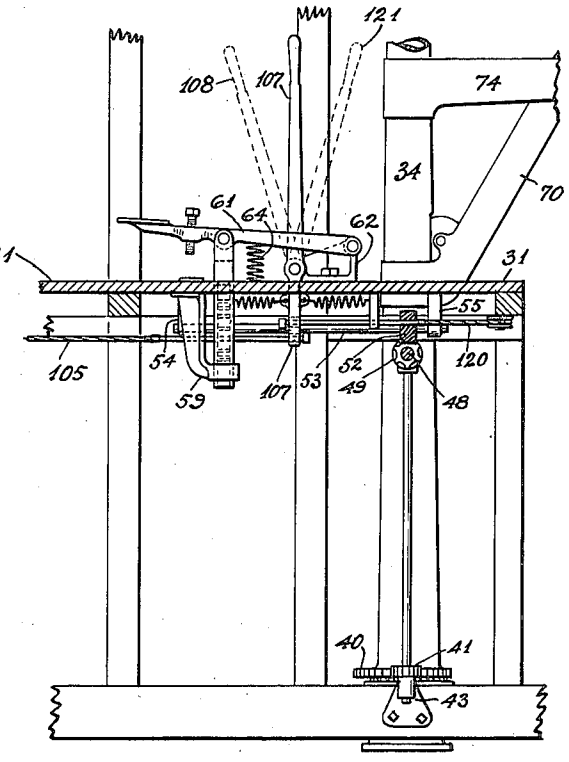


FIG. 5

WITNESS

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4 SHEETS—SHEET 4.

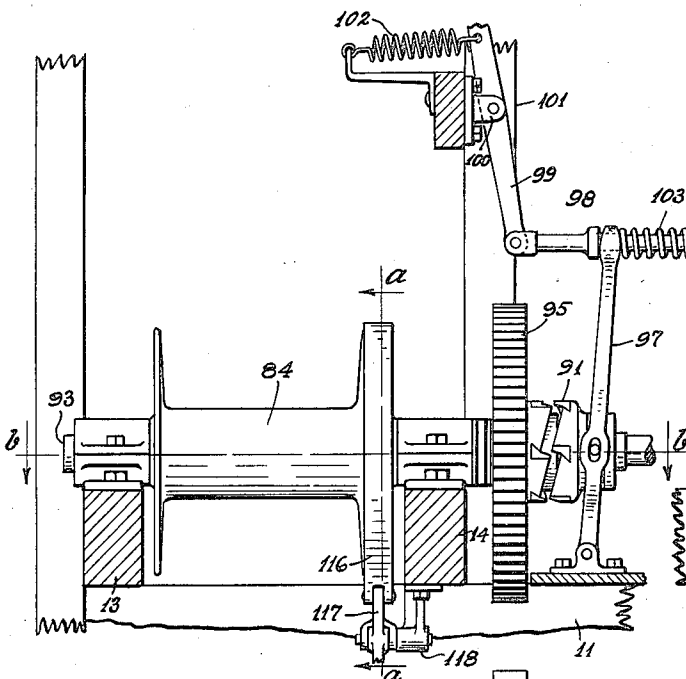


FIG. 6

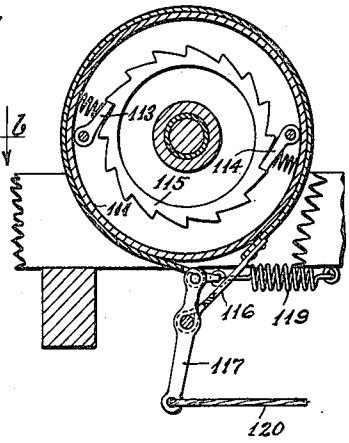


FIG. 7

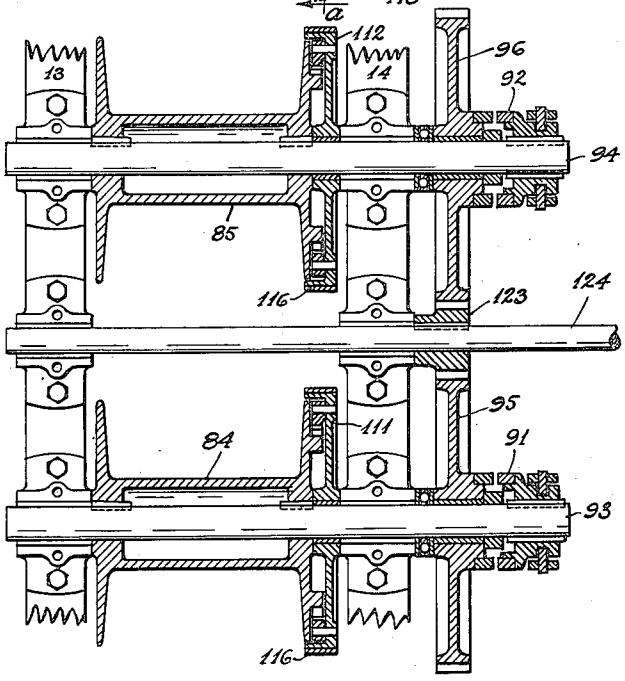


FIG. 8

WITNESS

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UNITED STATES PATENT OFFICE.

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EXCAVATOR.

1,281,379. Specification of Letters Patent. Patented Oct. 15, 1918.

Application filed February 17, 1916. Serial No. 78,993.

To all whom it may concern:

Be it known that I, CHARLES N. HUDSON, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented a certain new and useful Improvement in Excavators, of which the following is a specification.

My invention relates to improvements in excavators of that class which is adapted to be actuated by steam engines or electric motors, and the object of my invention is to provide an excavator which shall embody dipper-like shovels in association with machinery disposed on a float, to adapt it to dredge a channel of a body of water, or upon a movable support, to adapt it for use in the operation of grading the road-beds of railroads and highways and for operating upon mineral bearing earth of placer mines.

A further object of my invention is to provide an excavator whose plan of construction is such that, in its operation, its shovels shall be actuated to descend to a distant point to be filled with earth by their movement toward the base of the excavator to a vertical line adjacent to said base and thence upwardly; the filled shovels then being moved to deposit their contents into the hopper of an associated conveyer, whereby the weight of said shovels with their heavy contents is advantageously raised in a vertical line near the base of said excavator.

An additional object of my invention is to provide such an excavator with means for preparing a path in which it may be moved over the ground to be excavated as work of excavation proceeds, its excavating shovels and their associated levers being disposed to extend over its rear end.

I accomplish these objects by devices illustrated in the accompanying drawings wherein Figure 1 is a view, in vertical section on broken line *w*, *w* of Fig. 2, of an excavator embodying my invention; Fig. 2 is a fragmentary view on an enlarged scale of the same in horizontal section on broken line *x*, *x* of Fig. 1; Fig. 3 is a fragmentary view of the same in horizontal section, on broken line *v*, *v* of Fig. 1, showing details of my invention; Fig. 4 is a fragmentary view of the same in vertical cross-section on broken line *y*, *y* of Fig. 3; Fig. 5 is a fragmentary view of the same in vertical section on broken line *z*, *z* of Fig. 3; Fig. 6 is a view, on a larger scale, in side elevation of details of my invention; Fig. 7 is a view in vertical cross-section on broken line *a*, *a* of Fig. 6, showing some of said details; and Fig. 8 is a view in horizontal section on broken line *b*, *b* of Fig. 6, showing some of said details.

Referring to the drawings, throughout which like reference numerals designate like parts, 10 is a supporting base upon which is fixed a superstructure comprising floor beams 11, floor 12, longitudinally disposed girders, 13, 14, 15 and 16, vertically disposed studs, as studs 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27 and 28, upper deck girders 29, upper deck cross beams 30, upper deck flooring 31, gauntree cross beams 32, and top girders, as top girder 33.

At each of opposite points on the rear end portion of the structure, between the girders 13 and 14 and between the girders 15 and 16, respectively, is a vertically disposed hollow iron derrick mast, as masts 34 and 35, as more clearly indicated in Fig. 2, both of which masts 34 and 35 are operatively associated each with separate excavating mechanisms.

Since both of said masts 34 and 35 and their respective mechanisms are alike in plan of construction and mode of operation I will describe only the mast 34 and its associated mechanisms.

As shown more clearly in Fig. 4, the bottom end of the hollow mast 34 is provided with a sleeve 36 having a flange 37, which sleeve 36 is disposed with its upper end portion projected into the bottom end of the mast 34 with the upper side of the flange 37 in engagement with the end surface of said mast 34 while the lower end portion of said sleeve 36 projects downwardly into a flanged bushing 38 whose lower end rests upon an annular plate 39, which bushing 38 is secured in its position between the girders 13 and 14.

The flange of the bushing 38 is provided with an annular groove on its top side adjacent to its inner edge and within such groove are disposed balls of steel which engage with the underside of the flange 37 of the sleeve 36, thus to constitute a ballbearing upon which the mast 34 may be rotatively moved.

The flange 37 is provided with an integral segment 40 of a gearwheel which is adapted to engage with the pinion 41 which

is fixed on a vertically disposed shaft 42 that is rotatively mounted in bracket bearings 43 and 44, the bearing 43 being secured to a side of the girder 14 while the bearing 44 is secured to a corresponding side of the girder 29, thus a rotation of the shaft 42 will cause the mast 34 to rotatively move, the upper end of said mast 34 being disposed to project upwardly through a bearing 45 provided on the rear end of the top girder 33, as shown more clearly in Fig. 1.

In order to rotate the shaft 42, at required times, there is provided a beveled pinion 46 fastened on the upper portion of said shaft 42 which engages with another beveled pinion 47, which is secured on the end of a horizontally disposed shaft 48, which is provided with a worm-screw 49 and which is rotatably mounted in bearings 50 and 51 (indicated by dotted lines in Fig. 3).

A worm gearwheel 52 is mounted on a shaft 53, disposed at right angles to the shaft 48, to adapt said worm gearwheel 52 to engage with worm-screw 49, said shaft 53 being rotatably mounted in bearings formed in brackets 54 and 55 secured to the underside of the deck flooring 31.

Also mounted on shaft 53 on its other end portion is a toothed-wheel 63 and adjacent to each of opposite sides of said toothed-wheel 63 is a bar (as bars 56 and 57) which is disposed to be vertically slidable in a bracket (as brackets 58 and 59), which bars 56 and 57 extend upwardly through the deck flooring 51 to be articulated with foot levers 60 and 61, respectively, which are hinged both to a bracket 62 which is fastened upon the deck flooring 31, as more clearly shown in Fig. 5.

Extending between the undersides of each of the foot levers 60 and 61 and the deck flooring 31 is a helical compression spring, as spring 64, which serves normally to maintain its associated foot lever in its uppermost position.

Pivotally mounted on each of the bars 56 and 57 is a pawl (as pawls 65 and 66) so disposed that it may engage with the teeth of the toothed-wheel 63 whereby when the foot lever 61 is repeatedly depressed the toothed-wheel 63 and its shaft 53 will be rotated in a clockwise direction and whereby when the foot lever 60 in a like manner is depressed then said toothed wheel 63 will be rotated in a contra-clockwise direction, thus to rotate the mast 34 in a direction as may be required at different times.

As shown in Fig. 1, the hollow iron mast 34 is provided with rearwardly projecting bracket bearings 67 adjacent to the mast bearing 45 and with a slotted opening through the wall of the mast, and mounted within said bracket 67 is the pivot of a pulley 68, which pulley 68 projects through said slotted opening into the interior of the mast whereby a cable, as cable 69, may engage with said pulley 68 to be guided into the space within said mast 34.

A bifurcated arm 70 is rigidly attached to the mast 34 at a point adjacent to the upper side of the girder 29 which arm 70 is formed to project obliquely upward in a rearward direction to extend about half its length higher than the top of said mast 34 and a stay-rod 71 is connected between the upper end portion of said arm 70 and the top end of the mast 34.

The top end portion of the arm 70 is provided with two pulleys 72 and 73 which are adapted to engage with a cable, as the cable 69.

Another bifurcated arm 74 is rigidly attached to the mast 34 at a point adjacent to the lower side of the bracket 67, which arm 74 is disposed to extend rearwardly with its bifurcated members disposed one on each side of the arm 70 and the outer end of said arm 74 is connected with the upper end portion of the arm 70 by a brace-bar 75, whereby the two arms 70 and 74 are rigidly united.

The outer portion of the arm 74 is connected with the top end portion of the mast 34 by a stay-rod 76.

Articulated with the outer end of the arm 74 is one end of a boom 77 to whose other end is articulated the upper end of a shovel carrying member 78, to the lower end of which member 78 is secured a dipper shovel 79 of well known form of construction, whose earth-engaging edge extends toward the mast 34.

Articulated to the upper end of the member 78 is one end of a link 80 whose other end is articulated to a pulley 81 which is adapted to engage with a cable as the cable 69, which cable 69 has one of its ends fastened to a hook 82 disposed on the upper side of the end portion of the boom 77 and extends from said hook 82 to engage with the pulley 73, thence to engage with the pulley 81, thence to engage with pulley 72, thence to engage with the pulley 68, thence to extend downwardly through the mast 34 to engage with one of two idler pulleys (which are disposed side by side under the bottom of the mast 34, as indicated by dotted lines 83 in Fig. 1), thence to extend to one of two winding drums 84 and 85 which are adapted to be actuated by an engine 86 secured to the floor 12.

Adjacent to the lower end of the arm 70 the mast 34 is provided with a slotted opening, and a pulley 87 is mounted between the bifurcated members of said arm 70 in a position to project within said slotted opening and between the bifurcated members of the arm 74 are mounted two other pulleys 88 and 89 spaced from each other.

Attached to the shovel 79 is one end of a

cable 90 which extends therefrom to engage with the pulley 89, thence to engage with the pulley 88, thence to enter the mast 34 to engage with the pulley 87, thence to extend downwardly through the mast 34 to engage with the other one of the idler pulleys 83, thence to extend to the other one of the winding drums 84 and 85, as indicated in Fig. 1; thus a rotation of a required one of the winding drums 84 and 85 will, in an obvious manner, actuate the boom 77 or the shovel 79, or both the boom 77 and the shovel 79 may be actuated at the same time by a simultaneous rotation of both the winding drums 84 and 85.

The rotation of the winding drums 84 and 85 are controlled by lever actuated clutches 91 and 92, respectively, which are associated with shafts 93 and 94, respectively, upon which are mounted gearwheels 95 and 96, respectively, with the hubs of which said clutches 91 and 92 are respectively associated, as more clearly shown in Figs. 6 and 8.

The levers which actuate the clutches 91 and 92 are each like the lever 97 of Fig. 6 in construction and operation, the upper end of said lever 97 being yieldingly connected with a rod 98, as shown, the inner end of which rod 98 is articulated with the lower end of a lever 99 which is fulcrumed to a bracket 100 that is associated with a fixed stud 101, the upper portion of said lever 99 being provided with a helical tension spring 102 which serves, in an obvious manner, to maintain the clutch 91 in disengagement with its complementary member on the hub of the gearwheel 96, the teeth of which clutch 91 and of said complementary member are formed to make a recoil engagement whereby if the strain between the two members of the clutch is greater than a desired predetermined amount then the clutch 91 will be forced from engagement with the teeth of its complementary member by a cam-like action in response to the yielding character of the connection between the lever 97 and the rod 98, said rod 98 being surrounded by a helical compression spring 103 which extends between the lever 97 and adjusting nuts 104, which adjusting nuts 104 may be moved to give a desired tension to the spring 103 whereby if a cable on the drum 84 be subjected to a greater strain than is desired, then the clutch 91 will be disengaged as indicated.

The top end of the lever 99 is connected with a cable 105 which passes around a pulley 106, as indicated by dotted lines in Fig. 3, to extend therefrom rearwardly to connect with the lower end of a hand-lever 107 which is pivoted to one side of the bracket 62, as more clearly shown in Fig. 5, whereby a movement of the upper end of said hand-lever 107, in a rearward direction to the position indicated by dotted lines 108, will actuate said cable 105 to move the clutch 91 into engagement with its complementary member on the hub of the wheel 96 whereby rotary motion will be communicated to the drum 84, and in a like manner another lever 109, which is fulcrumed on the opposite side of the bracket 62, will actuate another cable, indicated by dotted lines 110 in Fig. 3, to cause it to operate the clutch 92 to communicate rotary motion to the drum 85 in an obvious manner.

As shown more clearly in Figs. 6, 7 and 8, each of the drums 84 and 85 is provided with a strap-brake mechanism in association with a pawl and ratchet mechanism, of well known form of construction, whereby said drums 84 and 85 may be released as desired when the clutches 91 and 92 are disengaged to permit the cables on said drums 84 and 85 freely to unwind to lower either the shovel 79 or the boom 77; said brake mechanisms each comprising a flanged disk, as disks 111 and 112, freely mounted respectively on shafts 93 and 94, upon the inner side of each of which flanged disks 111 and 112 are pivoted pawls 113 and 114 which engage with a ratchet, as ratchet 115 shown in Fig. 7, which is integral with the respective one of the drums 84 and 85.

Disposed to surround the flange of each of the flanged disks 111 and 112 is a strap-brake 116, of common form, which is connected with a lever 117 that is fulcrumed on a bracket 118, as shown in Fig. 6, the upper end of said lever 117 being connected with a helical spring 119 which serves normally to actuate the lever 117 to cause the strap-brake 116 to exert braking force on the disk 111, as indicated more clearly in Fig. 7.

To the lower end of the lever 117 is attached a cable 120 which if pulled in a direction in opposition to the helical spring 119 will overcome the effect of such spring thereby to release the brake mechanism, in an obvious manner, to permit its associated winding drum freely to rotate.

As indicated more clearly in Fig. 3, by dotted lines, the cable 120 is extended from the lever 117 rearwardly in engagement with guiding pulleys to connect the lower end with the hand-lever 107, whereby a movement of said hand-lever 107, in a rearward direction to the position indicated by dotted lines 121, will actuate said lever 117 in opposition to the spring 119 to release the brake-strap 116.

The hand-lever 109 in a like manner is connected by a cable, indicated by dotted line 122 in Fig. 3, which cable 122 extends forward to a lever, corresponding to the lever 117, which is associated with the brake mechanism of the winding drum 84.

The gearwheels 95 and 96 are both rotated

by a pinion 123 fixed on the shaft 124 that is connected with the engine 86, which engine 86, manifestly, may be an internal combustion engine, a steam engine or an electric motor.

Extending across the rear end portion of the excavator, between the studs 25 and 26, is an endless belt conveyer 125 mounted on rollers 126 and 127 whose shafts 128 and 129, respectively, may be connected with power driven mechanism, not shown, and beneath each of the opposite ends of said conveyer 125 is another endless belt conveyer, as conveyers 130 and 131 disposed to extend forward in an obliquely downward direction, as more clearly indicated in Fig. 1, said conveyers 130 and 131 being mounted on rollers 132, 133 and rollers 134 and 135, respectively, the shafts 136 and 137 of the rollers 132 and 134 being adapted to be connected with power driven mechanism, not shown.

Adjacent to the top surface of the conveyer 125 is a trough-like hopper 138, which extends throughout the length of said conveyer 125, into which hopper 138 may be deposited the contents of a shovel, as shovel 79, when such shovel 79 is in the position indicated by dotted lines in Fig. 1, and such contents of said shovel 79 will fall on to the conveyer 125 which may be moving in the required direction to deposit such contents on to a desired one of the conveyers 130 and 131, which conveyers 130 and 131 are each provided with trough-like hoppers 139 and 140, respectively.

The contents of the shovels, as shovel 79, may also be moved by rotating the mast 34 or 35 to deposit its contents directly into the hoppers 139 and 140, respectively, to fall directly on to the conveyers 130 and 131, respectively.

Beneath the forward end of each of the conveyers 130 and 131 is a hopper, as hoppers 141 and 142, respectively, which lead into chutes 143 and 144, respectively, which chutes may be extended to a desired point, or they may be associated with a conveyer (not shown), that may be disposed to convey dirt to a desired place of disposal.

In case the excavator is employed for mining in placer mines the dirt conveyed by the conveyers 130 and 131 may be conducted into any suitable gold saving device that may be disposed within the excavator.

Upon the forward end of my excavator, as more clearly shown in Fig. 1, I have provided a dipper shovel 145 and a pile driver 146 associated with operative mechanism of a well known form, which mechanism may be actuated by winding drums 147, 148, 149, 150 and 151, said winding drums being rotated by a shaft 152 that is driven by a belt 153 that is connected to the shaft 124 of the engine 86, as shown more clearly in Fig. 2, and said winding drums may be controlled in their operations by devices (not shown) which are similar to the devices which control the winding drums 84 and 85 which operate the masts 34 and 35 and their associated devices at the rearward end of the excavator.

The shovel 145 and the pile driver 146 are an important part of my excavator, since they adapt it for use in preparing a roadway on which the excavator may be moved in the operation of excavating cuts through uneven grounds as may be required in building railways.

For instance, if, in the progress of excavating a cut the excavator is moved forward to a hummock or mound of earth that obstructs the forward movement of the excavator then the shovel 145 is put into operation to remove such hummock or mound, throwing the dirt thereof to either side of the path of the excavator or if the excavator in its progress comes to a depression or creek, then the pile driver 146 may be operated to drive piles upon which a bridge may be formed to make a passageway for the excavator over such depression or creek.

Manifestly, in its operation, my excavator at all times rests upon the ground to be excavated and its shovels at its rear end are actuated to dip into the cut to be filled by drawing them toward their respective masts, as masts 34 and 35 and then upon being filled such shovels are hoisted directly upward adjacent to the rearward end of the excavator thereby exerting its force more advantageously than would be possible with excavators heretofore made in the operation of which the shovels are filled by moving the shovels away from the excavators and then elevating the filled shovel at a greater distance from such excavator.

The supporting base 10, which comprises two runners disposed parallel to each other, may be replaced by a float or a scow if the excavator is to be used as a dredge.

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

What I claim is:

1. An excavator including a mast, a boom carried by said mast, a motor, a drum and cable operated in one direction by said motor to operate said boom, manually operable mechanical means to control the operation of said drum, manually operable mechanical means to render said drum and cable free to move in the opposite direction, a pawl and ratchet connection between said drum and cable freeing means and said drum, a shovel carried by said boom, a drum geared to the first named drum and to said motor and having a cable operated in one direction by said motor to operate said shovel, manually op-

erable mechanical means to control the operation of the second drum, manually operable mechanical means to render the second drum and cable free to move in the opposite direction, and a pawl and ratchet connection between said second drum and cable freeing means and said second drum.

2. An excavator including a mast, a boom carried by said mast, a motor, a drum and a cable operated in one direction by said motor to operate said boom, manually operable mechanical means to control the operation of said drum, manually operable mechanical means connected to said controlling means to render said drum and cable free to move in the opposite direction, a pawl and ratchet connection between said drum and cable freeing means and said drum, a shovel carried by said boom, a drum geared to the first named drum and to said motor and having a cable operated in one direction by said motor to operate said shovel, manually operable mechanical means to control the operation of the second drum, manually operable mechanical means connected to the second controlling means to render the second drum and cable free to move in the opposite direction, and a pawl and ratchet connection between said second drum and cable freeing means and said second drum.

3. An excavator including a mast, a boom carried by said mast, a motor, a drum and a cable operated in one direction by said motor to operate said boom, manually operable mechanical means to control the operation of said drum constructed to automatically disconnect said drum from the motor when a predetermined strain is placed on said cable, manually operable mechanical means connected to said controlling means to render said drum and cable free to move in the opposite direction, a pawl and ratchet connection between said drum and cable freeing means and said drum, a shovel carried by said boom, a drum geared to the first named drum and to said motor and having a cable operated in one direction by said motor to operate said shovel, manually operable mechanical means to control the operation of the second drum constructed to automatically disconnect the second drum from the motor when a predetermined strain is placed on the second cable, means connected to the second controlling means to render the second drum and cable free to move in the opposite direction, and a pawl and ratchet connection between said second drum and cable freeing means and said second drum.

4. An excavator including a rotatable mast, means to rotate said mast, a boom carried by said mast, a motor, a drum and a cable operated in one direction by said motor to operate said boom, manually operable mechanical means to control the operation of said drum constructed to automatically disconnect said drum from the motor when a predetermined strain is placed on said cable, means to render said drum and cable free to move in the opposite direction, a pawl and ratchet connection between said drum and cable freeing means and said drum, a shovel carried by said boom, a drum geared to the first named drum and to said motor and having a cable operated in one direction by said motor to operate said shovel, manually operable mechanical means to control the operation of the second drum constructed to automatically disconnect the second drum from the motor when a predetermined strain is placed on the second cable, means to render the second drum and cable free to move in the opposite direction, and a pawl and ratchet connection between said second drum and cable freeing means and said second drum.

In witness whereof I hereunto subscribe my name this 21st day of January, A. D. 1916.

CHARLES N. HUDSON.

Witnesses:
FRANK WARREN,
O. JOHNSON.