No. 730,558. PATENTED JUNE 9, 1903

# G. McKAY.

## EXCAVATING APPARATUS.

APPLICATION FILED JAN. 15, 1900.

NO MODEL. 2 SHEETS—SHEET 1.

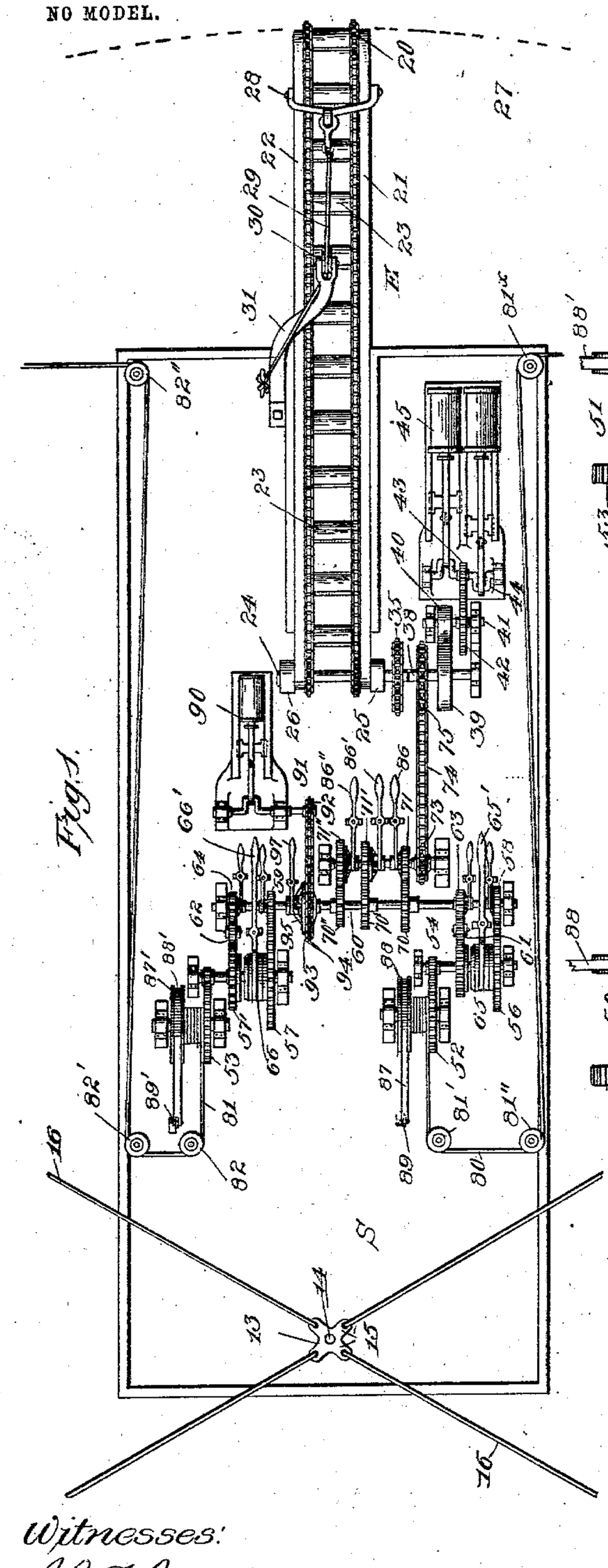

Fig. 1.

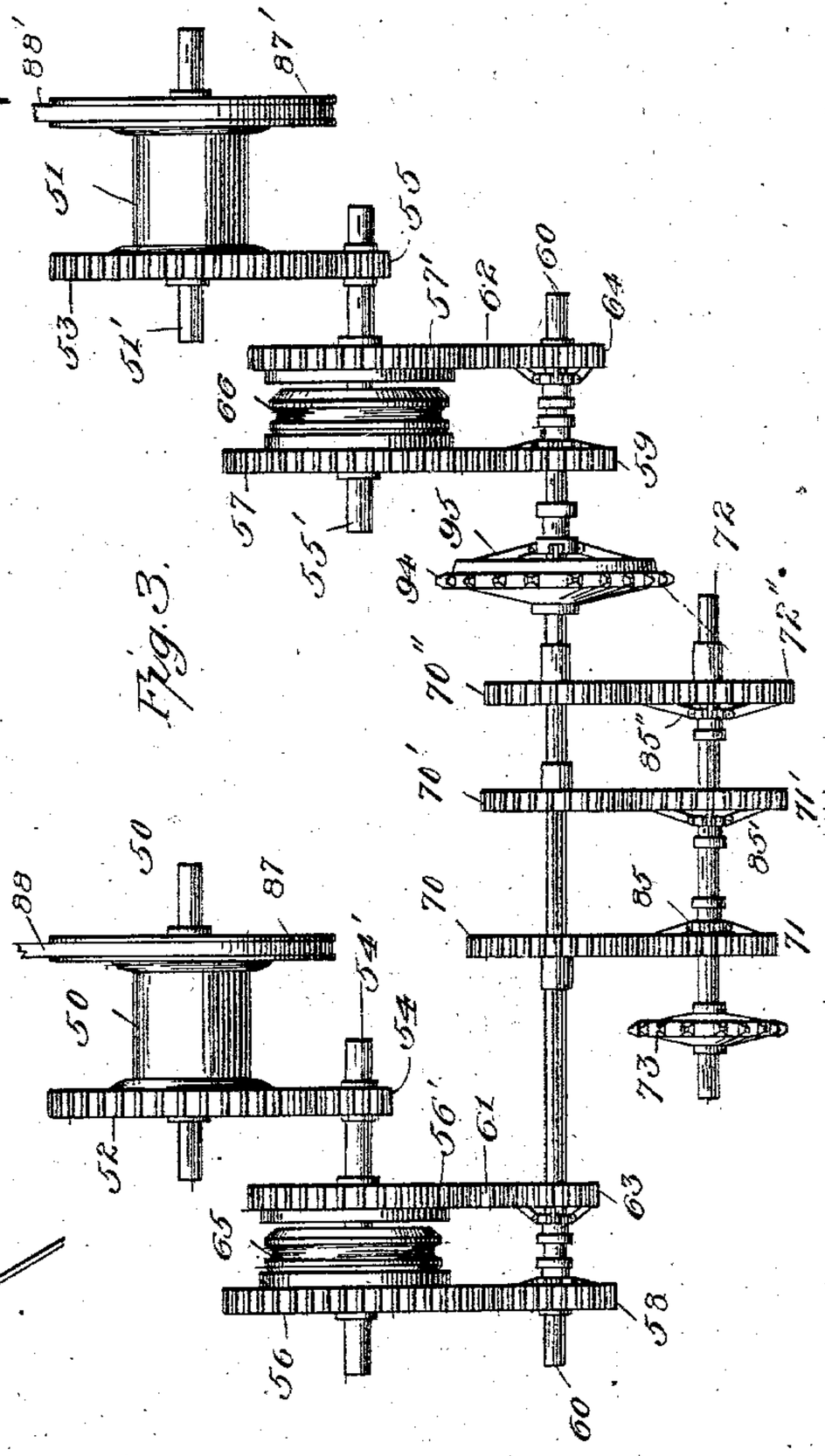

Fig. 3.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

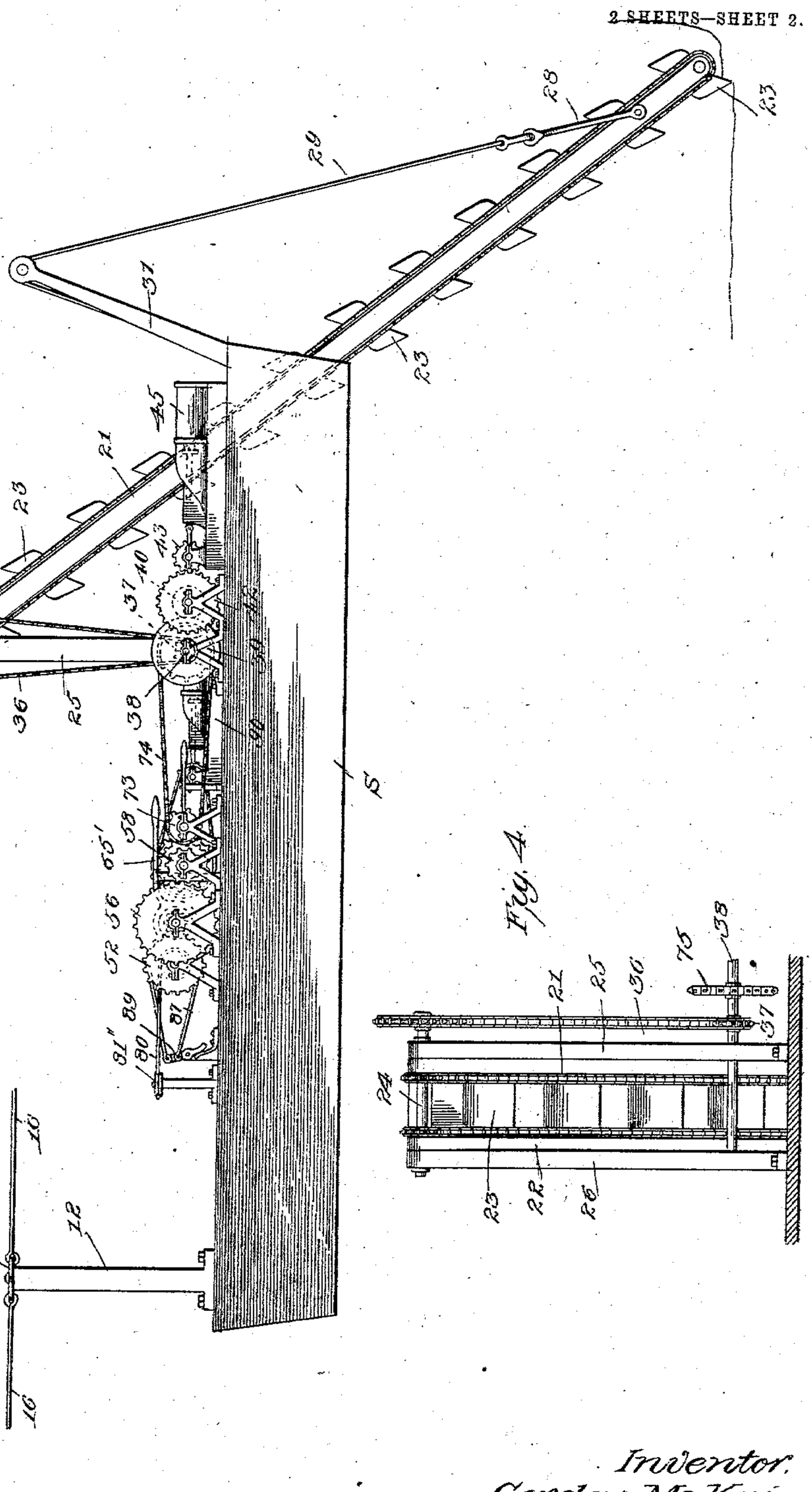


Fig. 4.




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No. 730,558. Patented June 9, 1903.

# UNITED STATES PATENT OFFICE.

GORDON McKAY, OF NEWPORT, RHODE ISLAND.

## EXCAVATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 730,558, dated June 9, 1903.

Application filed January 15, 1900. Serial No. 1,418. (No model.)

*To all whom it may concern:*

Be it known that I, GORDON McKAY, a citizen of the United States, residing at Newport, county of Newport, and State of Rhode Island, have invented an Improvement in Excavating Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to an excavating apparatus, and while it is capable of manifold uses, it is highly advantageous as an adjunct in placer-mining, where the material is taken from the bed of a river or other reservoir of water and supplied to a sluice to be washed therein for the purpose of separating the mineral from the dirt or finer gravel.

The improved excavating apparatus is shown in a simple and convenient embodiment thereof in the accompanying drawings, in which—

Figure 1 is a plan view of said apparatus. Fig. 2 is a side elevation of the same. Fig. 3 is a plan view of a portion of the mechanism for controlling the feed of the apparatus; and Fig. 4 is a sectional elevation looking toward the front, the section being taken just behind the excavating appliance.

The different parts of the apparatus may be sustained in any convenient manner, though they are represented in Figs. 1 and 2 mounted upon a scow or float S, which is adapted to be moored between the banks of a river or pond in such manner that it may swing about a center, so that an excavating or dredging appliance carried thereby may be presented at different angles to the bed of a river or embankment for the purpose of elevating earth to be treated in sluices or to be otherwise disposed of.

The post or standard 12 rises vertically from the bottom or floor of the scow, near the rear or stern thereof, and approximately midway between the gunwales, said post having the plate 13, pivoted, as at 14, to the upper side thereof.

The plate 13 has a series of horizontal substantially radial arms, as 15, (four being shown,) from which the cables or ropes 16 extend, said ropes serving to secure the scow in a desired field of operation and being coiled around "dead-men" or posts driven in the banks or the bed of the river.

By the construction specified the scow can be readily swung around a relatively stationary axis, so that the working end of an excavating appliance carried thereby may be moved in the arc of a circle to thereby enable the apparatus to operate evenly upon the bed of the river or other part being excavated, the said excavating appliance being lowered step by step after each successive stroke.

The excavating appliance is denoted in a general way by E, and it is shown including a chain conveyer, as 20, supported between the side stiles 21 and 22 of a ladder or framing, the conveyer having a series of buckets, as 23, adapted to scoop up the earth and to discharge the same at the upper end of the excavating appliance. The shaft 24 extends through the upper ends of the uprights 25 and 26, mounted upon the scow, and also through the side boards or stiles 21 and 22 of the excavating-ladder, said shaft 24 being in the nature of a pivot for the latter, upon which it can be swung either to raise or lower the same.

The excavating appliance extends diagonally downward and forward from its support and is movable laterally with said support, the arc of movement of the working end thereof or where the buckets strike the earth being indicated by the dotted line 27 in Fig. 1.

The side motion of the excavating appliance is termed the "feed" thereof, and I provide mechanism, hereinafter more particularly described, for operating the scow in such manner that this side or lateral feed is automatically effected, and said mechanism is preferably of such character that this side feed is arrested instantly when a resistance beyond a certain amount is opposed to or is in the path of the said dredging appliance or the scow, by reason of which neither the excavating appliance nor any of the parts of the driving mechanism therefor can be broken, which is a highly advantageous point, as in certain sections of this country repair-shops or expert workmen are not easily accessible, and upon the breakdown of a dredging apparatus a financial loss occurs or the outlay of considerable time is necessary before it can

be repaired and set in operation. I also provide means for instantly and automatically stopping the conveyer when the resistance opposed to its movement passes beyond a certain point, so that the buckets cannot be broken or injured.

The bail 28 is pivoted to the side boards 21 and 22 of the excavating-ladder, and it is connected by a shackle to the hoisting band or rope 29, which passes over the grooved pulley 30, mounted at the end of the mast 31 at the forward end of the scow.

By pulling on or paying off the rope 29 the excavator may be raised or lowered.

In Fig. 2 I have shown one of the buckets 23 as scooping up a quantity of earth, the loaded buckets passing up what is shown as the right-hand run of the conveyer. It sometimes happens that these buckets strike stones or other like obstructions in the bed of a river or embankment, and ordinarily the driving mechanism is of such a character that it continues to operate the conveyer, the buckets, floats, or equivalent devices carried thereby being broken or bent beyond use, and other parts may be broken or seriously injured. The driving mechanism, however, in the case of my improved apparatus is of such a nature that the motion of the conveyer is immediately stopped the moment that an unusual obstruction is encountered.

The normal side feed and the operation of the excavating device are both controlled, preferably, by a common engine, and the connections between the parts include in the present case a frictional power-transmitting appliance, one of the members of which can remain stationary or at rest relative to its companion, so as to assure the stoppage of the side feed, and consequently the elevator or excavating device. The upper shaft 24 carries a sprocket-wheel 35, connected by the sprocket-chain 36 with the sprocket-wheel 37, the shaft 38 of which is supported by suitable standards upon the bottom of the scow S. The said shaft 38 is shown carrying at its extreme outer end the friction-wheel 39, cooperating with the friction-wheel 40, carried by the shaft 41, having the gear 42. The gear 42 meshes with the gear 43, carried by the crank-shaft 44, driven by the compound engine 45 of some suitable type.

While the engine is in operation, the friction-wheels 39 and 40 will be driven through the intermediate parts, thereby to normally operate the conveyer. Should, however, any one of the buckets strike an unusual obstacle or increased resistance to its travel, the elevator will be stopped, its driving mechanism being rendered ineffective by the friction-wheel 40 slipping over the friction-wheel 39, the latter thereby being thrown out of action.

It will be remembered that the side feed of the scow, and consequently of the excavating device, is obtained from the engine 45, whereby such feed can be simultaneously stopped with the throwing out of action of the elevator.

Referring to Fig. 3, two spools or drums are shown at 50 and 51 and keyed to the shafts 50′ and 51′, which are suitably supported. The gears 52 and 53, respectively, are keyed to the shafts 50′ and 51′ and mesh with the pinions 54 and 55, respectively, keyed to the shafts 54′ and 55′. Each of the shafts 54′ and 55′ carry gears designated, respectively, by 56 and 56′ and 57 and 57′, which are loose on their shafts, the gears 56 and 57 meshing with the gears 58 and 59 upon the counter-shaft 60, while the gears 56′ and 57′ mesh with the idlers 61 and 62, which in turn mesh with the gears 63 and 64 upon the counter-shaft 60. Friction-clutches, as 65 and 66, coöperate with the gears 56′ and 56 and 57 and 57′, so that the gears 56 and 57′ or the gears 56′ and 57 can be simultaneously coupled to their shafts, by reason of which the spools 50 and 51 can be driven in opposite directions, one of said spools serving to pay off its cable, while the other one winds on its cable. The shaft 60 has fast thereon a series of differential gears, as 70, 70′, and 70″, which mesh with the gears 71, 71′, and 71″, all loose upon the shaft 72. The shaft 72 has fixed thereto the sprocket-wheel 73, connected by the sprocket-chain 74 with the sprocket-wheel 75 upon the shaft 38, which, it will be remembered, carries the frictional power-transmitting wheel 39. The shippers for the double-acting clutches 65 and 66 are shown as levers 65′ and 66′, pivoted near their centers upon a suitable support and each of them being bifurcated, as is customary, and the branches of the bifurcation having projections lying in grooves in said clutch members. The spool 50 has wound thereon the cable or rope 80, a similar rope 81 being wound upon the opposite spool or drum 51. The rope 80 passes around the direction or guide pulleys 81′ and 81″ in transverse alinement and is continued forward and passed around a similar guide or direction pulley $81^{\times}$ at the extreme forward end of the scow and is then carried laterally and connected to a post or dead-man upon the shore or other convenient place. The cable 81 is likewise arranged, the respective guide or direction pulleys being denoted by 82, 82′, and 82″, the parts 82 and 82′ being in alinement transversely of the scow with the parts 81′ and 81″, while the pulleys $81^{\times}$ and 82″ are similarly disposed at the extreme forward end of the scow, so that a relatively considerable leverage can be exerted by the engine 45 in swinging or turning the scow. The series of gears 71, 71′, and 71″, it will be remembered, is loose upon the shaft 72. For coupling them to said shaft I have illustrated the friction-clutches 85 and 85′ and 85″, the operating-levers of which are denoted by 86, 86′, and 86″.

The purpose of the three coöperating trains of gears carried by the shafts 72 and 60 is to vary the speed of side feed of the scow, and

consequently of the elevator, of the excavating appliance.

The drums 50 and 50′ have upon the inner sides thereof the annular enlarged heads or disks 87 and 87′, embraced by the friction straps or bands 88 and 88′, connected at a point to the rear of said heads or disks to rockers, as 89 and 89′.

The friction-straps serve to apply to the spools with which they coöperate a pressure sufficient to prevent slackness in either of the ropes or cables 80 and 81 as they are reeled off their drums.

It will be assumed that one of the gears 71, 71′, and 71″ is coupled to the shaft 72 and that the gears 56 and 57′ each are coupled to their shafts 54′ and 55′, respectively. On starting the engine 45 the spools 50 and 51 will be oppositely rotated, so that the scow, and consequently the dredging appliance supported thereby, can be swung about the axis 14, and when the stroke has been finished the clutches 65 and 66 will be shifted to connect the gears 56′ and 57 to their supporting-shafts, whereby the respective spools will be rotated in opposite directions, respectively, to impart a return stroke to the scow. As one spool, as 50, winds its cable 80 the other spool 51 will be unwinding its cable 81 and the friction device 88 will prevent the formation of slack in said cable 81, and as the ends of said cables are connected to fixed points upon the shore or other place the scow will be swung back and forth and the excavating appliance will be simultaneously driven so long as the engine 45 is in motion or until an obstruction is met, when the feed of the scow and the excavating appliance are stopped automatically, as has been described. The reversal of the spools is shown as effected by the shipping of the clutches 65 and 66, although it may be obtained otherwise—for example, by reversing the engine. Therefore it will be understood that the feed of the apparatus as a whole and the operation of the excavating device independently are automatically stopped at certain times.

It is obvious, of course, that only one of the spools need be coupled to its shaft upon each stroke of the scow—that is, the spool that is winding on its cable—the other spool being disconnected from the power mechanism and its cable being drawn off simply by the motion of the scow, the friction-strap coöperating with said disconnected spool acting against the same with a sufficient pressure or force to prevent the scow from jumping or shaking.

In some cases it is desirable to swing the scow without operating the excavating appliance, and for this purpose I have shown a second or supplemental engine, as 90, the crank-shaft 91 of which has a sprocket-wheel 92, connected by the sprocket-chain 93 with the sprocket-wheel 94, running loose upon the shaft 60. The engine 90, while the other engine 45 is in operation, remains at rest. When, however, the engine 45 is stopped and the engine 90 is started to swing the scow without operating the conveyer, the sprocket-wheel 94 is coupled to the shaft by means of a clutch, as 95, the operating-lever of which is shown at 97 in Fig. 1.

One of the main features of my invention as above described is the provision whereby the amount of power delivered to the devices for imparting a side feed to the scow or float is sufficient to swing the scow or float under ordinary circumstances, but is insufficient to cause the buckets to be damaged should the latter meet any undue resistance, and although I have in this embodiment of my invention shown one particular way of communicating to the rope and drum mechanism this required amount of power, and only this amount of power, yet my invention is not necessarily limited to the exact construction shown, neither are the other features of my invention limited to the construction or character of parts illustrated and previously described, for these points may be materially modified within the scope of the accompanying claims.

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

1. In an excavating apparatus, a scow or float moored for swinging movement, a chain-and-bucket excavating device carried thereby, excavator-operating mechanism, mechanism for imparting a side feed to the scow, a single motor for operating both said mechanisms whereby the side feed of the scow has a definite relation to the operation of the excavator, and friction driving devices between the motor and said mechanisms so constructed as to operate the same under normal conditions but to slip and allow them to remain inactive when undue resistance is made.

2. In an excavating device, a scow or float moored for swinging movement, a chain-and-bucket excavating device carried thereby, excavator-operating devices, rope-and-drum mechanism for imparting a side feed to the scow or float in either direction, and drum-operating mechanism so constructed that the maximum power which can be developed at the drum, while sufficient to give the scow or float its side movement under ordinary circumstances, is insufficient to damage the buckets should the latter meet undue resistance.

3. In an excavating apparatus, a swinging support, an excavator carried thereby, devices for swinging the support, excavator-operating devices, a motor to simultaneously operate both said devices, the support-swinging devices including a driving and a driven shaft, one of said shafts having a series of different-sized gears loose thereon, the other shaft having a series of coöperating gears fast thereon, and friction-clutches for driving

either of said loose gears, whereby the movement of the swinging support can be varied relative to that of the excavator.

4. In an apparatus of the class specified, a swinging support, an excavating appliance carried thereby, mechanism for operating the support substantially as described to secure a side feed of the excavating appliance, said mechanism including means for automatically stopping the side movement of the support when the resistance opposed to the same passes a certain point, and independent means for operating the swinging support sidewise without operating the excavating appliance.

5. In an apparatus of the class specified, a scow or float having a standard provided with a pivoted member, stay-ropes connected with said pivoted member and adapted to be connected with fixed devices, thereby to moor the scow or float, and means substantially as described connected with said scow or float for imparting a swinging movement thereto.

6. In an apparatus of the class specified, a scow or float having a standard provided with a pivoted member, stay-ropes connected with said pivoted member and adapted to be connected with fixed devices, thereby to moor the scow or float, and means connected with said scow or float substantially as described for imparting a swinging movement thereto, and a dredging appliance supported by said scow or float.

7. In an apparatus of the class specified, a scow, an excavating appliance carried thereby, including a conveyer, means for operating the conveyer and simultaneously therewith imparting a feed to the scow, and independent means for imparting a feed to the scow without operating the conveyer.

8. In an apparatus of the class specified, a scow, means for mooring the same upon a body of water for swinging movement, a plurality of spools upon the scow, cables wound upon said spools and connected with fixed devices independent of the scow, means to rotate said spools in opposite directions, and a brake device adapted to act against each of said spools, and an excavating device operated by the means that rotates the spools.

9. In an apparatus of the class specified, a scow, means for mooring the same upon a body of water for swinging movement, a plurality of spools upon the scow, cables wound upon said spools and connected with fixed devices independent of the scow, means to rotate said spools in opposite directions, and at varying speeds, said means including a frictional driving appliance, a brake device adapted to act against each of said spools, and an excavator operated by the means that rotates the spools.

10. In an apparatus of the class specified, a scow, means for mooring the same upon a body of water for swinging movement, a plurality of spools upon the scow, cables wound upon said spools and connected with fixed devices independent of the scow, means to rotate said spools in opposite directions, said means including a frictional driving appliance, a brake device adapted to act against each of said spools, and an excavating appliance operated by the means that rotate the spools.

11. In an excavating device, a scow or float moored for swinging movement, a chain and bucket excavator carried thereby, excavator-operating devices, drums mounted on said scow, ropes attached to said drums and operating to give to the scow a side feed in either direction, and devices for operating either of said drums independently, said devices including means to change at will the speed of the drums, and means to permit the operative drum to stop when the excavator meets undue resistance.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GORDON McKAY.

Witnesses:

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