No. 693,266. Patented Feb. 11, 1902.

W. M. GROSS.

EXCAVATOR.

(Application filed Apr. 24, 1901.)

(No Model.) 4 Sheets—Sheet 1.

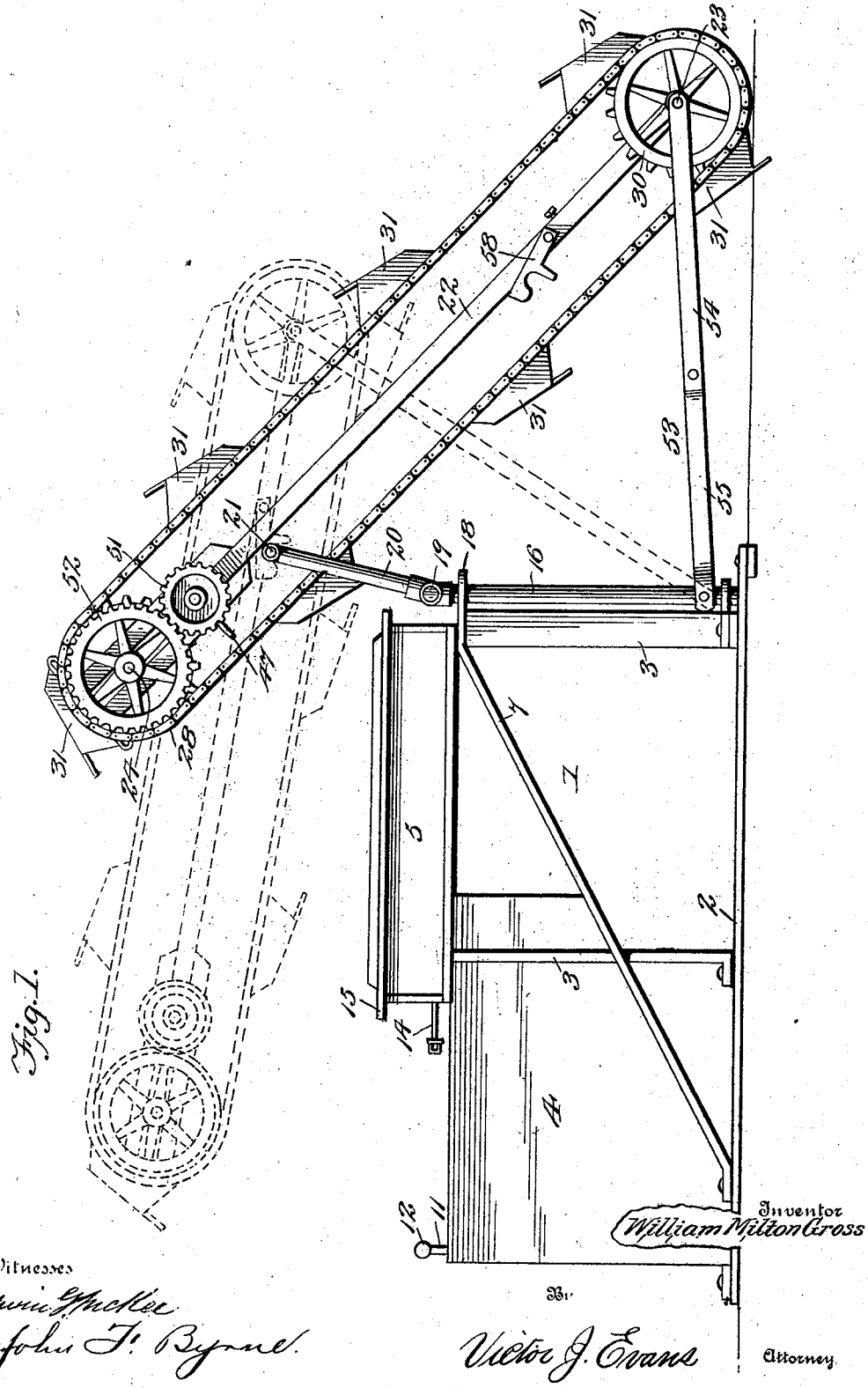


Fig. 1.

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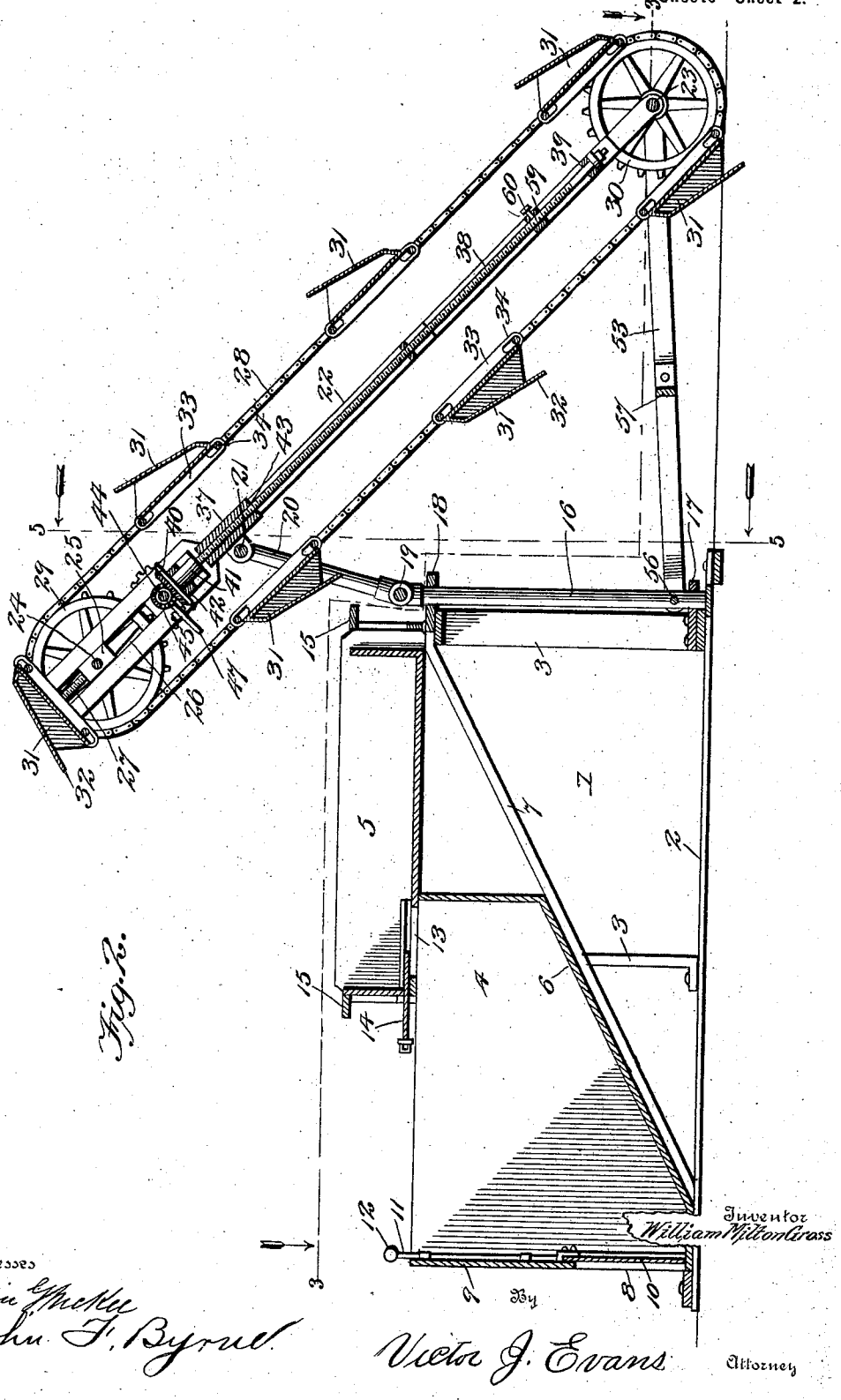


Fig. 2.

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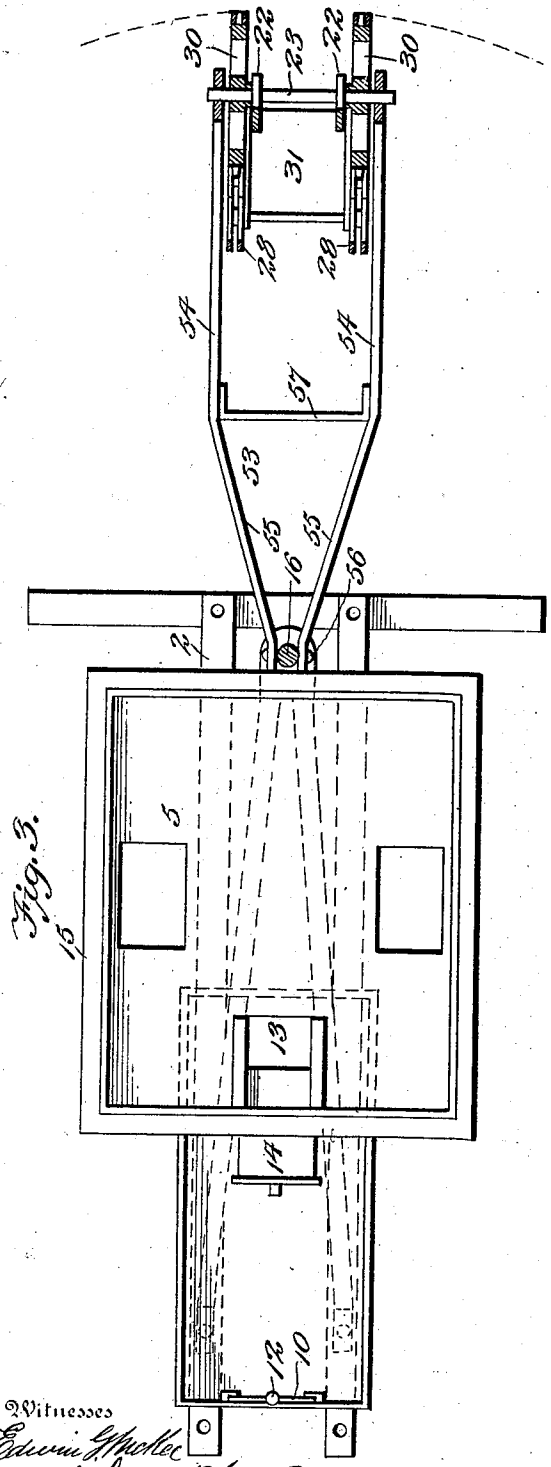


Fig. 3.

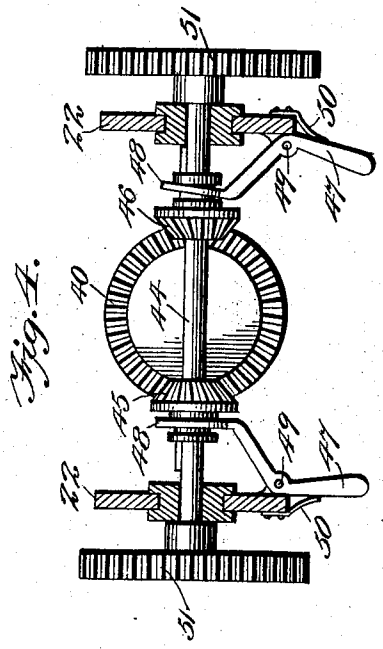


Fig. 4.

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EXCAVATOR.

(Application filed Apr. 24, 1901.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 6.

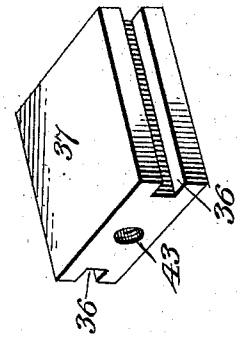


Fig. 7.



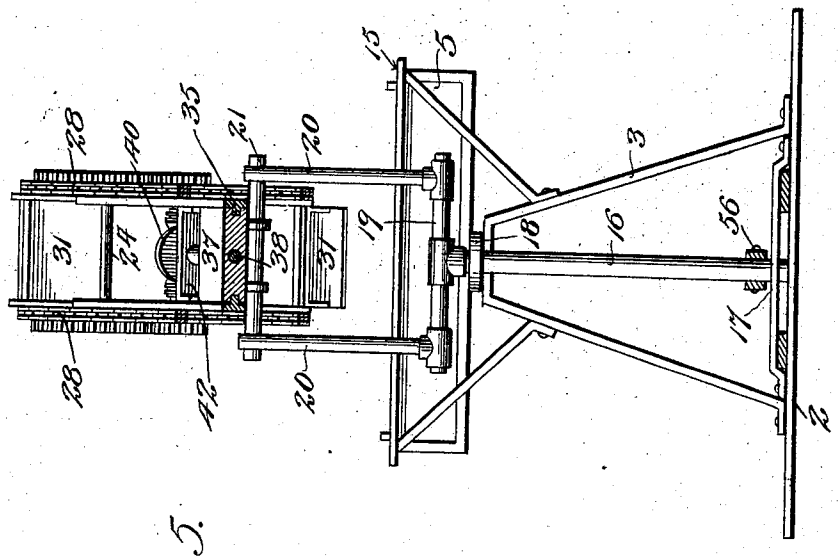


Fig. 5.

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UNITED STATES PATENT OFFICE.

WILLIAM MILTON GROSS, OF OGDEN, UTAH.

EXCAVATOR.

SPECIFICATION forming part of Letters Patent No. 693,266, dated February 11, 1902.

Application filed April 24, 1901. Serial No. 57,230. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MILTON GROSS, a citizen of the United States, residing at Ogden, in the county of Weber and State of Utah, have invented new and useful Improvements in Excavators, of which the following is a specification.

This invention relates to excavators, being designed for digging or excavating earth and various materials and elevating the same and delivering the excavated material into a receiving-hopper.

The excavator comprises an endless elevator by means of which the excavated material is taken up and elevated to the point where it is discharged into the receiving-hopper. This combined excavator and elevator is mounted on a swinging frame, so as to be capable of movement in a horizontal direction, and is so mounted as to relieve itself or to be self-adjusting whenever the excavating shovels or buckets strike against an unyielding substance. In connection with the combined excavator and elevator means are employed for rapidly hoisting and lowering the elevator bodily, so that it may be operated at any desired depth.

With the above and other objects in view, the nature of which will appear as the description proceeds, the invention consists in the novel construction, combination, and arrangement of parts hereinafter fully described, illustrated, and claimed.

In the accompanying drawings, Figure 1 is a side elevation of an excavator constructed in accordance with the present invention, showing the operative position of the excavator in full lines and indicating by dotted lines the folded or elevated position thereof. Fig. 2 is a vertical longitudinal section through the same. Fig. 3 is a plan view of the excavator with the elevator shown in section. Fig. 4 is an enlarged detail cross-section taken in line with the counter-shaft and showing the reversing mechanism. Fig. 5 is a cross-section through the machine, showing the manner of mounting the reciprocatory cross-head, &c. Fig. 6 is a detail perspective view of the reciprocatory cross-head. Fig. 7 is a detail fragmentary view of one of the flanged frame-bars.

Like numerals of reference denote like parts in the different figures of the drawings.

Referring to the drawings, 1 designates a suitable stand or support upon which the various parts of the excavator are mounted. This stand comprises a bed or base plate 2, from which rise standards or posts 3, which form a support for a ballast-box 4 and a receiving-hopper 5, the ballast-box 4 having an inclined bottom 6, which is supported upon inclined frame-bars 7, connected with the posts 3. The ballast-box 4 is provided at its lower end with a discharge-opening 8, formed in the end wall 9 thereof and which may be closed or opened by means of a slide-gate 10, which is adjusted by means of an operating-stem 11 and handle 12. The receiving-hopper 5 is supported at one end upon the terminal portions of the inclined frame-bars 7 and at its opposite end upon the ballast-box 4, the receiving-hopper being arranged to overlap the ballast-box and discharge material into said box through an opening 13, formed in the bottom of the hopper, which opening is controlled by a sliding gate 14. The hopper 5 is braced and strengthened by means of a reinforcing-flange 15, located adjacent to the upper edge thereof.

Associated with the stand 1 is a horizontally-swinging crane, comprising a vertical shaft 16, which is mounted in bearings 17 and 18, located, respectively, adjacent to the bottom and top of the stand, the vertical shaft 16 resting at its lower end upon a portion of the bed or base frame 2. At its upper end, above the bearing 18, the shaft 16 is provided with a rigid cross-head 19, having rigidly connected thereto crane-arms 20, preferably located equidistant from the line of the shaft 16 and having their upper ends connected by a supporting-shaft 21, upon which the elevator, hereinafter fully described, is hung. Any suitable means may be employed for turning the vertical shaft 16 on its longitudinal axis for the purpose of swinging the combined excavator and elevator, which will now be described.

The combined excavator and elevator comprises, essentially, a frame consisting of parallel bars 22, in the opposite ends of which are mounted shafts 23 and 24, located respectively at the lower and upper ends thereof. The shaft 23 may be made stationary with respect to the frame; but the upper shaft 24 is mounted in slide-boxes 25, which are capable of being moved up and down or back and forth in slots or ways 26 in the frame-bars, as clearly illustrated in Fig. 2, the said slide-boxes 25 having associated therewith adjusting-screws 27, by means of which any desired tension may be given to a pair of sprocket-chains 28, which pass around sprocket-wheels 29 and 30, mounted respectively on the shafts 24 and 23 at the upper and lower ends of the elevator. Connected with the endless chains 28 at suitable intervals are excavating and hoisting buckets 31, the outer walls of which are extended to form scoops or blades 32 for scooping up the earth or other material and filling the buckets preparatory to their upward movement. Each bucket also comprises a pair of links 33, forming members of the chains 28 and having the adjacent chain-links connected thereto by means of a pin-and-slot engagement, as shown at 34, whereby the buckets are adapted to be carried around the sprocket-wheels 29 and 30 in the continuous movement of the chains 28.

In order to provide for the raising and lowering of the combined excavator and elevator, the frame-bars 22 are provided upon their inner adjacent sides with flanges 35, which enter grooves 36 in the opposite edges of a reciprocatory cross-head 37, thus adapting the cross-head to slide longitudinally between the frame-bars 22. The means for reciprocating the cross-head 37 consists of a feed-screw or screw-shaft 38, which is journaled at one end in a cross-bar 39 and provided at its opposite end with a beveled gear-wheel 40, the hub 41 of which is journaled in a bearing 42, carried by the frame-bars 22. The feed-screw 38 passes through and engages in a threaded opening 43 in the reciprocatory cross-head, so that as the screw is revolved it turns within the cross-head, and as the cross-head is mounted on the crane-arms the result will be that the frame of the combined excavator and elevator will be raised or lowered, according to the direction in which the feed-screw 38 is turned. As the means for imparting rotary movement to the feed-screw and reversing the direction of rotation thereof I provide a counter-shaft 44, which is journaled in the frame-bars of the elevator and which has mounted thereon a pair of slidable beveled pinions 45 and 46, each of which has a splined engagement with the counter-shaft and is capable of being slid into and out of engagement with the gear-wheel 40 by means of a shipping-lever 47, provided with a fork 48 in engagement with a groove in the hub of the pinion 46. Each of the shipping-levers 47 is fulcrumed at 49 on the elevator-frame, and the pinion 45 or 46, as the case may be, is held out of mesh with the beveled wheel 40 by means of a throw-off spring 50. The springs 50 serve to hold both of the beveled pinions 45 and 46 out of engagement with the wheel 40, so that the feed-screw 38 is normally stationary. When, however, it is desired to raise or lower the elevator, one of the levers 47 is operated for throwing the pinion connected therewith into engagement with the wheel 40, whereupon a rotation in one direction or the other will be imparted to the feed-screw, causing it to turn within the cross-head 37 and raise or lower the elevator. The counter-shaft 44 is conveniently driven by means of a pinion 51, mounted fast on the counter-shaft and meshing with a spur gear-wheel 52, fast on the upper shaft 24 of the elevator. It may here be stated that the motor for operating the endless chain of buckets may be mounted on the frame of the elevator, so as to move therewith, and said motor may be geared directly to one of the shafts 44 or 24. It is, however, considered unnecessary to illustrate the application of the motor, as such motor may be applied at any convenient point and suitably geared to the operative parts of the combined elevator and excavator.

The lower end of the elevator-frame is supported by means of a swinging brace 53, comprising the parallel side bars 54, which embrace the lower portion of the elevator-frame, and the inwardly-diverging members 55, which are pivotally connected at their inner ends to the lower portion of the vertical shaft 16 by means of a bolt or pivot 56. At one or more intermediate points the side bars of the swinging members are connected by a tie-brace 57, and the outer ends of the side bars 54 are provided with openings to receive the shaft 23 at the lower end of the elevator. As the elevator is raised or lowered by the mechanism hereinabove described the swinging brace 53 swings upward or downward and guides the lower end of the elevator-frame. Said brace also serves to hold the lower part of the elevator up to its work and swings with the elevator as it turns upon the axis of the vertical shaft 16. One or both of the frame-bars 22 are provided with retaining hooks or latches 58, (shown in Fig. 1,) which when the elevator is lifted to the dotted-line position of Fig. 1 are adapted to engage over the supporting-shaft 21 and hold the elevator in that position.

59 designates an adjustable stop which may be held at any point in the length of the feed-screw by means of a binding-screw 60, the said stop being adapted to come in contact with the lower end of the reciprocatory cross-head 39 in order to prevent the elevator-frame from being moved upward too far.

In operation the excavator is set up at the

point of operation and power applied to the endless chain of buckets. A sufficient quantity of earth or other material is then deposited in the receiving-hopper 5 and allowed to pass into the ballast-box 4, so as to fill said box to any desired extent and form a counterbalance for the combined excavator and elevator, which will prevent the tipping over of the machine under the operation of the excavating devices. After filling the ballast-box the controlling-slide 14 is closed. The operation of the excavator may now be continued as long as needed and it may be swung horizontally upon the vertical shaft 16 as a center, the material being carried upward by the buckets and deposited in the receiving-hopper 5. When it is necessary to move the excavating-machine, the gate 10 may be opened, so as to allow the material therein to escape through the opening 8, thus materially lightening the machine and adapting it to be carried with facility from place to place.

It will be understood that the machine herein described is susceptible of various changes in the form, proportion, and minor details of construction, which may accordingly be resorted to without departing from the principle or sacrificing any of the advantages of the invention.

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

1. In an excavator, the combination with a frame or stand, of a crane adapted to swing on a vertical axis, an elevator comprising an endless series of buckets and mounted on the crane, means for raising and lowering the elevator-frame, and a swinging brace for supporting the lower portion of the elevator.

2. In an excavator, the combination with a supporting frame or stand, of a horizontally-swinging crane, an elevator adjustably mounted thereon, a cross-head carried by the crane, and a feed-screw journaled in the elevator-frame and having a threaded engagement with said cross-head.

3. In an excavator, the combination with a supporting frame or stand, of a horizontally-swinging crane journaled therein, an elevator pivotally supported on said crane and comprising an endless series of buckets, and a feed-screw for bodily raising and lowering the elevator.

4. In an excavator, the combination with a supporting stand or frame, of a horizontally-swinging crane journaled therein, an elevator slidingly mounted with respect to said crane, and means for raising and lowering the elevator and sliding the same with respect to the crane.

5. In an excavator, the combination with a supporting stand or frame, of a horizontally-swinging crane comprising a vertical shaft, a supporting-shaft carried thereby, an elevator-frame having an endless series of buckets, a cross-head journaled upon said supporting-shaft, and means connected with said cross-head for raising and lowering the elevator.

6. In an excavator, the combination with a supporting stand or frame, of a horizontally-swinging crane, a cross-head pivotally mounted on said crane, an elevator-frame slidingly connected with said cross-head and comprising an endless series of buckets, and a feed-screw journaled in the elevator-frame and having a threaded engagement with said cross-head.

7. In an excavator, the combination with a supporting frame or stand, of a horizontally-swinging crane, a cross-head pivotally mounted thereon, an elevator having a sliding engagement with said cross-head and comprising an endless series of buckets, a feed-screw having a threaded engagement with said cross-head and journaled in the elevator-frame, means for rotating said feed-screw, and feed-screw-reversing mechanism.

8. In an excavator, the combination with a supporting frame or stand, of a horizontally-swinging crane, a cross-head pivotally mounted thereon, an elevator having a sliding engagement with said cross-head and comprising an endless series of buckets, a feed-screw journaled in the elevator-frame and having a threaded engagement with the cross-head, a beveled gear-wheel on said feed-screw, a counter-shaft having pinions slidable into and out of engagement with said wheel, and means for shifting one or the other of said pinions into and out of engagement with the wheel on the feed-screw.

9. In an excavator, the combination with a frame or stand, of a horizontally-swinging crane, a cross-head pivotally mounted thereon, an elevator slidingly connected with the cross-head, a feed-screw journaled in the elevator-frame and having a threaded engagement with said cross-head, a beveled gear-wheel on the feed-screw, a counter-shaft, beveled pinions slidingly mounted on said shaft, means for moving said pinions into and out of engagement with the beveled wheel on the feed-screw, and means for normally holding said pinions out of engagement with the beveled wheel.

10. In an excavator, the combination with a frame or stand, of a horizontally-swinging crane, an elevator mounted thereon and capable of being bodily raised and lowered, shafts at the ends of the elevator-frame carrying sprocket-wheels, an endless chain of buckets running on said sprocket-wheels, and a swinging brace receiving the shaft at the lower end of the elevator and pivotally connected to the vertical shaft of the crane.

11. In an excavator, the combination with a frame or stand, of a horizontally-swinging crane, an elevator comprising an endless series of buckets and having a sliding engage-

ment with the crane, means for raising and lowering the elevator, and a latch for holding the elevator in its raised position.

12. In an excavator, the combination with a frame or stand, of a horizontally-swinging crane, a cross-head pivotally mounted thereon and provided with grooves in its opposite sides, an elevator-frame comprising parallel side bars having flanges which work in the grooves of the cross-head, and means for sliding the elevator-frame relatively to the cross-head.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM MILTON GROSS.

Witnesses:
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J. C. JONES.