3 Sheets—Sheet 1.

J. A. BALL.
Excavators.

No. 198,445. **Patented Dec. 25, 1877.**

Fig. 1.

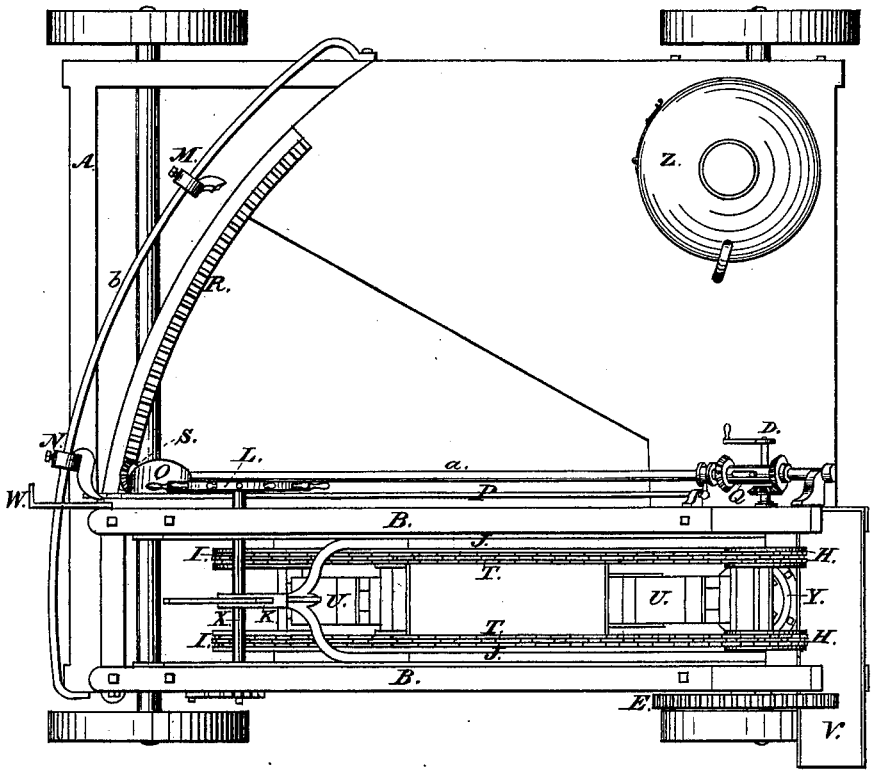

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Fig. 2.

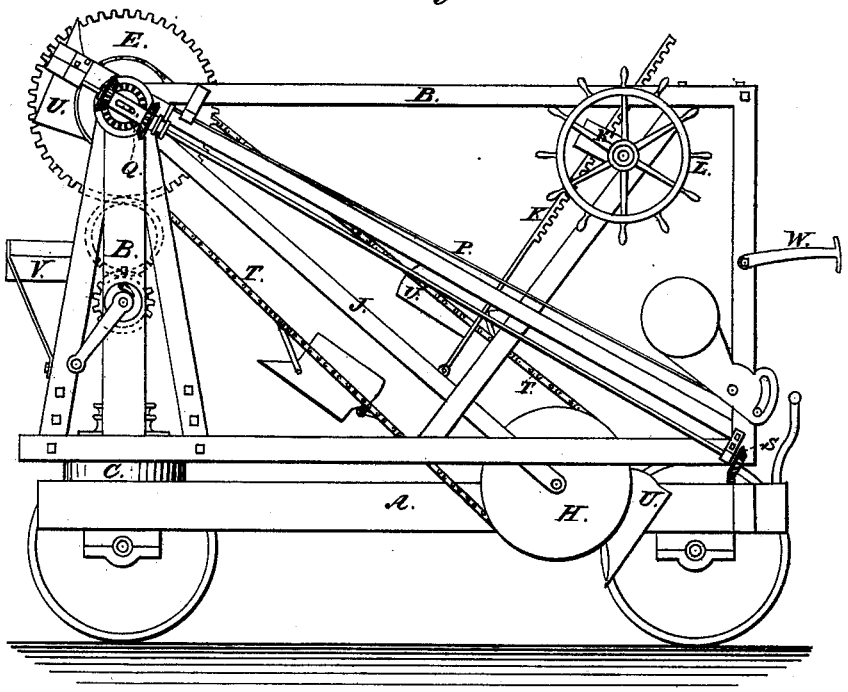
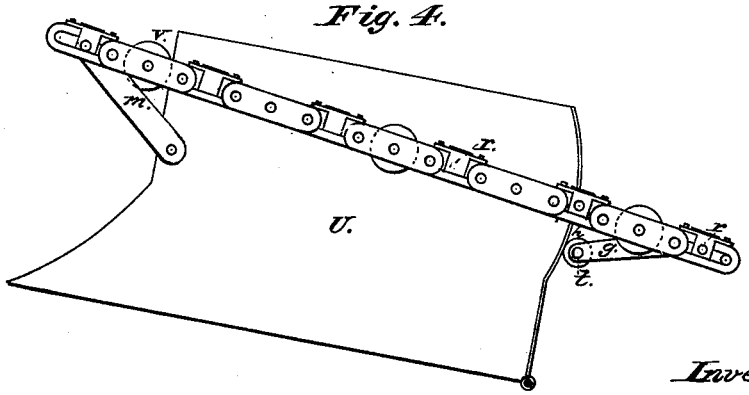


Fig. 4.



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J. A. BALL.

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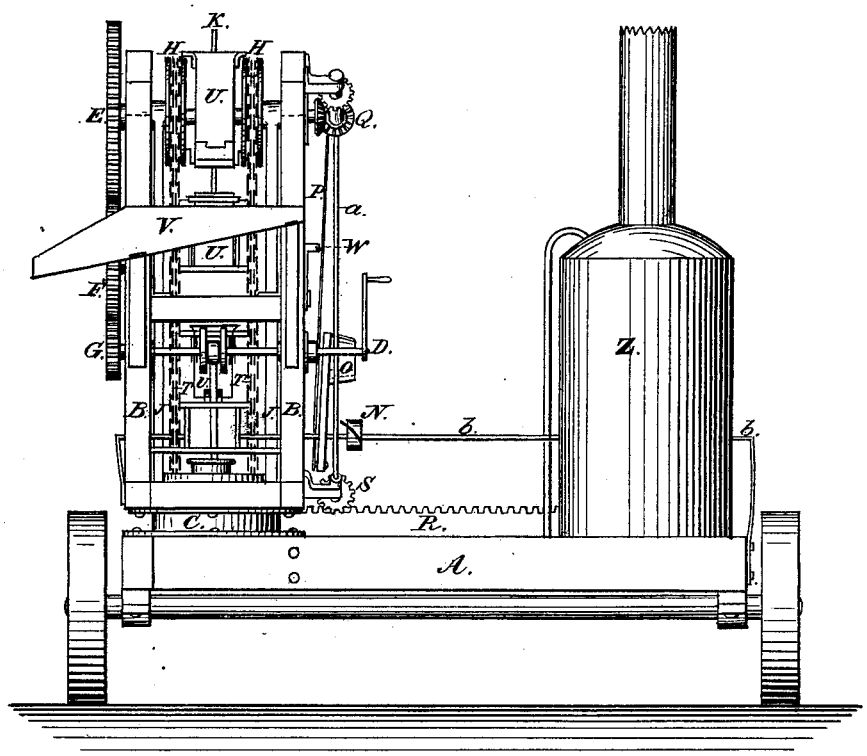
Fig. 3.



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Inventor:

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UNITED STATES PATENT OFFICE.

JOHN A. BALL, OF OAKLAND, CALIFORNIA.

IMPROVEMENT IN EXCAVATORS.

Specification forming part of Letters Patent No. **198,445**, dated December 25, 1877; application filed June 4, 1877.

To all whom it may concern:

Be it known that I, JOHN A. BALL, of Oakland, in the county of Alameda and State of California, have made certain new and useful Improvements in Excavators, of which the following is a specification, reference being had to the accompanying drawing and the letters marked thereon.

The object and purpose of the present invention is to hang the buckets of an excavator upon a pivoted ladder, so that they may be operated to constantly plow in regular furrows, to disintegrate and lift the earth to the point of discharge with the least possible friction, and arranging the elevator-frame to work automatically, with means of adjustment to suit the desired width of the cut, and regulate the depth of the same in excavating. The elevator-frame is also connected with the bed or main frame, whereby the necessary horizontal sweep of the buckets is obtained without increasing the gear required to operate the same, the combination and arrangement of the several parts whereby these results are produced being hereinafter described, and subsequently pointed out in the claims.

Figure 1 is a plan view. Fig. 2 is a side elevation. Fig. 3 is an end elevation, and Fig. 4 shows the bucket and chain.

The following is the construction of the machine: A represents the bed-frame or carriage which supports the whole of the machinery; B, the elevator-frame, which is hinged or pivoted at C, the outer end operating upon the rack R. The tooth or chain wheel I carries the chain T, to which the buckets U are attached. The lower end of the ladder J holds the spool or large drum H, around which the chain T and buckets U pass. E, F, and G are spur-wheels, designed to connect the crank-shaft D with the driving-shaft X. The clutch or shifting gear Q is operated by means of the shaft or rod P. The rack K is operated by the hand-wheel L and clutch K′, for the purpose of raising, lowering, and holding the ladder. J represents the ladder-frame; L, the hand-wheel by which the ladder-frame J is raised or lowered. M and N are adjustable shifting stops or trippers. O is the shifting-lever weight. P is the shifting-rod. Q represents the shifting-gear. R represents the segmental rack, and S the pinion to operate in the same. T represents the elevator-chains, and U the buckets attached to the same. V represents the discharge-chute. W represents the hook to operate in the notch in the weight-lever O, and hold the same and keep the shifting apparatus out of gear. X represents the shaft to raise the elevator-ladder J by means of the pinion on the same. Y represents the cylinder-head; Z, the boiler. *a* represents the connecting-shaft to operate the shifting-gear. *b* represents the way or guide rod which carries the adjusting-stops M and N.

The following is the operation of the machine: As the shaft D is revolved, giving motion to the gear E, F, and G, the chain is set in motion, carrying the buckets in the usual way. I employ the same construction of bucket as those used in my dredging machinery, although any suitable well-known construction of bucket may be employed. By rotating the shaft *a*, the pinion S, meshing in the segment R, swings the frame B until it brings the shifting-weight O in contact with the trippers M or N, thus reversing and setting it to revolve in an opposite direction, and thus from side to side, between the trippers M and N, cutting the width at which they may be set apart.

It will be seen that this arrangement causes a narrow cut or furrow to be made from the side of the cut or "land," as it is termed in plowing, while the ladder may be lowered to the depth required for the excavation.

The machine may be gradually moved forward by any suitable mechanical means.

The following is the mode used in my machine (and shown in the accompanying drawing) of attaching the bucket to the chain and operating the gate, opening, closing, and holding the same in place: The buckets U are attached by the pivot or journal which operates in the box or bearing *r*, which forms a direct attachment of the bucket to the chain, and also serves as a pivot. The link *m* connects the front of the bucket with the chain. The link *g* connects with the crank-axle *h*, which carries the roll *t*. As the bucket is carried over the large spool, cramping the chain, the roll *t* is moved up toward the end of the door or gate of the bucket, still holding it in place, and as the same passes on the straightened

chain it moves down upon the same; but when passing onto the chain-wheel from the under side, as the chain bends over the chain-wheel, the arm or connecting-link *m* draws the front of the bucket in toward the center of the wheel, and raises the back end out above the chain until the door or gate drops open, discharging the load into the chute V. The weight of the gate then drops it back in place, closing the end of the bucket; and as the chain again straightens the roll *t* is again held firmly against the door, and thus carried around, repeating the same operation at the same points.

It will readily be seen that the combination of the links *g* and *h* and the roll *t* serves not only to form an elastic bar to the bucket-gate, to hold the same firmly, but it holds back to allow the closing of the gate after the bucket has passed to the straightened portion of the chain.

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

1. The combination of the shifting-gear Q, shaft or rod P, weighted shifting-bar O, rod *a*, pinions S, segment-rack R, and the reversing-stops *m n*, substantially as and for the purpose described.

2. The combination of the lever *g* and crank-axle *h* with the roll *t* and chain T, as and for the purpose specified.

3. In an excavator, the combination of the carriage A, ladder-frame B, pivoted upon the center *c*, and provided with the ladder J, constructed and arranged substantially as shown and specified.

JOHN A. BALL.

Witnesses:
J. H. REDSTONE,
THOS. G. BROOKS.