3 Sheets—Sheet 1.

# J. A. WOODWARD.

## COAL-ELEVATOR.

No. 192,610. Patented July 3, 1877.

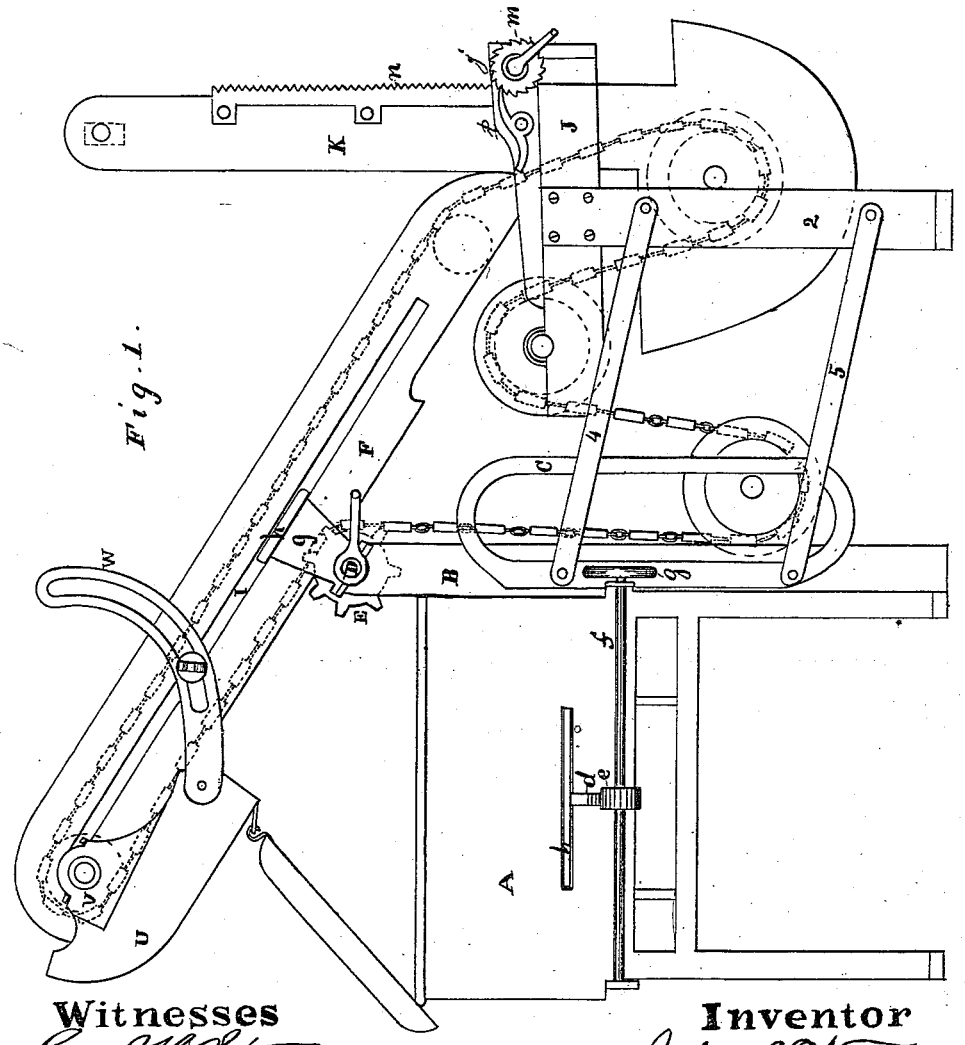


Fig. 1.

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3 Sheets—Sheet 2.

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## COAL-ELEVATOR.

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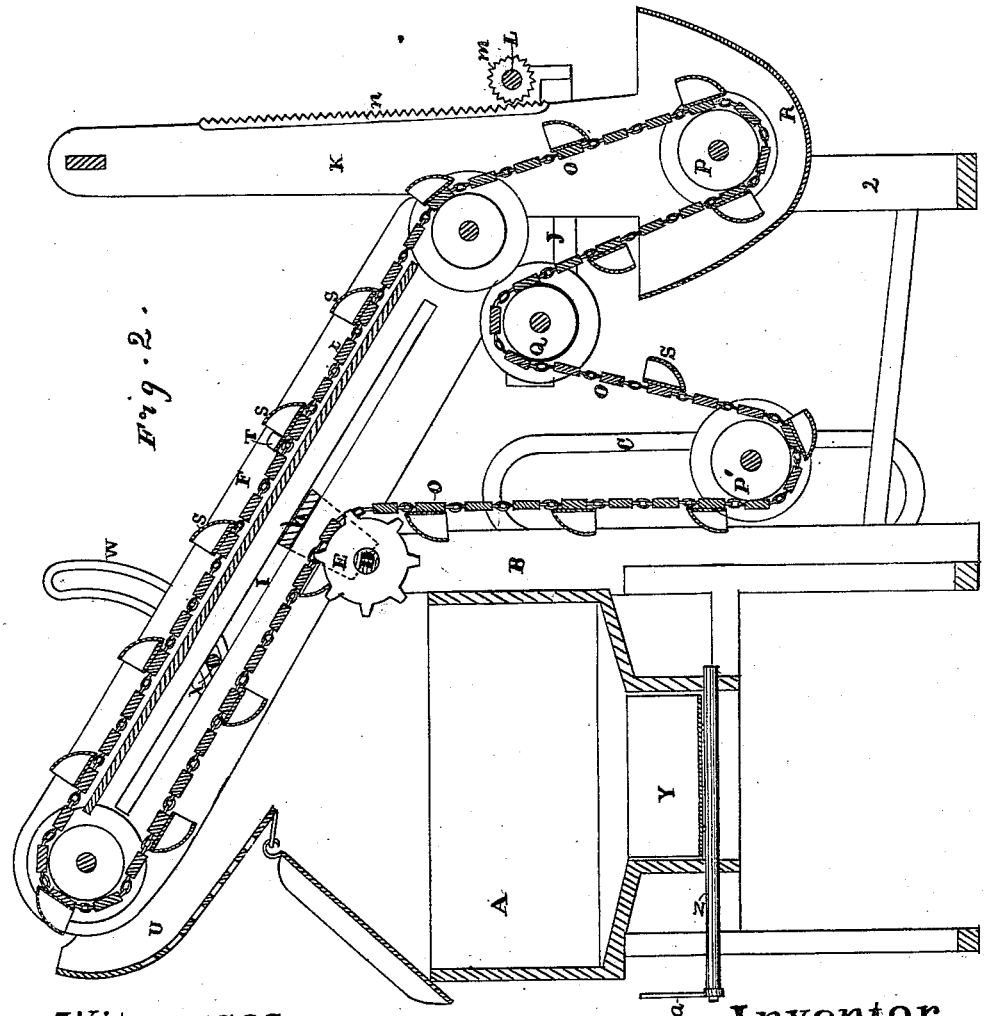


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3 Sheets—Sheet 3.

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## COAL-ELEVATOR.

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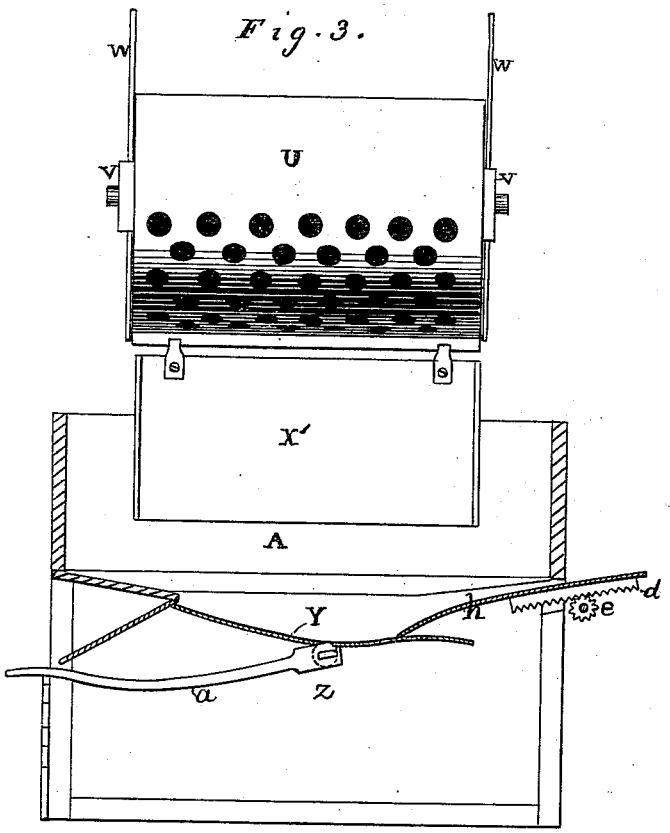
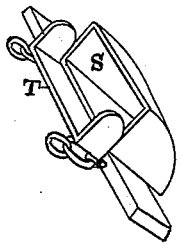
*Fig. 3.*

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# UNITED STATES PATENT OFFICE.

JOHN A. WOODWARD, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF TWO-THIRDS HIS RIGHT TO S. A. SANDERSON AND I. W. GATES, OF SAME PLACE.

## IMPROVEMENT IN COAL-ELEVATORS.

Specification forming part of Letters Patent No. **192,610**, dated July 3, 1877; application filed May 8, 1877.

*To all whom it may concern:*

Be it known that I, JOHN A. WOODWARD, of the city and county of San Francisco, and State of California, have invented an Improved Coal-Elevator; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention relates to an improved machine for unloading cargoes of coal and other similar substances from the holds of ships, and at the same time screening the coal and delivering it into carts upon the wharf.

My machine is constructed upon the elevator plan, and is made in two parts, each of which is portable, so that the machine can be easily moved from place to place and adjusted to the location and peculiar surroundings of the vessel.

One of these parts is supported upon the vessel which is to be unloaded, and consists of the frame-work around which the endless chain travels, while the other part is supported upon the wharf, and consists of the reservoir or hopper into which the screened coal is dumped by the elevator-buckets, and from which it is delivered into the carts.

For a more complete explanation of my invention reference is made to the accompanying drawings, in which A represents the box or reservoir into which the coal is dumped by my elevator-buckets. This box or reservoir is mounted upon a substantial frame-work at a sufficient height above the floor of the wharf to permit an ordinary coal-cart to drive under it, so that the coal can be automatically delivered through a valve in the bottom of the box or reservoir directly into the cart, as hereinafter more fully described.

B B are two strong upright posts, which I secure to one side of the box near each end, so that their upper ends will project above the top of the box, and to the side of each of these uprights I secure a slotted plate, C, so that the slot will extend outside of the posts, as represented.

The driving-shaft D is supported in boxes on the upper ends of these posts, and upon this shaft I secure one or more toothed wheels, E, which drive the endless belt by engagement with its transverse slots, as described in my former application for a patent.

The frame F, around which the endless belt travels, rests upon the upper ends of these posts, and is kept in place by a short side piece, *g*, upon each side. The lower end of each side piece is supported by the projecting ends of the driving-shaft D, while their upper ends are connected by a bar, *h*, which passes through the frame transversely and through a longitudinal slot, I, in each side of the frame.

The side pieces of the frame rest upon the upper ends of the posts B, and the frame can be shifted endwise as far as the bar *h* can move in the slots I. One end of the frame will then be supported over the reservoir A, while the opposite end projects to a distance from it.

J is a square frame, which is made of the proper size to horizontally rest upon the hatch-combings or railings which surrounds the hatchway of a vessel, where it can be temporarily secured by any ordinary means. Inside of this square horizontal frame I place a vertical frame, K, so that its lower end will extend down into the hatchway.

A horizontal shaft, L, passes across the end of the horizontal frame J near its outside edge, and on this shaft I secure pinions *m*, opposite the edges of each side of the frame. A rack, *n*, is secured to each side of the frame K in position to engage with the pinions *m m*.

The endless belt O which I use is made after the pattern described in my former application for a patent on an endless-chain elevator. This belt I make considerably longer than is necessary to pass around the frames, so that I will have sufficient slack to admit of extension of the belt-frames, as hereinafter described.

This belt passes around a drum, *p*, at the lower end of the vertical frame K, and up over the upper side of the frame F, and back underneath it until it passes over the driving-shaft D. After passing over the driving-shaft I provide the necessary slack by dropping it down and passing it under an independent

drum or roller, P, the ends of which are guided in the slotted plates C, which are secured to the upright posts B. Thence the belt passes up over a drum, Q, which has its bearing in the rear end of the horizontal frame J, and thence down under the drum P, at the lower end of the vertical frame, the point where it started from.

The frame F being attached to the upright posts B by a sliding support, its outer end will be drawn down against the upright frame J when the buckets of the endless belt are loaded, and this will force the upright frame in an opposite direction until its racks *n* engage with the pinions *m* of the shaft L. The abutting end of the frame F is rounded, so that at whatever angle it stands with reference to the upright frame, no obstruction will be presented other than friction to the raising and lowering of the upright frame, as hereinafter more fully described.

A semicircular box or trough, R, is constructed at the foot of the upright frame J, inside of which the drum P is placed. The coal to be hoisted is shoveled into this trough, and as the buckets pass around under the drum they take up their loads.

The buckets S S are attached to the slats *t* of the belt, and to prevent them from spilling any of their contents as they pass up the inclined frame K, I secure a plate, T, to the links which connect the slat to which each bucket is secured with the slat in front of it, so as to fill the space and form a wide bottom which will not interfere with the flexibility of the belt.

The ends of these plates are turned up, so as to form side-boards, which prevent the coal from falling from the sides of the belt.

The coal-screening device is placed at the upper end of the frame F, and consists of a curved metal plate, U, which is arranged to partially surround the upper end of the frame, and is provided with perforations, so as to form a screen-plate.

This plate is as wide as the frame F, and is provided with side pieces, V which extend outside of the frame, so that the projecting ends of the drum or shaft at the upper end of the frame will pass through holes in them. A curved slotted arm, W, is secured to the lower edge of the screen, so that it extends outside of the sides of the frame. A rod, X, which is provided with a head on one end, passes through the slot of the arm on one side, and extends across the frame and through the slot of the opposite arm. A nut on the opposite end serves to tighten the arms against the sides of the frame, and fix the screen in whatever position it is adjusted to.

X′ is an apron, which is hinged to the lower edge of the screen, and extends out over the side of the box A, so as to conduct the screenings which pass through the screen out of the way.

The box A, as above mentioned, has a valve, Y, in its bottom. The portion of the bottom which surrounds this valve is made sloping towards the valve-opening, so that the coal in the box will be directed toward it.

The valve Y is secured to a shaft, Z, which extends out to one side of the box, where a lever-handle, *a*, is secured to it. The valve-opening is made in the center of the bottom of the box, and the valve opens downward, so that it also forms a chute to direct the coal into the cart underneath.

To assist in closing the valve against the weight of coal in the box, I provide what I call a "lever-plate," for equalizing the weight. To do this I extend the valve-opening to one end of the box. The valve-plate Y is made large enough almost to fill the entire opening, the shaft Z passing under its middle, as represented. The lever-plate *h* passes through a horizontal slot in the end of the box, so that it will stand at an angle with its inner end resting upon the lever end of the valve, so that the weight of coal which rests upon the lever-plate will counteract the weight of coal which rests directly upon the valve. On the under side of this lever-plate is a rack, *d*. This rack engages with a pinion, *e*, on a shaft, *f*, which extends across outside of the end of the box and is turned by a hand-wheel, *g*, at one end, so that by turning the shaft the lever-plate can be projected farther upon the valve-lever or withdrawn toward the end of the box, in order to regulate the amount of counteracting leverage according to the weight of coal in the box or reservoir.

For the purpose of connecting the two parts of the machine together I have represented post 2 for supporting the horizontal frame J, and braces 4 and 5 for connecting the posts with the uprights B, but these do not form a part of the machine.

The posts 2 represent the sides of the hatchway, while the braces merely keep the parts together.

When the machine is to be moved from one place to another I detach the bar *h* from the short side pieces *g*, and release the ends of the roller P from the slotted plates C, so as to allow the frame F and endless belt to be turned to a vertical position on the horizontal frame J. The two parts of the machine are then detached from each other, so that they can be moved about separately wherever desired.

When a vessel is to be unloaded I place the elevated box or reservoir upon the wharf in the proper position, and move the horizontal frame J with its attachments on board of the vessel. The frame J is then placed upon and secured to the comb-hatchings of the vessel. The frame F is lowered to its position upon the upright posts B, and secured as above described. I then insert the ends of the roller P in their guide-slots, and the machine is ready for work.

The operation of the machine is as follows: The upright frame K is lowered down the hatchway by means of the shaft L, pinions *m*, and rack *n*, until the semicircular box or trough R rests upon the coal in the ship's

hold, where it is held by the ratchet *j* and pawl *p*. Power is then applied to the driving-shaft, and the endless belt with its buckets is set in motion. The coal is shoveled into the box or trough R, from which it is taken by the buckets and carried up over the frame F and cast upon the screen *h*. The screenings or fine coal pass through the perforations in the plate, and are directed by the apron or chute X over the side of the box upon the wharf, while the merchantable pieces of coal fall into the box or reservoir A. As fast as the level of the coal in the hold of the vessel lowers, the upright frame K is lowered correspondingly, so that a constant stream of coal is maintained from the ship to the box A. Meanwhile the carts are driven under the box and filled by the cartman, who lowers the lever-handle *a*, so as to open the valve and allow the cart to fill.

The roller P, by its gravity, takes up the slack of the endless belt and gives it out as occasion requires, so that the rise and fall of the tides or the rolling of the vessel will not affect the operation of the machine.

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

1. The elevated box or reservoir A, with its lever-valve Y and lever-plate *h*, in combination with the shaft Z, and lever-handle *a*, substantially as and for the purpose described.

2. The elevated box or reservoir A, with its lever-valve Y, and adjustable lever-plate *h*, in combination with the shaft Z, and lever-handle *a*, substantially as and for the purpose described.

3. The horizontal frame J, with its shaft L and pinions *m*, arranged to be secured upon the hatch-combings of a vessel, in combination with the vertical frame K, with its racks *n* and semicircular box or trough R, said frame being combined with an adjustable frame, F, endless belt *t*, and elevated box or reservoir A, substantially as and for the purpose described.

4. The single vertical frame K, arranged to be lowered into the hold of a ship without disturbing the frame F, and provided with the semicircular box or trough R at its lower end, inside of which the drum P is mounted, in combination with the endless-belt bucket-elevator and a slack take-up device for allowing extension to the belt, substantially as above specified.

5. The endless slat-belt *t*, having a plate, T, the ends of which are bent upward to form side pieces secured to the links in front of each bucket, substantially as and for the purpose described.

6. The adjustable belt-carrying frame F, provided with a screening device, U, and arms W at its upper end, substantially as and for the purpose described.

7. The perforated metal-plate screen U, curved as described, and having the side pieces V, said screen being suspended so as to partially surround the upper end of the frame, and rendered adjustable by means of the slotted arms W, rod X and nut, substantially as and for the purpose described.

8. The adjustable and pivoted screen U, with its hinged apron or chute X′, in combination with the adjustable frame F, and endless-belt bucket-elevator *t t*, and elevated box or reservoir, substantially as and for the purpose described.

In witness whereof I have hereunto set my hand and seal.

JNO. A. WOODWARD. [L. S.]

Witnesses:
J. W. GATES,
JNO. L. BOONE.