2 Sheets—Sheet 1.

J. A. WOODWARD.

ENDLESS-CHAIN ELEVATOR.

No. 191,911. Patented June 12, 1877.

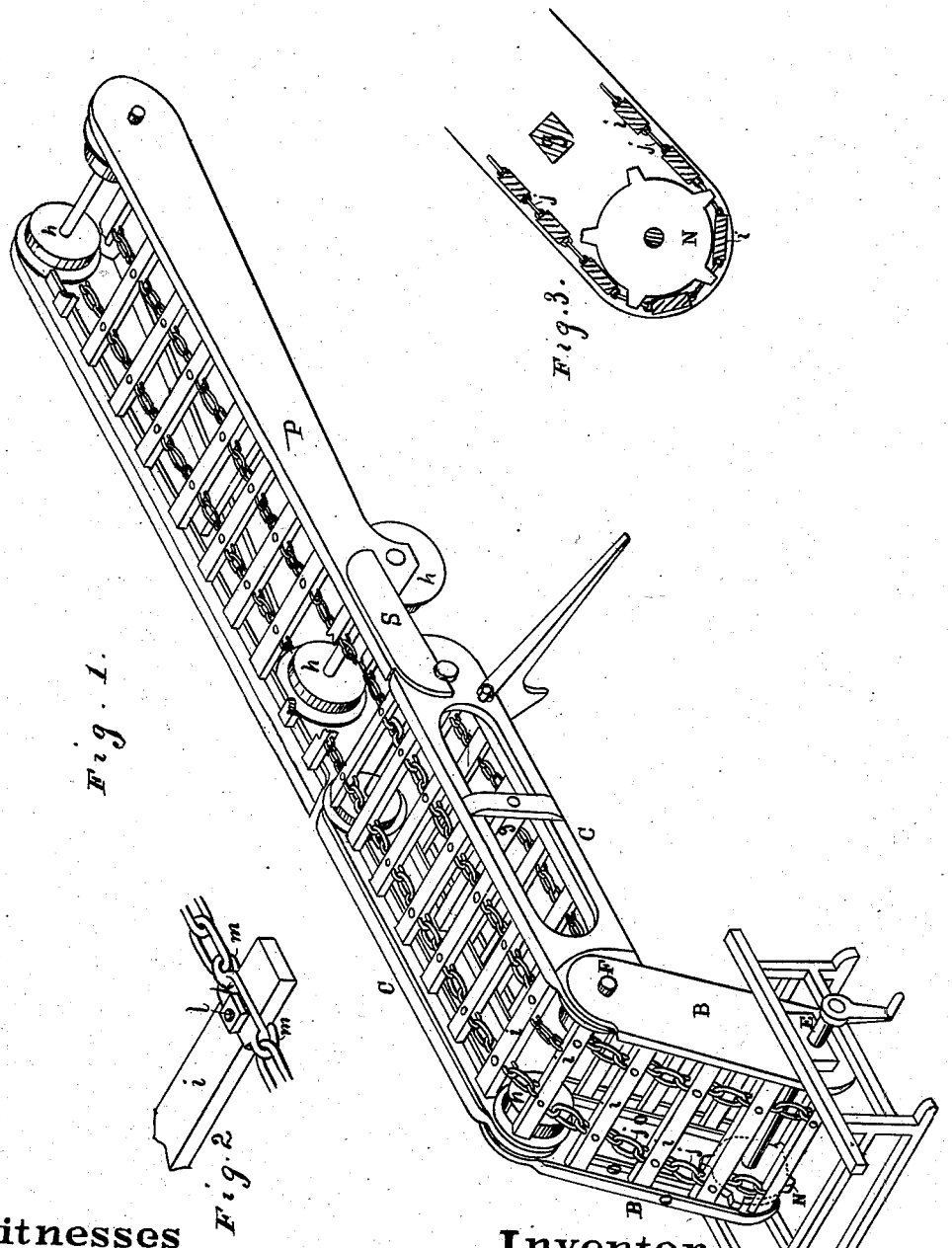

Fig. 1.

Fig. 3.

Fig. 2

Witnesses
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O. F. Stacy

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2 Sheets—Sheet 2

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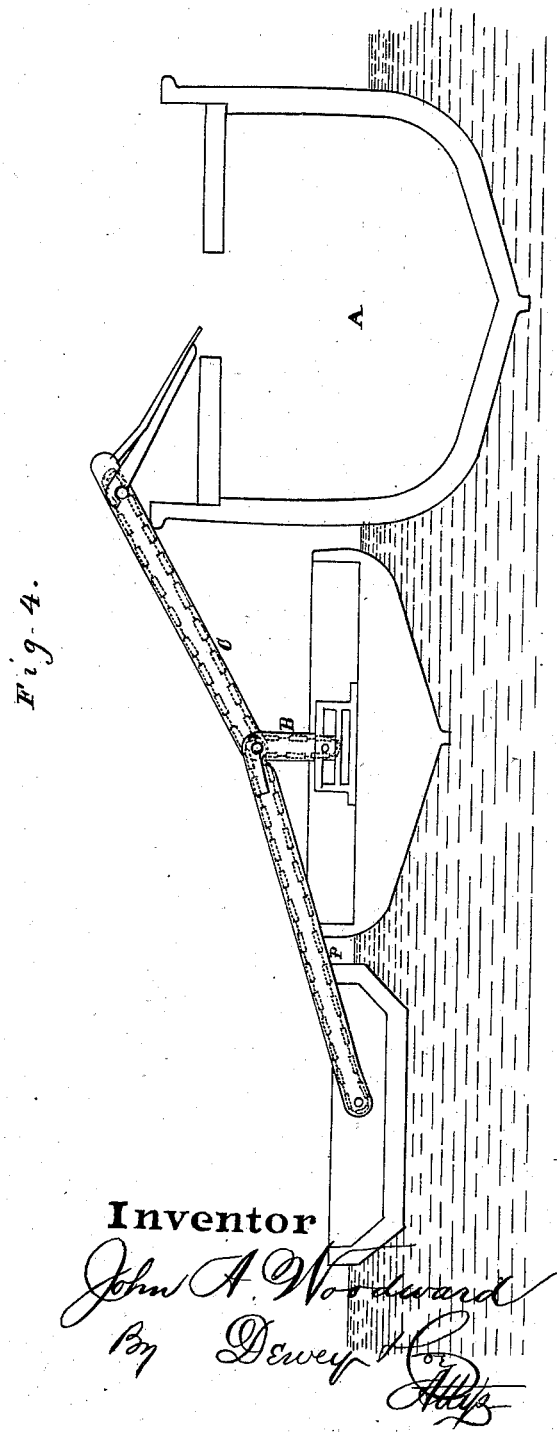

Fig. 4.

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UNITED STATES PATENT OFFICE.

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

IMPROVEMENT IN ENDLESS-CHAIN ELEVATORS.

Specification forming part of Letters Patent No. **191,911**, dated June 12, 1877; application filed April 19, 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 Endless-Chain 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 certain improvements in endless-chain elevators, such as are used for hoisting, carrying, and delivering coal, grain, lumber, and other substances into and out of the holds of ships, all as hereinafter more fully described.

Referring to the accompanying drawings, Figure 1 is a perspective view of my device. Fig. 2 is a part of slat 2, showing the plate K. Fig. 3 shows the toothed wheel N. Fig. 4 represents my invention as arranged for loading and unloading vessels.

Let A represent the hold of a vessel, from which it is desired to hoist a cargo of coal or other substance, or into which it is desired to deposit such a cargo. B C represent two or any number of similarly-hinged sections, which compose the frame over which an endless belt, hereinafter described, is arranged to travel. Each of these sections consists of two side pieces, which are connected together by one or more cross-braces, *g*, as represented. The lower end of the section B is mounted on a shaft, E, about which the section can be moved in a vertical plane. This shaft also serves as a driving-shaft, to which the power which drives the belt is applied. One end of the section C overlaps the upper end of the section B, and the two ends thus overlapped are connected together by a shaft, E, which extends entirely across the frame. On each end of this shaft, inside of the sides of the sections, is secured a stationary flanged wheel, *h*, with the flange on the outside edge. The ends of this shaft outside of the wheels will then form journals or bearings, about which the sections can move. Any number of similar sections can thus be joined together, so as to form a flexible frame for the endless belt to travel over.

The endless belt which I use is a slat-belt, the slats *i i* being connected together by links *j j*, as follows: To the under side of each slat and near each end I secure a plate, *k*, by means of a bolt, *l*, which passes directly through the slat, and is secured by a nut on the opposite side. These plates extend entirely across the slats, and their ends are bent so as to form hooks or staples *m* opposite each edge of the slat, into which the links are connected, so as to form a continuous slat belt. This belt can be easily lengthened or shortened by disconnecting any two of the slats, and either inserting other slats or removing some of them, according to the necessities of the case.

Upon the shaft E, which I mentioned above as being the driving-shaft, I rigidly secure one or more toothed wheels, N, the teeth of which are spaced according to the width of the slats *i i*, so that they serve, by engaging with the slats, to drive the belt.

This is a great improvement over the ordinary method heretofore used of driving the belt by gearing with links on each side of the belt, because I apply the power directly to the slats, which form the strongest part of the belt. This arrangement also enables me to preserve an equal strain or tension upon all parts of the belt, so that it will move uniformly and without torsion.

A single toothed wheel placed in the middle of the shaft E can be employed, or one can be placed near each end of the shaft corresponding to the flanged wheels *h*, as represented in the present instance.

On the inside of each section I secure a ledge or rail, O, to each side, upon which the ends of the slats will bear and move when the belt is at work, and thus be prevented from sagging. The ends of the shaft E project a little on the outside of each section, so that when desired other sections, P, can be attached to them by hooking the extremities of said sections over them. The belt can then be extended around them, so that by employing a number of sections any desired length of belt can be made. When the sections are secured in a position at angles to each other the rims of the wheels *h* serve to support and guide the passing belt.

The section P is provided with projecting arms *s*, the ends of which are formed into hooks, so that it can be hooked onto the projecting ends of the shaft E of an end section, for the purpose of receiving the load from the belt and directing it into the desired receptacle.

When this elevator is used for hoisting and carrying coal and other like substances suitable buckets will be secured to the belt in the ordinary way; but when it is used for hoisting and carrying large and heavy articles like grain in sacks, the buckets are not required.

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

1. The sections B C, connected by the shaft E, and provided with the side rails O, in combination with the flanged wheels *h*, substantially as and for the purpose described.

2. An endless-chain elevator consisting of the slats *i*, plates *k*, having hooks or eyes formed upon their ends, and attached to the slats transversely of their length by bolts *l*, and the links *j*, substantially as herein shown and described.

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

JOHN A. WOODWARD. [L. S.]

Witnesses:

I. W. GATES,

S. A. SANDERSON.