

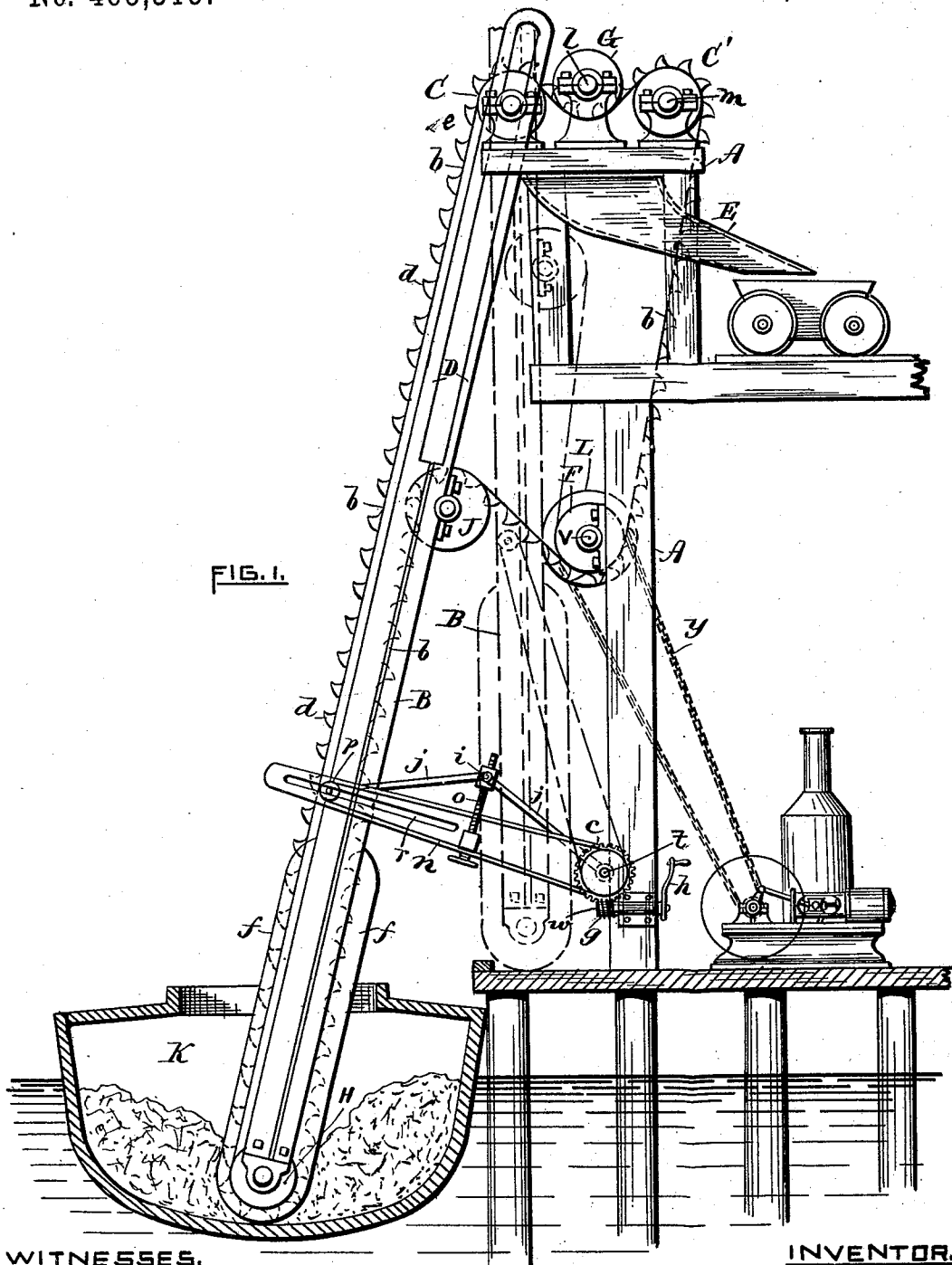
(No Model.)

2. Sheets—Sheet 1.

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ENDLESS CHAIN ELEVATOR.

No. 465,313.

Patented Dec. 15, 1891.



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INVENTOR.

Charles Harrigan

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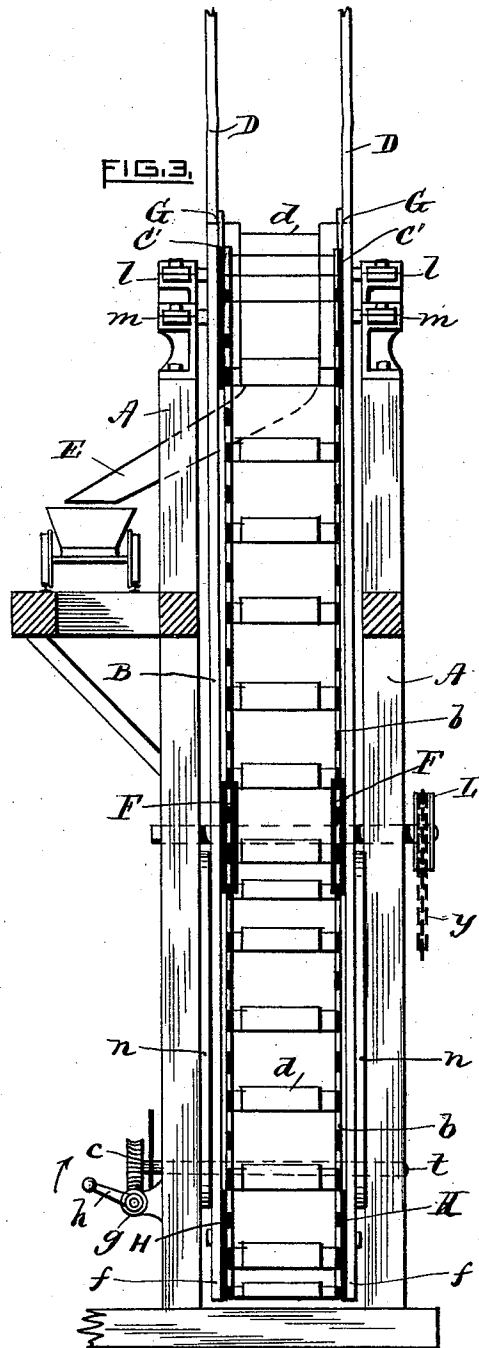
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Charles Harrington
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INVENTOR.

Bert Arnold

UNITED STATES PATENT OFFICE.

BENJAMIN ARNOLD, OF EAST GREENWICH, RHODE ISLAND.

ENDLESS-CHAIN ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 465,313, dated December 15, 1891.

Application filed August 10, 1891. Serial No. 402,199. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN ARNOLD, of East Greenwich, in the county of Kent and State of Rhode Island, have invented certain
5 new and useful Improvements in Endless-Chain Elevators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of
10 reference marked thereon, which form a part of this specification.

These improvements relate to that class of elevators called "endless-chain" elevators using endless chains with buckets for the purpose of raising coal, grain, sand, and other
15 commodities, and is intended in this case for use in transferring such merchandise from one vessel to another or to cars, or for storage in buildings constructed for that purpose.
20 It has been found necessary in elevators of this class when used for unloading vessels, to provide for the difference in the height of the vessel with regard to the elevator and its motive power caused by the rise
25 and fall of the tide, and the change in the level of the coal, grain, &c., to be raised, as the unloading of the vessel progresses.

The main object of these improvements is to make provision for these changes in such a manner as to dispense with a large portion
30 of the weight necessary to be raised and handled in the usual form of this class of elevators in accommodating them to these changes in position. It is also designed to
35 simplify the construction and lessen the power required to operate the elevator by avoiding the raising of the coal, grain, &c., above a certain fixed point, whatever the depth may be from which it is taken to be elevated. It is
40 illustrated in the accompanying drawings.

Figure 1 shows a side elevation of the elevator, wharf-engine to furnish the power, and a part of a coal-barge in section. Fig. 2 is a front elevation, with the lower end of the
45 movable frame resting on the wharf, as shown in broken line in Fig. 1. Fig. 3 shows a back elevation taken just back of the main upright A of the frame-work, with the movable frame in the same position as in Fig. 2.

50 The stationary parts of the elevator consist of two side frames A, like the one shown in Fig. 1, connected together by means of

beams, and a platform near the top upon which the commodity raised is to be delivered. Three horizontal shafts *e l m* are
55 placed across from one frame to the other at the top and held in suitable bearings on each frame. Each of these shafts has two wheels secured to it. The wheels C C on the shaft *e*, and the wheels C' C' on the shaft *m* support the greater part of the weight of the
60 chains and buckets attached to them, and the wheels C have also the load in the bucket to support when in operation.

B is a movable frame made in two side
65 parts connected together by suitable cross beams or bars to form a solid frame. It may be constructed of wood, for light grain-elevating, or of T-iron, as it is represented, for coal, &c. It has bearings attached to both
70 side parts at their lower ends to receive a horizontal cross-shaft, upon which the wheels H are made fast, around which the chains and their buckets pass in taking up the coal or grain. The wheels J are held on another
75 horizontal cross-shaft having bearings on the upper end of the frame B.

D is an extension of the frame B, made lighter and preferably in two parts on each side to form channels between them for guid-
80 ing-blocks *a*, on which its upper part rests, and connected together at the top for mutual support, as most of the load comes on the front bars. The guiding-blocks *a* are made fast to the bearings of the shaft *e*, making
85 that shaft the center of motion on which the whole movable frame swings.

A horizontal driving-shaft V is held in bearings, one on each of the main uprights of the frame A, and has a wheel L, by which it is
90 turned, secured on one end outside of the bearing, and two chain-wheels F F, made fast on it between the bearings, to carry the chains and buckets which pass around those wheels in going down empty.

95 The wheels C, C', G, H, and J may be simply pulleys, around which the chains *b* pass; but the driving-wheels F, F, and L are constructed so as to either drive the chains passing over them, as in the case of the wheels F, or made to be driven by a chain *y* from the engine, as wheel L is, and they may be either sprocket-wheels or wildcat-wheels used for working chain cables. Two endless chains *b*
100

b, having a series of buckets *dd* placed across from one chain to the other and properly secured to both, are used to convey the coal or grain, &c.

- 5 The course of the chains and buckets is from the driving-wheels *F F*, which move them up over the wheels *J*, then down around the wheels *H*, where the buckets fill themselves, thence up with their contents over the
10 wheels *C*, and down under the wheel *G*, which depresses them and causes the buckets to be tipped over between the wheels *C* and *G* sufficiently to discharge their contents into the chute below them, then up over the wheel *C'*,
15 which is for the purpose of carrying the chains and empty buckets far enough back from the chain of full buckets in front to admit of the chute being placed between the ascending and descending chains and buckets, and down
20 empty to the driving-wheels *F F* again. The coal, grain, &c., is carried from the barge *K* by the buckets *d*, which automatically fill themselves in passing down around the wheels
25 *H* up over the wheels *C*, and as they pass down on the back of wheels *C* to go under the wheels *G* they are inclined sufficiently to insure their contents being discharged through the intervals between the buckets into the
30 chute *E*, placed under the wheels *C G C'*, between the ascending and descending portions of the chain *b*, and by the chute are conveyed out one side from between the chains down into cars or other receptacle provided to receive them. The chain and empty buckets
35 then pass up over the wheels *C'*, down under the driving-wheels *F*, up over the wheels *J*, and down to the wheels *H* again.

- The object of the movable frame *B* is to allow the lower wheels *H*, with the chains and buckets, to be let down to the depth necessary
40 to reach the coal, grain, &c., in the vessel, which, as before stated, may, by reason of the tide, &c., be more or less below the level of the elevator-base.

- 45 The mechanism for lowering and raising the frame *B* and also for pushing it out from the wharf and drawing it in again consists of a horizontal shaft *t*, held in suitable bearings secured to the uprights of the frame *A* and
50 having a worm gear-wheel *c* fastened on it. A short shaft *w* is placed in a bearing attached to the frame *A*, at right angles to the shaft *t* and at such a distance from it that a worm *g* on the end of the shaft *w* will engage with the worm-gear *c* on the shaft *t* and operate it
55 when turned. An arm *n* is secured at one end to this shaft *t* and connected to the frame *B* by a pivot *p*, made fast in that frame. This pivot *p* slides in a slot *r* in the arm *n*, and is
60 moved therein by a pair of toggle-levers *j j*, the outer end of the pair being held on the pivot *p* and the inner end of the pair is held loose on the shaft *t*. The other two ends of the levers *j* are pivoted to a nut *i*, which has
65 a screw-thread made in it fitting onto a screw *o*, held in a bearing placed transversely on the arm *n*. The arrangement is such that

upon turning the screw *o*, so as to draw the nut *i* down toward the arm *n*, the toggle-levers *j j* will be straightened and the pivot *p* with
70 the frame *B* will be pushed out toward the end of the arm, and, vice versa, upon turning the screw *o* in the other direction the pivot and frame *B* will be drawn in toward the frame *A*. 75

The operation of the mechanism that raises and lowers the frame *B* is this: Supposing the position of the frame to be as shown by broken lines in Fig. 1—that is, with its lower end
80 resting on the wharf—by turning the crank *h* in the direction of the arrow, Fig. 3, the worm *g* will turn the worm-gear *c* over, so as to throw the arm *n* out from the frame *A*, which will carry the frame *B* out with it, and also let it
85 down as it proceeds and bring it to the position shown by the full lines in Fig. 1. Further adjustment in or out from the wharf can be made, as before described, by means of the screw *o* and toggles *j*. In an elevator for light
90 work one arm *n* may be sufficient; but for heavy work two such arms, one for each side of the frame *B*, will be required, with the toggles and mechanism to operate them, as described. It will be readily seen that when
95 the frame *B* is lowered from the position shown in broken lines in Fig. 1 to the position shown in full lines in the same figure, the length of extra chain required to lengthen the bight
around the wheels *H* will be supplied from the chains where they pass over the wheels *J*,
100 which, as they descend with the frame *B*, will release an equal portion of the chains passing over them, and when the frame *B* is raised the wheels *J* will take up the slack of the chains released by the rising of the wheels *H*
105 and thus keep them at proper tension in all positions, avoiding the necessity for carrying the chains and buckets at the top far above the point of delivery when the frame is raised by reason of the tide, &c. 110

In endless-chain elevators of the usual construction, of which United States Patents Nos. 362,571 and 433,762 are fair examples, the whole weight of the chains and buckets is added to that of the frames carrying them,
115 and this gross weight has to be raised or moved in making changes to accommodate the apparatus to the height of the tide, &c., and to this weight is to be added the weight of coal, &c., in the buckets when the changes
120 occur while unloading a vessel, as they usually do, making a weight of from twelve to fifteen tons in some cases to be handled; but in this
elevator the weight of the greater part of the chains, buckets, and all the load in the buckets
125 is supported by the wheels *C* and the stationary frame *A*, leaving only the weight of the frame *B*, which can be made much lighter, as it has less to support and the weight of less
130 than one-half of the chains and empty buckets, which is a decrease of over one-half the weight to be raised and handled in keeping the lower end of the elevator at the proper height. The point of delivery of the load

raised is always the same, likewise the place for the application of power to operate the elevator, which makes the apparatus much simpler to construct and requiring much less power to operate.

Having thus described the construction and operation of my improvements, I claim as my invention—

1. In an endless-chain elevator, the movable frame B, having guide-bars at its upper end supported by the stationary frame-work A and having the wheels H and J, mounted thereon, substantially as described, in combination with the wheels C, chains *b*, buckets *d*, and means for moving said frame B, substantially as herein set forth.

2. In an endless-chain elevator having a movable frame for adjustment, the combination of the shaft *t*, worm gear-wheel *c*, worm *g*, shaft *w*, slotted arm *n*, and stud *p*, engaging therein with said movable frame B, and stationary frame A, substantially as set forth.

3. In an elevator of the kind described, the

combination of the toggle *j*, screw *o*, nut *i*, with the arm *n*, stud *p*, wheel *c*, worm *g*, movable frame B, and stationary frame A, substantially as specified.

4. The combination of the three sets of wheels C G C' and chute E, located between the ascending and descending runs of the chains, with the chains *b*, buckets *d*, and frames A and B, substantially as described.

5. In an endless-chain elevator, a movable frame having thereon two sets of wheels to carry endless chains with buckets, said wheels being located in two bights of said chains to take up in one bight while releasing said chains in the other bight, substantially as described, in combination with said chains, buckets, and means for operating them and said movable frame.

BENJ. ARNOLD.

Witnesses:

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S. L. LEETE.