(No Model.) 3 Sheets—Sheet 1.

D. T. DENTON.

HOIST DRUM FOR DISCHARGE APPARATUS OF COAL OR ORE DOCKS.

No. 514,262. Patented Feb. 6, 1894.

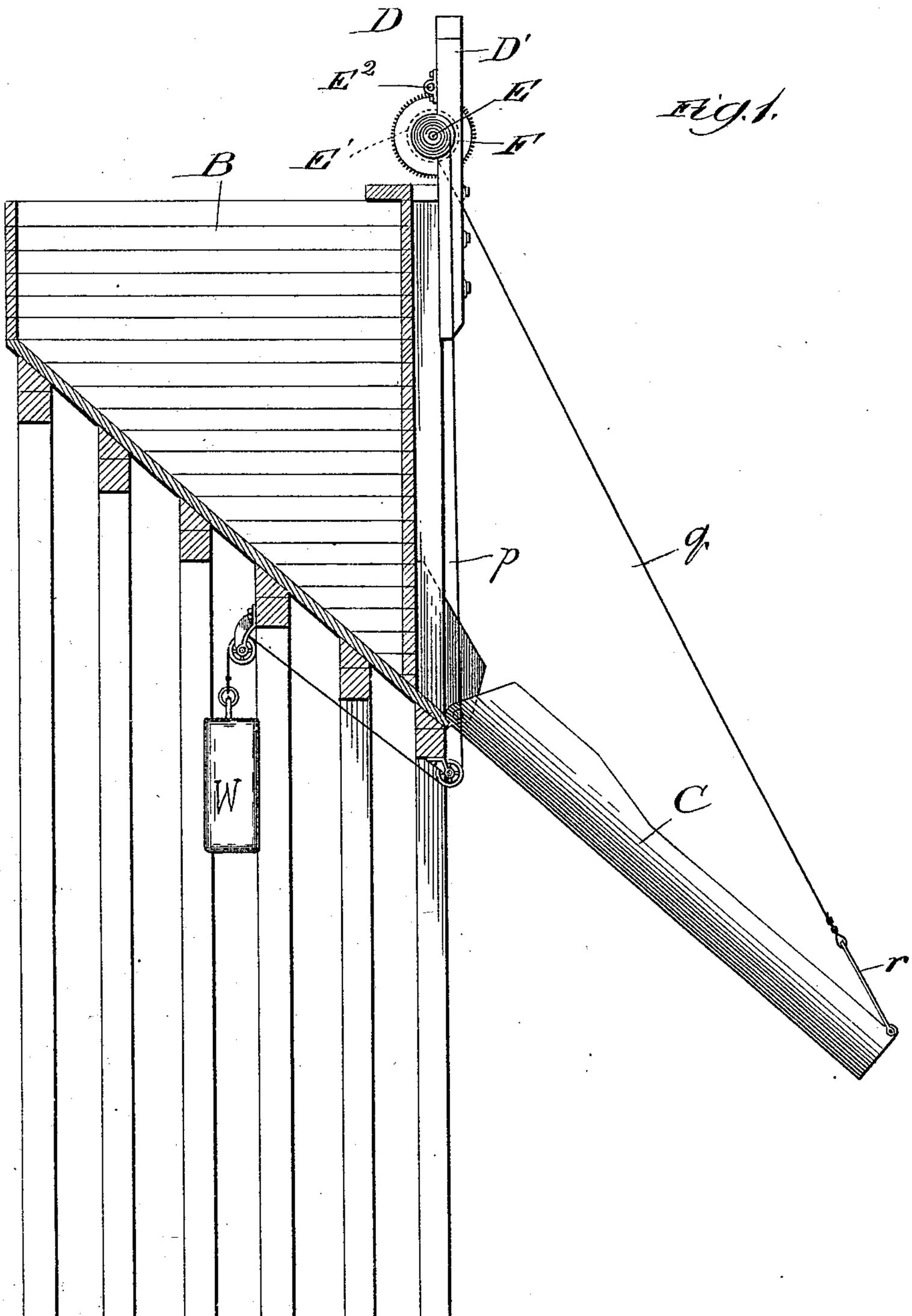

Fig. 1.

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Fig. 2.

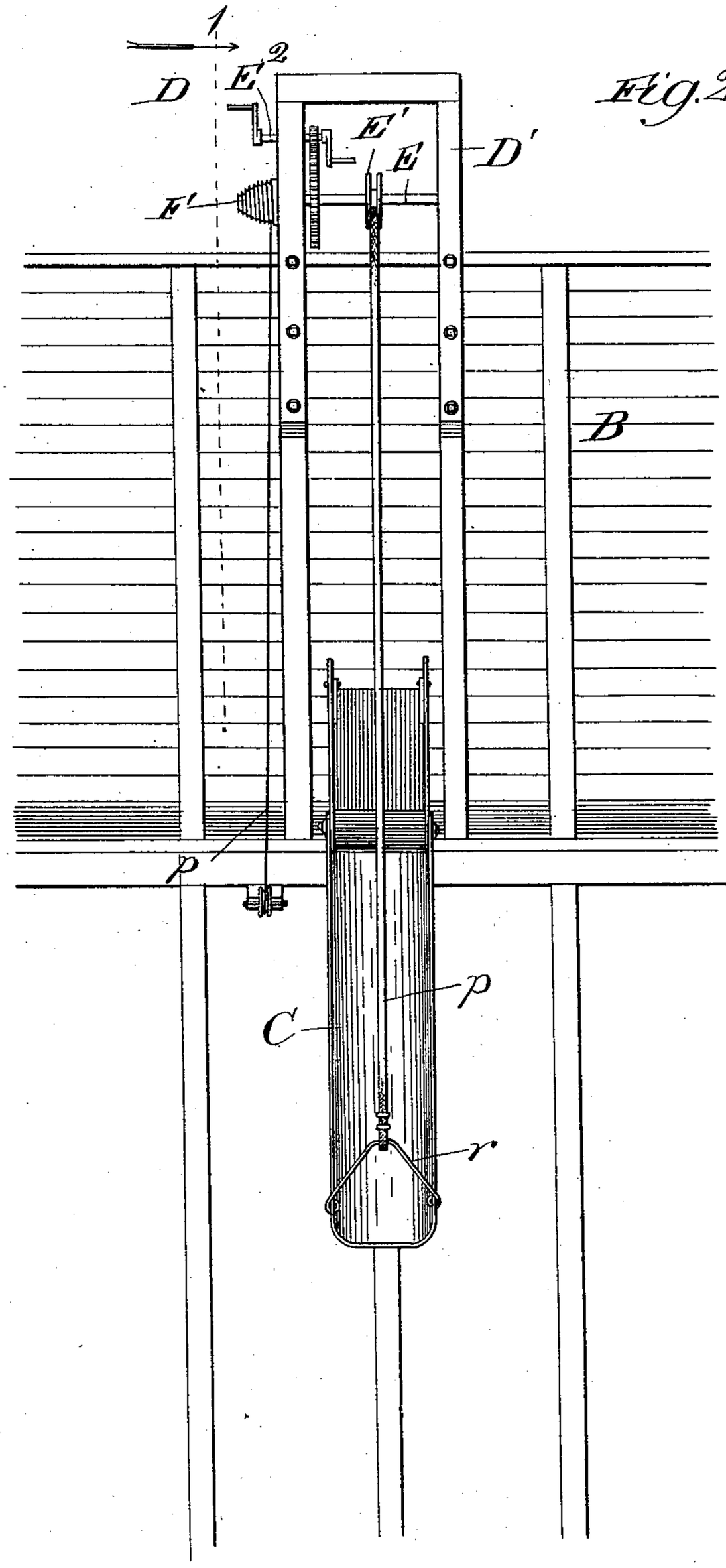

Fig. 3.

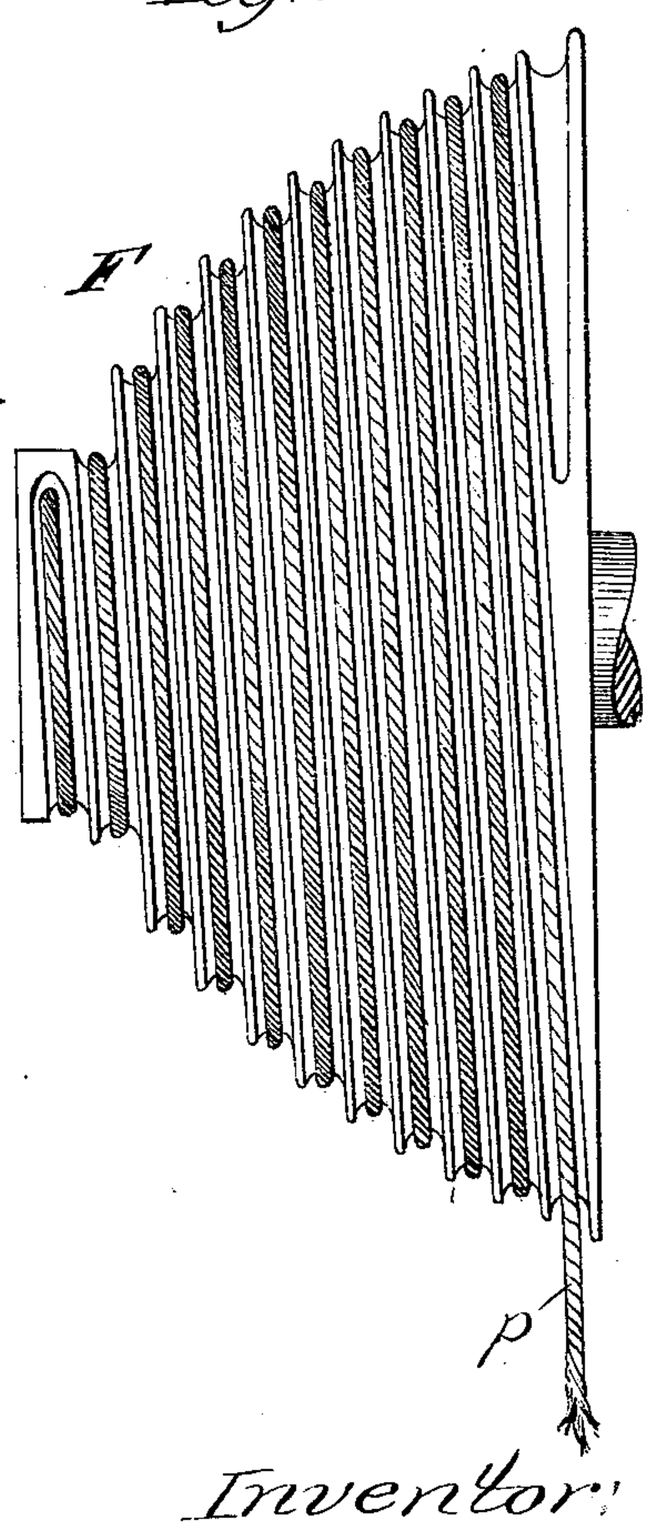

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Fig. 4.

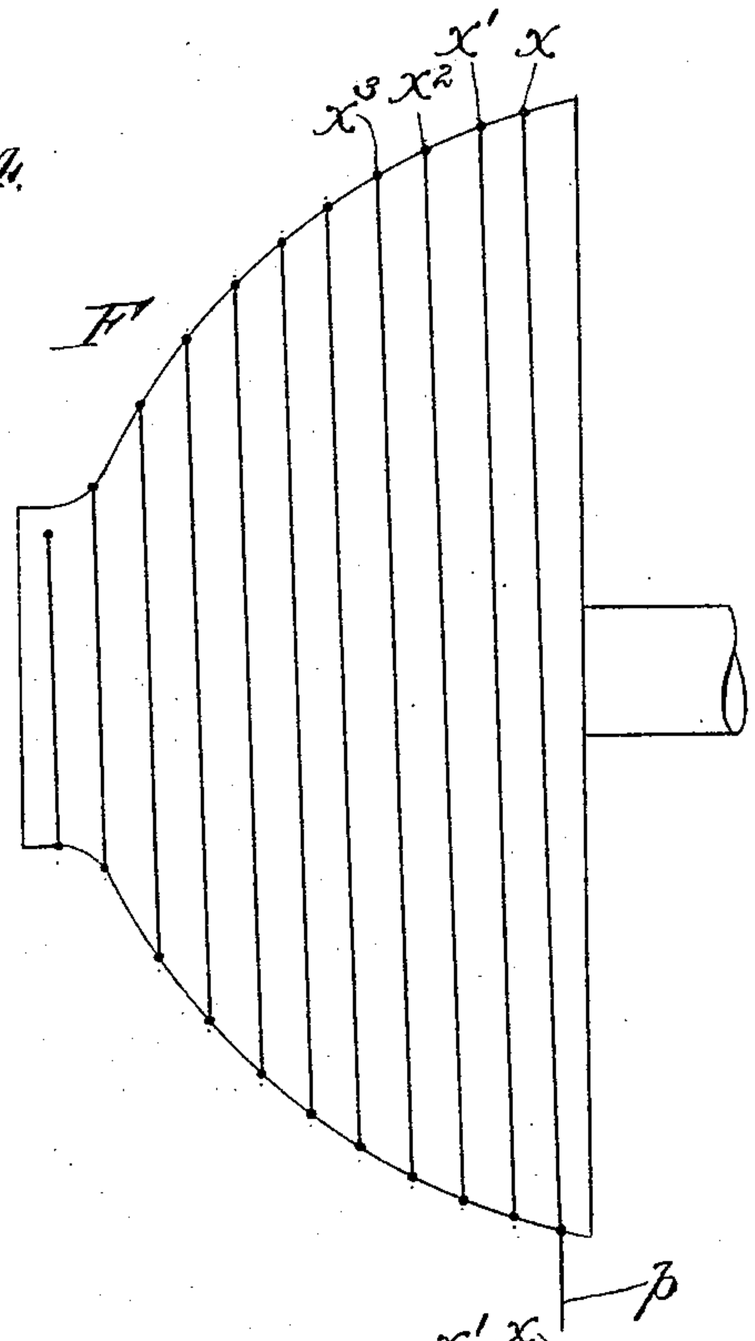
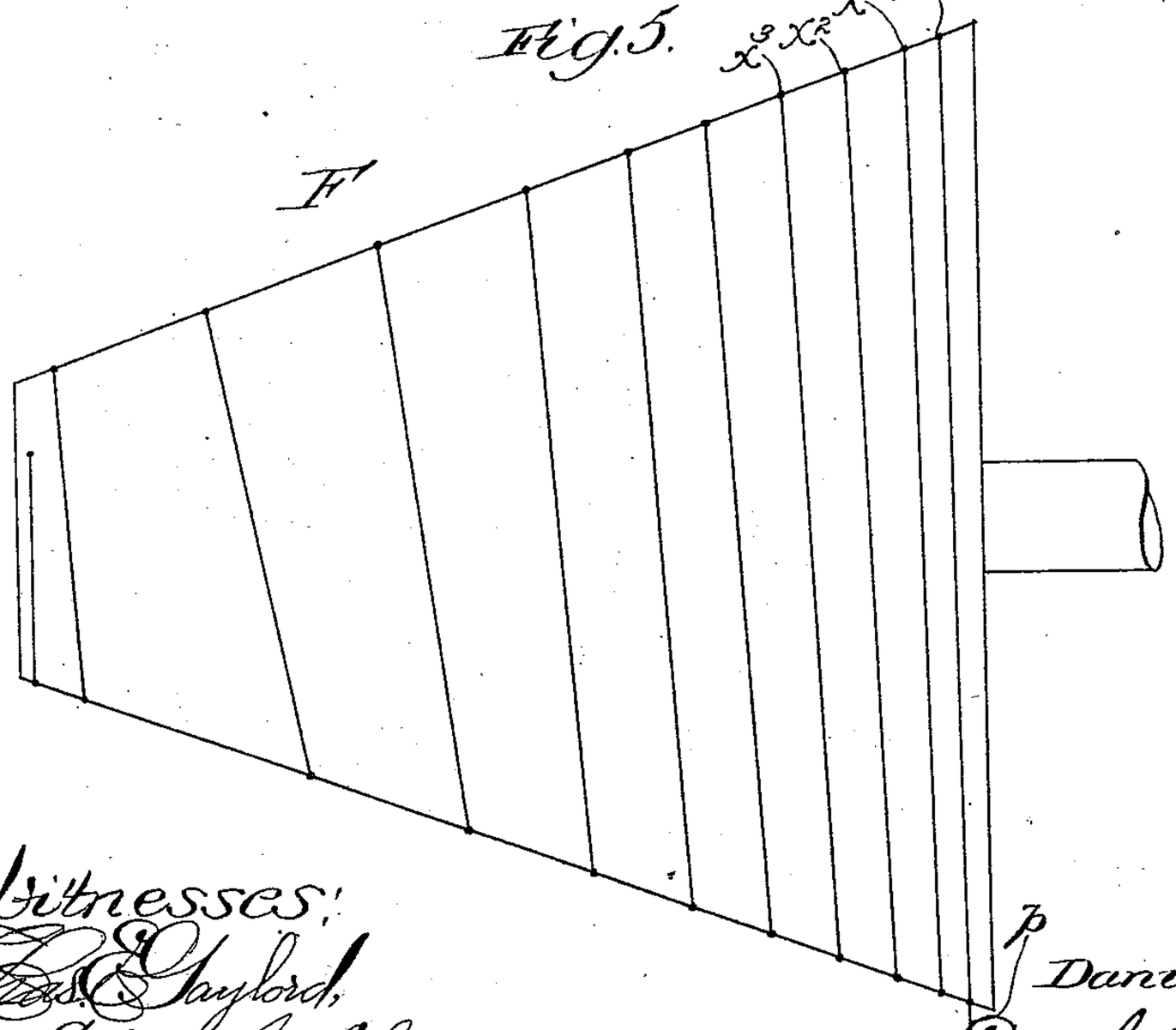


Fig. 5.



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UNITED STATES PATENT OFFICE.

DANIEL T. DENTON, OF LAKEVIEW, MINNESOTA, ASSIGNOR TO THE PETTIBONE, MULLIKEN & COMPANY, OF CHICAGO, ILLINOIS.

HOIST-DRUM FOR DISCHARGE APPARATUS OF COAL OR ORE DOCKS.

SPECIFICATION forming part of Letters Patent No. 514,262, dated February 6, 1894.

Application filed July 25, 1893. Serial No. 481,425. (No model.)

To all whom it may concern:

Be it known that I, DANIEL T. DENTON, a citizen of the United States, residing at Lakeview, in the county of St. Louis and State of Minnesota, have invented a new and useful Improvement in Hoist-Drums for the Discharge Apparatus of Coal or Ore Docks, of which the following is a specification.

As coal, ore, and the like, docks, are commonly constructed, they involve bins, supported in elevated position, each having a chute pivotally supported on one end at the discharge-opening in the base of the bin and adapted to be raised and lowered vertically on its pivot to remove it, in the one instance, out of the way, and, in the other instance, to adjust it into operative position for directing the contents of the bin into a vessel to be loaded. The chute, which is very heavy, is operated through the medium of hoisting mechanism at the top of the bin, and, to facilitate operation of the hoist, the chute is counterbalanced. The resistance which a chute presents in its movement from one ultimate position to the other, is greatest when it extends horizontally, the resistance decreasing as the chute is raised or lowered from, and increasing as it is lowered or raised toward, the horizontal. Obviously the chute in its raised and operative (lowered) positions requires the less exertion of the counterbalancing effect, since in each it is mainly supported by its pivot, resting at its inner end thereon when raised, and hanging at its inner end thereon when lowered. But the greatest resistance the chute offers to the hoisting operation is in starting its rise from the let-down position, for the hoist being above and to the rear of the pivotal support, the strain of the hoisting operation necessarily tends, in a considerable measure, to pull the chute lengthwise against its pivotal support.

The objects of my improvement are to provide simple, but highly practicable and efficacious means for proportioning, through the medium of the hoist, the effect of the counterbalance more or less approximately to the varying resistance of the chute in its rise and fall; and to provide the greatest leverage at the hoist when the chute is in its lowered, or operative, position, thereby the more easily to overcome the binding tendency due to the strain, referred to, against the pivot. To these ends I provide, in the hoisting mechanism, a drum tapering toward one end and spirally grooved about its periphery to guide the winding and unwinding of the cable fastened to the tapering end of the drum for suspending from the latter the counterbalance-weight, the relative distance between the centers of adjacent sections of the spiral groove increasing, in the direction of the taper, to decrease, accordingly, the leverage, on the drum, of the chute-counterbalancing weight, and thereby compensate for variation in the resistance presented by the chute in operating it.

Referring to the accompanying drawings—Figure 1 is a view in sectional side elevation of a dock of the class referred to, provided with my improvement. Fig. 2 is a view of the same in front elevation. Fig. 3 shows, in elevation, the approximately cone-frustum shaped hoisting drum forming the main feature of my improvement; and Figs. 4 and 5 are somewhat exaggerated representations of my improved drum, shown, respectively, in the form presented by Fig. 3 and in a modified form.

A is the dock, of which B is one of the bins, having pivotally supported at its discharge-opening, to swing in a vertical plane, in a common or any suitable manner, a chute C, which may involve any desired or well-known construction.

D is the hoisting mechanism, usually comprising a frame D′ extending above the bin and supporting a rotary shaft E having a flexible connection between a winding-drum thereon and the chute toward its outer end, and with which is connected a suitable counterbalance exerting an opposing effect upon the chute. I connect the shaft E with the chute, as at a pivotal bail *r* near its outer end, preferably by a flat cable *q* of woven wire, as the flexible connection, from a drum E′, which should be circumferentially flanged, as represented, to afford a peripheral groove, in which to wind the cable, of just about sufficient width to admit it. On the shaft E, and preferably on an end thereof projecting be-

yond the frame D′, is secured a drum F tapering from near one (preferably its outer) end toward the opposite end; and the drum is approximately semi-spheroidal in shape, or convexo-convex longitudinally, and is grooved circumferentially and spirally, the distance between the centers of adjacent sections of the groove (as along the top and bottom of the view presented in Fig. 3), decreasing in the direction toward the flaring end of the drum, as indicated. To the outer, or narrower, end of the drum F I attach a cable, chain, or the like, *p*, having suspended upon it any suitable construction of counterbalance, represented as a weight W, and which cable, or the like, winds on its drum oppositely to the winding of the cable *q* on the drum E′. For turning the shaft E I may gear it, as shown, to a crank-shaft E^2.

The operation is as follows: While the chute has been moving, by properly turning the shaft E, toward the lowered position in which it is represented, and thus producing paying out of the cable *q*, the cable *p* has been wound along the drum F in the peripheral groove thereon in the direction of its increasing diameter, thereby increasing, through the medium of the drum, the leverage of the weight W on the chute, till the latter reaches a horizontal position, at which the cable *p* is at a point of considerably greater diameter of the drum. Thereafter, in the continued descent of the chute, notwithstanding the fact that its resistance to the weight decreases till the chute is fully lowered, the cable *p* winds upon the continued increasing diameter of the drum F till the chute has reached its lowest position when the cable is upon the greatest diameter of the drum, where the weight may exert the greater leverage on the shaft E and thus enable the hoisting operation the more easily to overcome the resistance referred to in starting the rise of the chute. While it would appear that, in view of the decreasing resistance of the chute in descending from the horizontal position, the diameter of the drum might accordingly be decreased along the portion thereon at which the cable *p* then winds, I find, in practice, that the best result is attained by the continued flaring of the drum in the form thereof illustrated. As the chute rises, by reversing the direction of turning the shaft E, the cable, or the like, *p*, gradually unwinds from the flaring end of the drum F till it suspends the counterbalance from a point thereon where it exerts a leverage which is sufficient to counterbalance the chute when it reaches its horizontal position; after which its leverage decreases by the continued unwinding till the cable hangs from the outer reduced end of the tapering drum F.

The operation will be further elucidated by the description hereinafter contained, with particular reference to the exaggerated representation of the hoisting-drum in Figs. 4 and 5. Thus Fig. 4 shows the distance between the points *x* and *x′* to be slightly less than that between *x′* and x^2; that between x^2 and x^3 to be less than the distance between x^2 and x^3; and so on. Fig. 5 illustrates the same principle applied to a regular-cone form of the drum.

It is to be understood that when the chute C occupies its hanging position, the cable *p* must extend between the weight W and the greatest diameter or circumference of the drum to enable the greatest leverage, or effect of the weight, to be exerted through the drum to effect the greatest resistance of the chute to being started to rise, due to its having to be pulled to some extent against its pivot, until after it has been started. Thereafter, the diameter of the drum could remain substantially uniform to the point of unwinding its cable at which the chute will have reached a horizontal position, or thereabout (wherein it is, so to speak, heaviest) provided that diameter be sufficient to enable the weight to exert the leverage there necessary to offset or equal the gravity of the chute when horizontal. It is preferred, however, as hereinbefore suggested, to observe the tapering form of the drum throughout, and also the differential distances between the centers of adjacent groove-sections. During the rising progress of the pivotal chute from the horizontal position, its gravity necessarily decreases quite rapidly, so that the weight W must not only exert less and less leverage on the drum in order to be a counterbalance for the chute, but the decrease in the chute's gravity is so irregular that the decrease in the leverage of the weight W on the drum must be irregular to correspond more or less approximately. Accordingly, so to speak, the pitch of the groove is changed to guide the cable *p* the quicker or more immediately toward the tapering end to where the leverage of the weight on the drum will be lessened to the extent required for counterbalancing; and this variance in the pitch of the groove is according, or approximately according to the irregularity in the variation of the weight of the rising (or, for that matter, falling) chute, and is what is meant by the variation in the distance between the centers of adjacent groove-sections.

The weight W is intended to represent any analogous resisting medium to the chute, and is to be so understood in the appended claims.

The effect of my improvement may be had by interchanging the positions of the drums F and E′, and connecting the chute with the former and suspending the weight from the latter; and this without departure from my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. A drum for the pivotal-chute hoist-shaft of the hoisting mechanism of a coal, ore, or the like, dock, said drum tapering in one direction to its end and having a circumferential spiral groove with the distance between

the centers of its adjacent sections decreasing in the direction toward the flaring end of the drum, substantially as and for the purpose set forth.

2. A drum for the pivotal-chute hoist-shaft of the hoisting mechanism of a coal, ore, or the like, dock, said drum being approximately semi-spheroidal in shape and tapering toward one end and having a circumferential spiral groove with the distance between the centers of its adjacent sections decreasing in the direction toward the flaring end of the drum, substantially as and for the purpose set forth.

DANIEL T. DENTON.

In presence of—
A. H. MULLIKEN,
WALTER N. INGALLS.