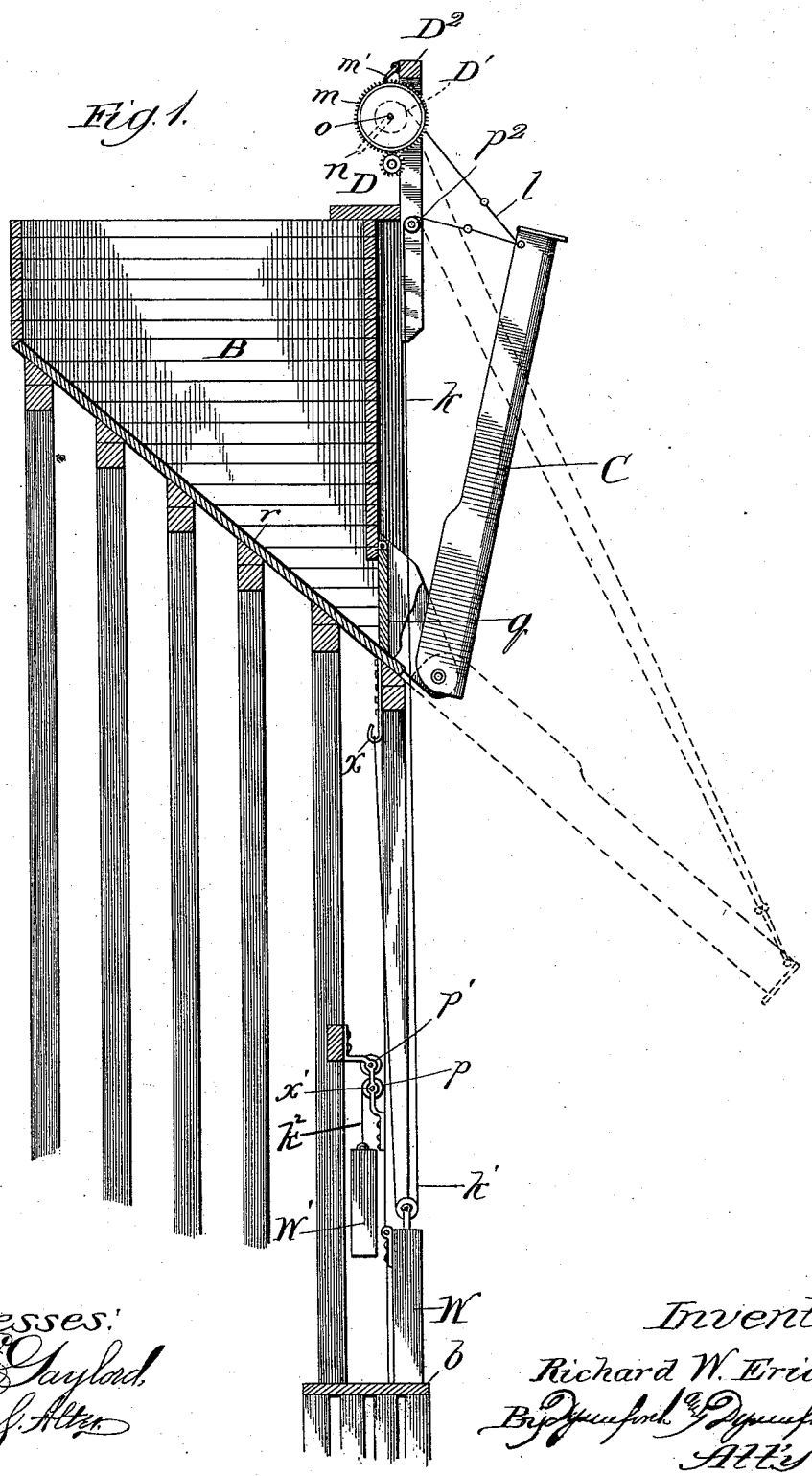
(No Model.) 2 Sheets—Sheet 1.

R. W. ERICSON.

COUNTERBALANCE MECHANISM FOR CHUTES OF COAL OR ORE DOCKS.

No. 522,519. Patented July 3, 1894.

Fig. 1.



Witnesses:
Chas. E. Gaylord.
Luke J. Alty.

Inventor:
Richard W. Ericson.
By Dyrenforth & Dyrenforth,
Attys.

(No Model.) 2 Sheets—Sheet 2.

R. W. ERICSON.

COUNTERBALANCE MECHANISM FOR CHUTES OF COAL OR ORE DOCKS.

No. 522,519. Patented July 3, 1894.

Fig. 2.

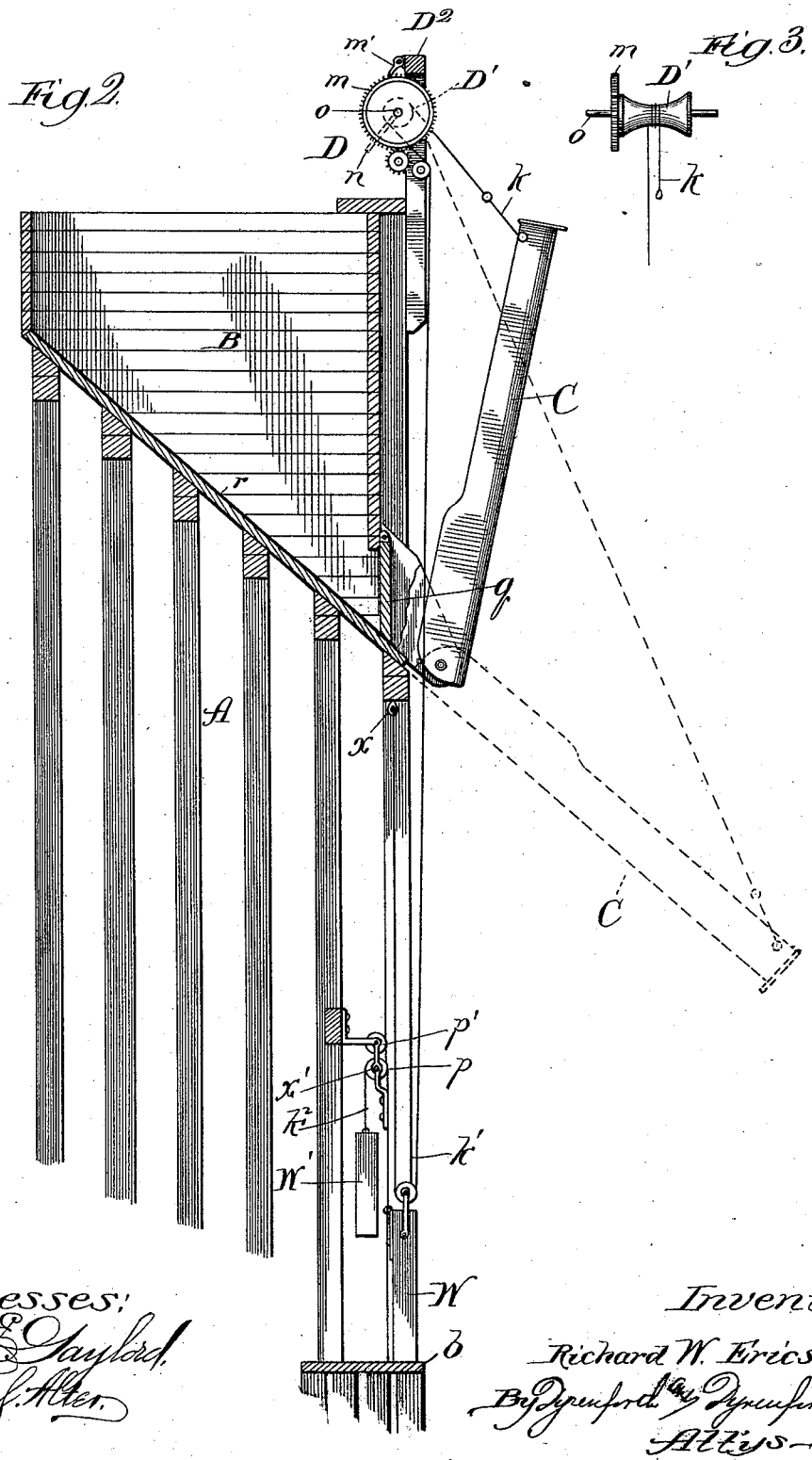


Fig. 3.

Witnesses:
Chas. E. Gaylord.
Lutie J. Alter.

Inventor:
Richard W. Ericson.
By Dyrenforth & Dyrenforth,
Attys.

UNITED STATES PATENT OFFICE.

RICHARD W. ERICSON, OF AURORA, ASSIGNOR TO THE PETTIBONE, MULLIKEN & COMPANY, OF CHICAGO, ILLINOIS.

COUNTERBALANCE MECHANISM FOR CHUTES OF COAL OR ORE DOCKS.

SPECIFICATION forming part of Letters Patent No. 522,519, dated July 3, 1894.

Application filed April 18, 1894. Serial No. 507,978. (No model.)

To all whom it may concern:

Be it known that I, RICHARD W. ERICSON, a citizen of the United States, residing at Aurora, in the county of Kane and State of Illinois, have invented a new and useful Improvement in Counterbalance Mechanism for the Chutes of Coal or Ore Docks, of which the following is a specification.

The object of my invention is to improve, in the matters of simplicity and efficacy, in the construction of counterbalance-mechanism for the ponderous chutes, which are lowered into inclined position from the dock-bins to load the contents of the latter into vessels, and are raised when out of use, and the direction of my improvement is that of so suspending weights for controlling a chute that they shall be brought into play to exert the greater gravity against the chute as the resistance of the latter increases according to its variations in position in being raised or lowered on a fulcrum, and to exert thereon the lesser gravity as the chute-resistance decreases according to such variations.

My improvement is based, for its operativeness, upon the theory that the chute presents the least resistance to be counterbalanced in its completely raised and completely lowered positions, because when raised it stands and bears most of its weight on the fulcrum and when lowered it hangs, and thus bears most of its weight thereon; that its greatest resistance to be counterbalanced is presented by the chute in a horizontal position; and that this resistance increases as the chute is lowered toward the horizontal and decreases as it is raised therefrom; while the chute offers the greatest resistance to being raised from its lowered position owing to binding against its fulcrum.

My invention consists in the chute-counterbalancing means hereinafter described and claimed adapted to exert their counterbalancing, or approximately counterbalancing, effect on the chute in each of its assumed positions in being raised or lowered, by reducing and increasing their weight as the resistance of the chute decreases or increases.

Referring to the accompanying drawings—Figure 1 shows a vertical section of a dock provided with my improved chute-counterbalance mechanism, represented mainly in side elevation. Fig. 2 is a similar view of the same showing a modification of my improvement; and Fig. 3 is a detail view of the drum and cable in the modified form of the apparatus.

A denotes the frame-work of a dock-structure and B is a bin surmounting it and provided with the usual inclined bottom r leading to the discharge-outlet q at the base of the front side of the bin.

C is the chute, of usual or any suitable construction, pivotally supported at one end adjacent to the outlet q to adapt it to be swung on a fulcrum; and D is hoisting-mechanism shown as a drum D′ on a shaft o journaled in a suitable frame D^2 extending beyond the top of the bin on its front side, the shaft carrying a winch n and being provided with a ratchet-wheel m to be engaged by a dog m' on the frame.

As shown in Fig. 1, the chute is connected from near its outer end by a flexible connecting medium l (as a chain or cable) with the drum D′; and from near the point of fastening the chain l there depends a cable k, passing over a guide-pulley p^2 and fastened at its lower end stationarily to the dock, as at x, the cable being sufficiently long to permit, freely, lowering of the chute and to form a loop k' in which is suspended a weight W. Another weight, W′, is connected with the weight W by a cable k^2 which suspends the weight it carries from a guide shown as a pulley p journaled at x' on the dock and between which and an adjacent pulley p' the cable passes from the weight W. The combined gravity of both weights is sufficient to about counterbalance the chute when extending horizontally from its fulcrum. The normal relative positions of the weights, when the chute is raised, are those shown, wherein the heavier weight W rests on the base b, and the lesser weight W′ is held in suspension to reduce to the extent of its gravity that of the weight W. As the chute is lowered the weight W is raised from its position of resting on the base b, while the weight W′ descends and soon rests on the base, thereby relieving the weight W of it, while the greater weight continues to rise to oppose its full

gravity to the chute till the latter has fallen some distance (to or near a horizontal position) and until the cable k, in paying out, shall have brought the base of the loop k' above the plane of the pulleys p, p'. Thereafter, the continued descent of the chute raises both weights and is opposed by their combined gravity to counterbalance it at the horizontal position and resist its momentum in falling till it is completely lowered, in which position it presents the greatest resistance to being raised by the weights because their pull upon it tends to force it lengthwise or bind it against its center of movement. When the hoist-shaft is turned to raise the chute, overcoming its binding resistance, referred to, against the fulcrum is mainly accomplished by the combined gravity of the weights W and W', which continue thereafter to descend together till the chute has risen beyond the horizontal, after which the lesser weight strikes the base b leaving the entire weight W alone to counterbalance the chute until the latter is raised far enough to lower the base of the loop k' below the plane of the pulleys p, p', whereby the descending weight W raises, and is reduced by, the weight W' throughout the remainder of the rise of the chute.

The only material variation in my improvement as illustrated in Fig. 2 from the representation thereof in Fig. 1 is that the connection by the flexible connecting medium of the chute with the hoist and counterbalance is made continuous, by passing the cable k from the primary weight W, with several turns, about the drum D' and thence to the chute near its outer end, where the cable is fastened. Obviously, the operation is the same with either form of the device, of reducing the gravity of the primary or greater weight by the secondary or lesser when the resistance of the chute, near its raised position, is least; bringing the full gravity of the greater weight to bear against the chute when near the horizontal position; and employing the combined gravity of both weights to resist the chute in its horizontal position and to assist in overcoming the binding to which it is subjected by starting its rise from the completely lowered position.

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

1. In combination with the chute and hoist-mechanism of a coal, ore, or the like, dock, a counterbalance comprising a primary weight on a cable fastened at one end to the chute and at its opposite end to the dock, forming a pendent loop for said weight, a secondary weight connected with the primary weight by a cable passing thence over a guide in the plane between the weights, and a supporting base for the weights, substantially as and for the purpose set forth.

2. In combination with the chute and hoist-mechanism of a coal, ore, or the like, dock, a counterbalance comprising a primary weight W on a cable k fastened at one end to the chute and at its opposite end to the dock, forming a pendent loop k' for said weight, a secondary weight W', a pair of guide-pulleys p, p', supported on the dock to one side of the plane of movement of the primary weight and above the same in its lowest position, a cable k^2 extending between said pulleys and connected at its opposite ends respectively with the weights W and W', and a base b for the weights, substantially as and for the purpose set forth.

3. In combination with the chute and hoist-mechanism of a coal, ore, or the like, dock, a counterbalance comprising a primary weight W on a cable k fastened at one end to the chute, proceeding thence downward and fastened at its opposite end to the dock, forming a pendent loop k' for said weight, a cable l connecting the chute with the hoist-drum, a secondary weight W', a guide-pulley p supported on the dock to one side of the plane of movement of the primary weight and above the same in its lowest position, a cable k^2 connecting the two weights over said guide-pulley, and a base b for the weights, substantially as and for the purpose set forth.

RICHARD W. ERICSON.

In presence of—
HARVEY HUGHES,
J. M. KENNEDY.