(No Model.)

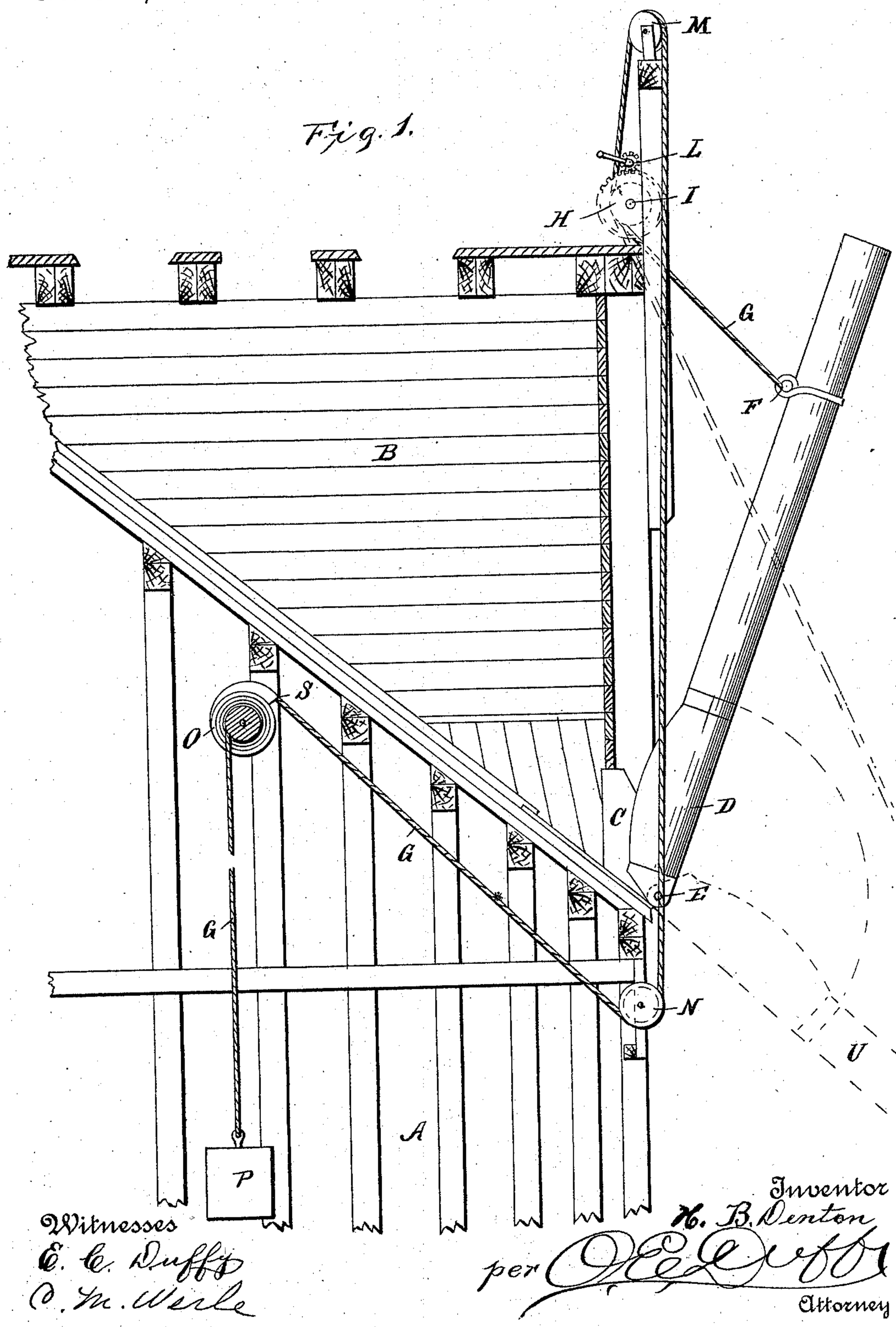
4 Sheets—Sheet 1.

H. B. DENTON.

HOIST DRUM.

No. 574,085. Patented Dec. 29, 1896.

Fig. 1.



Witnesses
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C. M. Merle

Inventor
H. B. Denton
per
Attorney

(No Model.) 4 Sheets—Sheet 2

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HOIST DRUM.

No. 574,085. Patented Dec. 29, 1896.

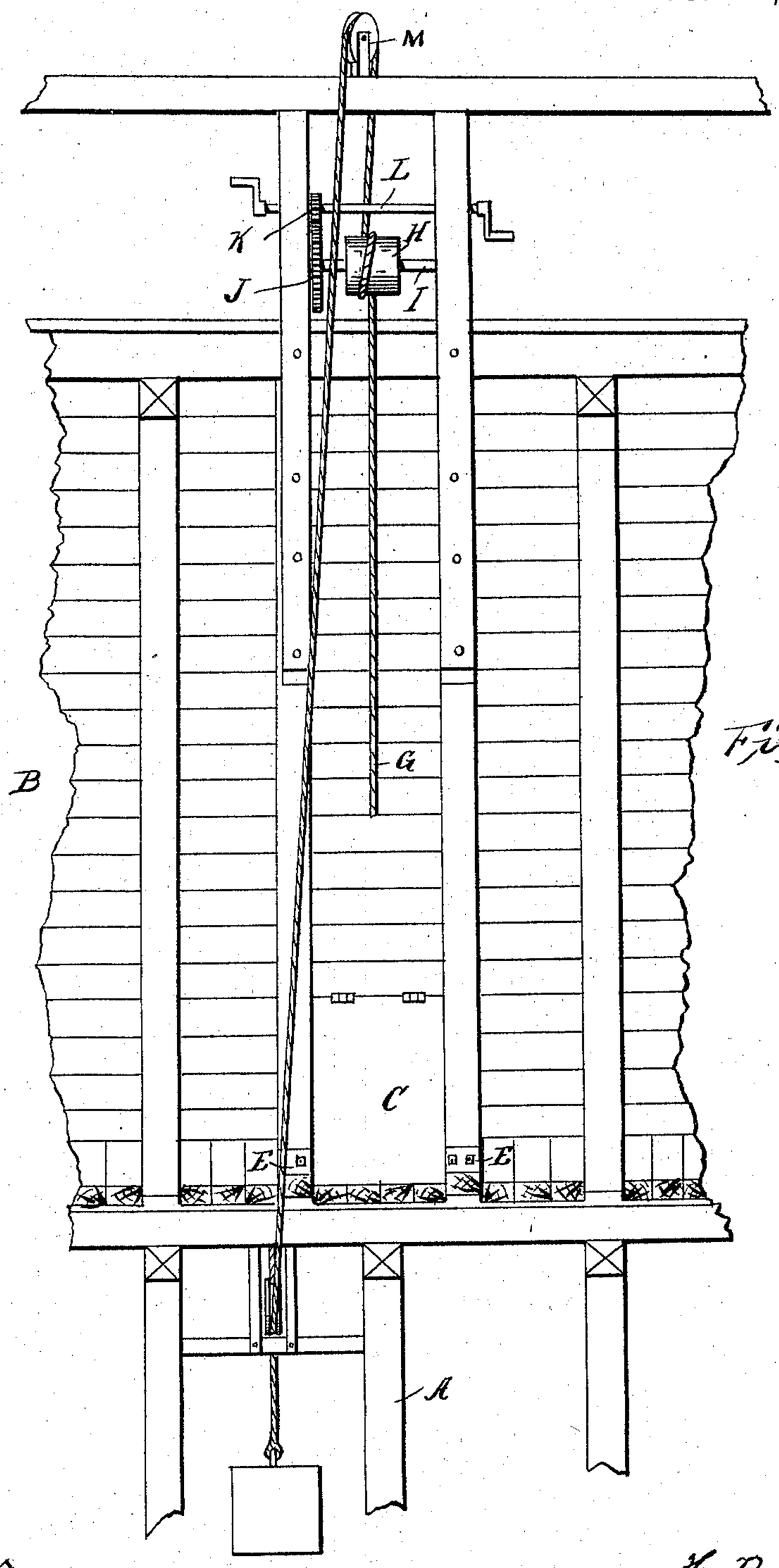

Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

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HOIST DRUM.

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Fig. 6.

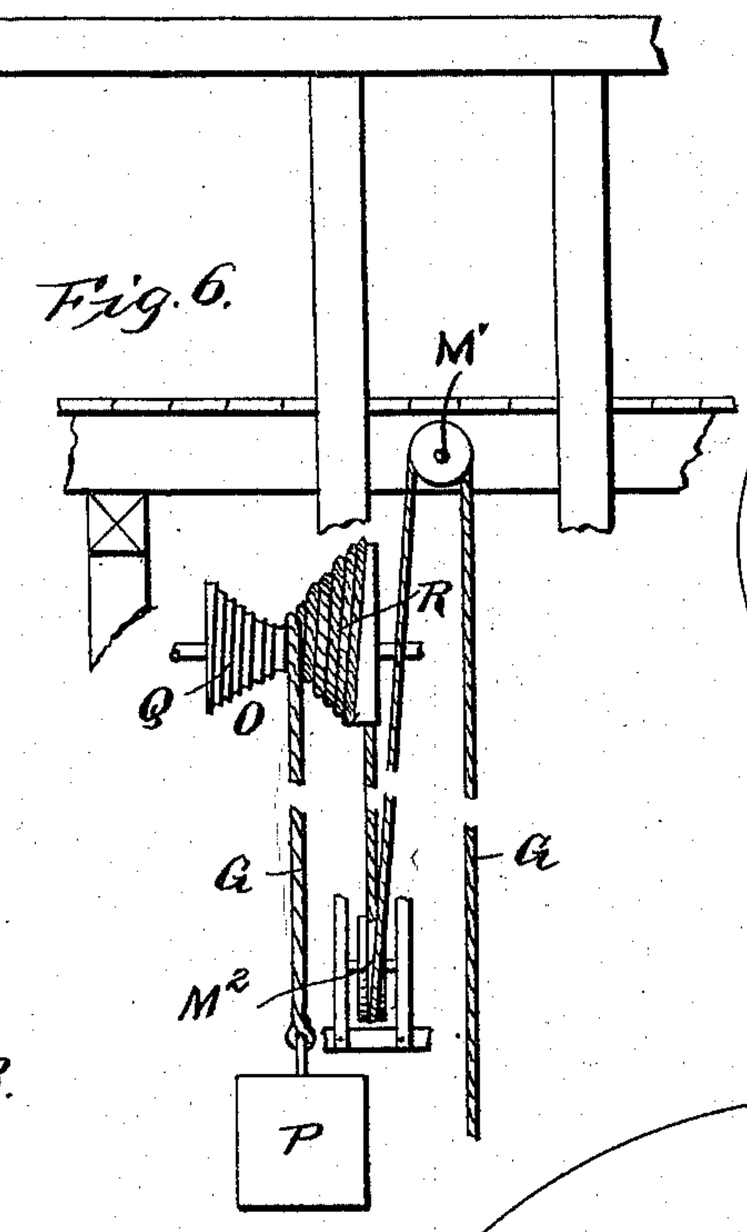


Fig. 5.

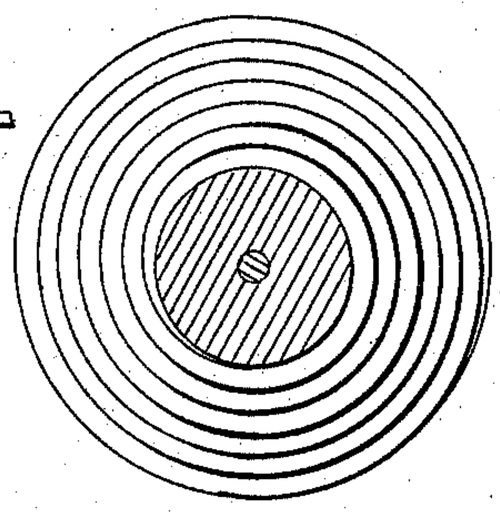


Fig. 6^A.

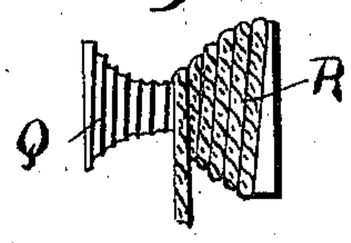


Fig. 3.

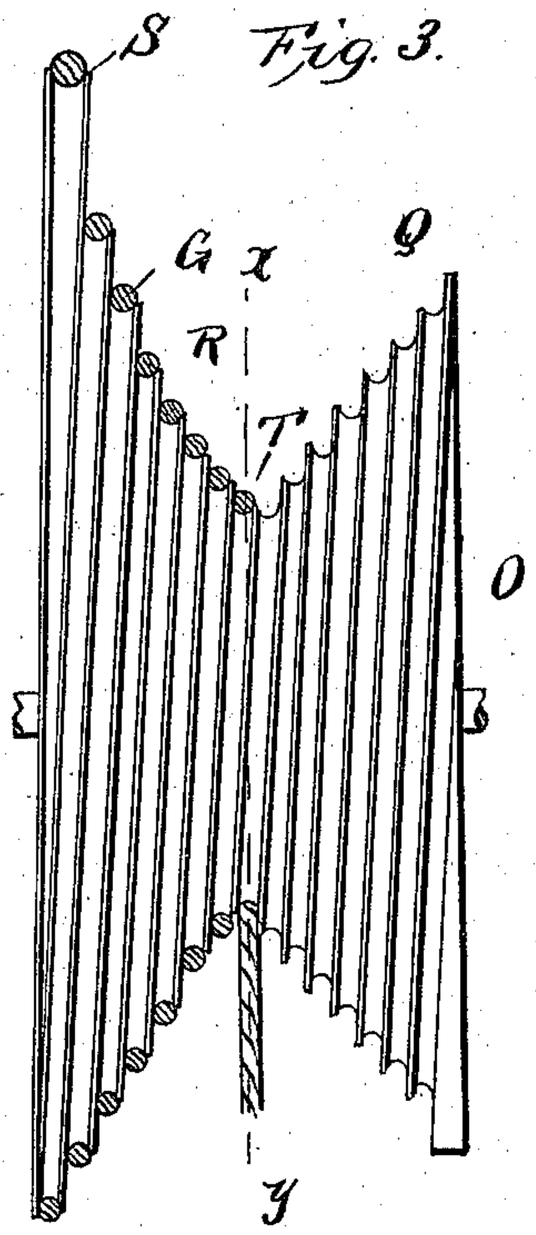
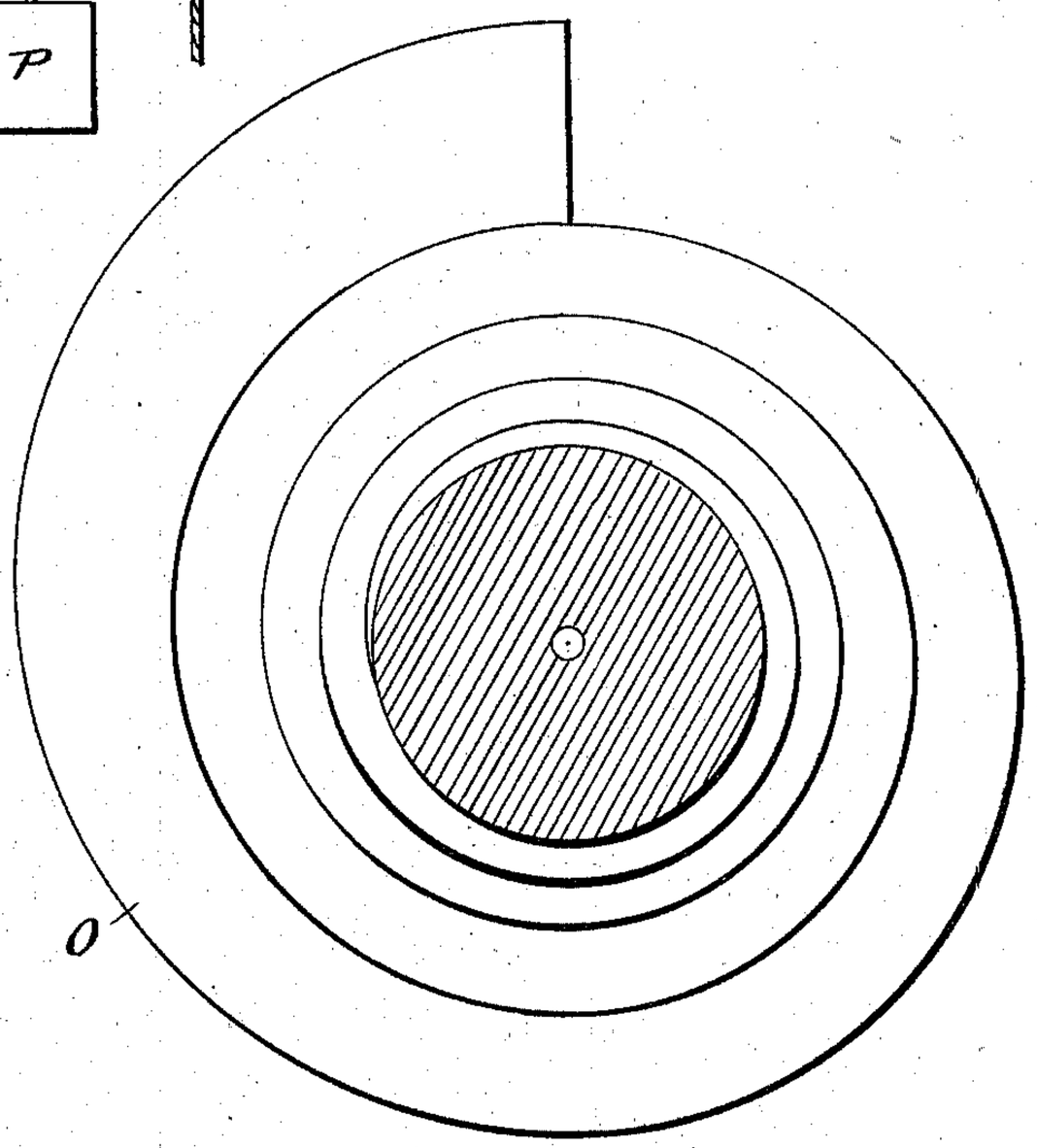


Fig. 4.



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(No Model.) 4 Sheets—Sheet 4.

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HOIST DRUM.

No. 574,085. Patented Dec. 29, 1896.

Fig. 7.

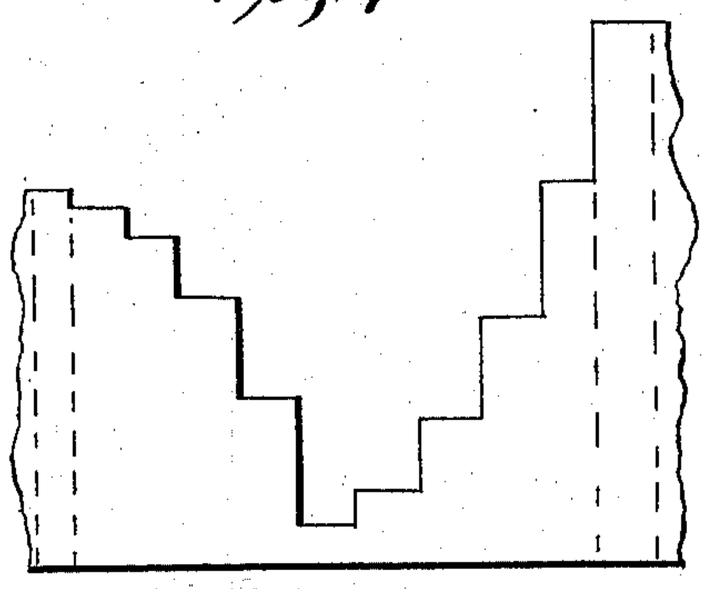
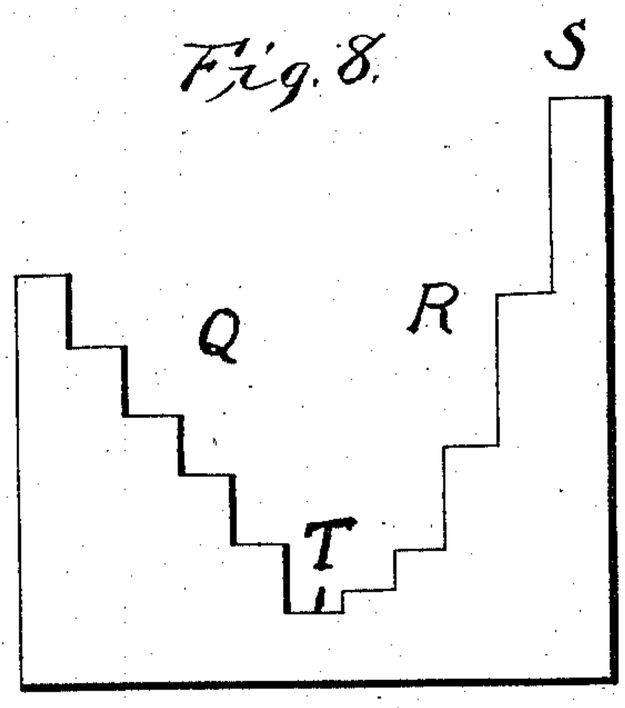


Fig. 8.



Witnesses
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UNITED STATES PATENT OFFICE.

HERBERT B. DENTON, OF LAKE VIEW, MINNESOTA.

HOIST-DRUM.

SPECIFICATION forming part of Letters Patent No. 574,085, dated December 29, 1896.

Application filed June 9, 1896. Serial No. 594,883. (No model.)

To all whom it may concern:

Be it known that I, HERBERT B. DENTON, of Lake View, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Hoist-Drums; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention relates to certain improvements in hoist-drums for the discharge apparatus of coal or ore docks.

As usually constructed, a coal or ore discharging plant involves the use of elevated bins located on the edge of a dock, the bins being provided at the lower front face with an opening and door, and at the lower end of the door long heavy chutes are pivoted. The chutes require to be raised and lowered to accommodate them to hatchways of the holds of the lighters or vessels to be filled, and then after the discharge they must be rapidly raised to be clear of the vessels. These chutes when in lowered position offer an immense strain to the hoisting mechanism, due partly to their weight, but mostly to the "knuckle-joint" which is produced, and which exerts its most powerful effect when the chute tends to assume a position near the lower vertical. At this time an enormous pull is required to start the chute toward its elevated position, and the pull required becomes less and less as the chute is raised until near its upper vertical position, when the pull required is comparatively small. These varying strains upon the chute-hoisting mechanism require a corresponding variation in the power applied to the winch in order to secure a uniform speed of lift, and where a uniform power is applied, such as manual power or an engine of definite horse-power, the speed of the winch would correspondingly vary, which would be distressing in the case of manual power and undesirable in the case of an engine. It is, moreover, a desideratum that the speed of the hoist of the chute be not merely uniform, but that it be accelerated as much as possible as it is raised higher and higher in order to rapidly clear the chute from all obstructions presented by the vessel which is in haste to depart with its cargo, and also because as the "purchase" against the power becomes less and less the uniform power is expended more economically in point of time when an improved accelerating mechanism is used. To ease the hoisting mechanism, it is customary to counterweight the chute, and it is to the improvement in the equalizing mechanism of the combined hoisting and counterweighting mechanism that my invention is chiefly directed. It is customary to use separate ropes or chains for operating the hoisting and the counterweighting device, respectively, and much cutting and connecting of cables is incident thereto.

The object of my invention is therefore, first, to provide a single continuous cable for operating the hoist of the chute and for connecting with the counterweight; second, to provide an equalizing device by means of which a uniform power may exert its greatest lifting force when the chute is in its lowest position; third, to so arrange the hoisting mechanism that an accelerating speed may be given to the chute as its resisting weight becomes less and less on rising; fourth, to so construct the equalizing mechanism that the single continuous cable may work freely without unnecessary friction, biting, or fraying, and, fifth, to so construct the counterweighting device that it will come to rest easily without a jar when the operation of hoisting the chute is completed without the use of a brake.

To accomplish the above objects, I use the mechanism illustrated in the accompanying drawings, forming part of the specification, the nature of which will fully appear in the detailed description of said drawings, and in which—

Figure 1 represents a side sectional elevation of a dock, bin, chute, and chute hoisting and counterbalancing device. Fig. 2 is a front elevation of the same. Fig. 3 represents a side elevation of the equalizing-sheave. Fig. 4 is a sectional view of the same, taken on line $x\ y$ of Fig. 3, looking to the left. Fig. 5 is a sectional view of the sheave, taken on line $x\ y$ of Fig. 3, looking to the right, on a

reduced scale. Fig. 6 is a front elevation of a modification of my device. Fig. 6ª is a side elevation in detail of the equalizer substantially the same as the others shown, but more decidedly convexed and concaved, respectively. Figs. 7 and 8, Sheet 4, show exaggerated sections of my equalizer, the purpose of which is to more explicitly illustrate the principles of my invention, and I make them somewhat resembling two sets of stairs rising in opposite directions, Fig. 7 showing a modified form—*i. e.*, the steps of the two conic frustums increase and diminish in opposite directions, so that the same result is obtained as if one of the frustums had grooves of equal diameter and the other of greater geometrical spaces from the center and increasing to the circumference. Fig. 8 illustrates substantially the construction shown by Figs. 3, 4, and 5 of Sheet 3. In this figure it will be observed the risers are equal on one side, while on the other side they increase in geometric ratio, all of which I desire to claim as embodying the principle of my invention.

Corresponding letters of reference indicate the same elements in all the views.

A represents the dock; B, the coal or ore bin located thereon in an elevated position; C, the opening at its lower front portion for discharging the material contained in the bin, and D the chute by means of which the material is discharged from the bin into the vessel, said chute being pivoted at E, so as to enable it to swing in a vertical plane and be raised and lowered. At the point F of the chute, which will afford an advantageous lead, is secured the hoisting-cable G. The cable G takes a turn or so over a pulley H, located on a shaft I. Shaft I is provided with a large gear-wheel J, which meshes with the pinion K upon the winch-axles L. It is obvious that this hoisting-gearing may be compounded or altered to suit circumstances, and its precise nature has no bearing upon the ultimate nature of the present invention.

After leaving the drum H the cable passes over a pulley M, so located as to give it a fair lead, and then passes to another leading-pulley N, from which it passes to the equalizing-sheave O, to the counterweight P.

The essence of my invention, aside from the single continuous hoisting and counterweight cable, resides in the peculiar construction of this equalizing-sheave O, and its construction is as follows: It is composed of two frustums of conical and conoidal portions, the two portions being integral and their smaller bases meeting. Upon the conical portion of the equalizing device there is cut or cast a continuous spiral groove or pulley, and upon the conodial portion there is also a spiral groove, the two grooves being mutually continuous. From the central portion where the conical and conoidal portions meet the conoidal spiral groove is cut upon a diameter which constantly increases, so that the steps or increase are in a geometric ratio to each other, causing a very rapid ascent from the center in a uniformly-accelerated degree. In the drawings the groove on the conical portion of the sheave O is marked Q and that on the conoidal portion R.

As shown in Fig. 1, the chute is in its raised position in full lines and the lifting effort of the cable is required to be the least, and the cable therefore passes over that portion of the conoidal spiral R which is of greatest diameter, as at S, Figs. 1 and 3. On the other hand, that part of the cable which leaves the sheave and leads to the counterweight P is on the smallest diameter or throat of the sheave at T, so that at this moment the counterweight exerts its smallest leverage upon the sheave. As the chute is lowered the cable will rapidly unwind from the highest portion of the conoidal spiral and the portion of the cable leading to the counterweight will gradually wind up on an increasing diameter of the conical portion, until finally, when the chute is in its lowest position, as at U, (shown dotted in Fig. 1,) when the hoisting part of the cable will have been wholly unwound from the conoidal spiral and be on the throat of the sheave and the part leading to the counterweight will be around the groove of the conical spiral at its greatest diameter. It is at this point, when the chute offers the greatest resistance to hoisting, that the mechanical effect of the hoist is the greatest by having the cable located as above described, *i. e.*, having the cable on the throat of the conoidal portion of the sheave where the weight of the chute has the least leverage, and having the part leading to the counterweight on the portion of the conical sheave where the spiral groove has the greatest diameter, and therefore the counterweight has the greatest leverage on the sheave.

Instead of having the cable lead from the chute to the hoisting mechanism, as described above, I may arrange it as shown in Fig. 6, where the cable G, leading from the chute, passes over a pulley M′ to another pulley M² and thence directly over the conoidal portion of the equalizing-sheave O and then continuing to the counterweight P, the latter portion of the cable being so rove as to travel on the conical portion Q of the sheave. The winch-gearing then operates upon the shaft of the equalizing-sheave directly.

It is obvious that in the practical manufacture of the equalizing-sheave it can be cast all in one piece, grooves and all, or be cast in one piece and the grooves turned thereon by a proper machine, or the conical and conoidal portions may be made separately and then united by keys, dowels, or bolts. It is also obvious that where chain cable is to be used the grooves may be provided with sprocket-teeth, if desired.

It will be noticed that in a sheave constructed as described the cable can always pass fairly from one portion of the spiral groove to another without the coils coming in fraying or biting contact with each other,

there being no abrupt bulging of the sheave, its surface curves and edges being of easy ascent and descent.

Slight deviations may be made in the several constructions and arrangements of parts without departing from the spirit and scope of my invention.

Having thus fully described my invention, what I believe to be novel, and desire to secure by Letters Patent of the United States, is—

1. In a coal or ore discharging dock, the combination of a bin provided with a discharge-opening, a discharge-chute pivoted in front of said opening, a winch for raising and lowering said chute, an equalizing-sheave composed of a grooved frustum joined at its smaller base to the smaller base of another grooved frustum, said grooves being mutually continuous, with a single continuous cable connected to said chute and passing over said winch and also passing over said frustums of said equalizing-sheave to a counterweight, substantially as described.

2. In a coal or ore discharging dock, the combination of a bin provided with a discharge-opening, a discharge-chute pivoted in front of said opening, an equalizing-sheave composed of a grooved conoidal frustum joined at its smaller base to the smaller base of a grooved conical frustum, a winch for turning said sheave, with a single, continuous, cable connected to said chute and rove over, first, the conoidal portion of said sheave and next over its conical portion, thence leading to a counterweight, substantially as described.

3. An article of manufacture consisting of a sheave composed of a grooved conoidal frustum joined at its smaller base to the smaller base of a grooved conical frustum, said two grooves being mutually continuous, substantially as described.

4. An article of manufacture consisting of a pulley-sheave composed of a grooved conoidal frustum joined at its smaller base to the smaller base of a grooved conical frustum, said two grooves being mutually and spirally continuous, and the diameter of the conoidal portion increasing in a geometrical ratio from the meeting throat of said bases to its larger base, and the diameter of the conical portion increasing from said throat to its larger base in an arithmetical ratio, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

HERBERT B. DENTON.

Witnesses:

JOHN B. GREENFIELD,

CHAS. R. HAINES.