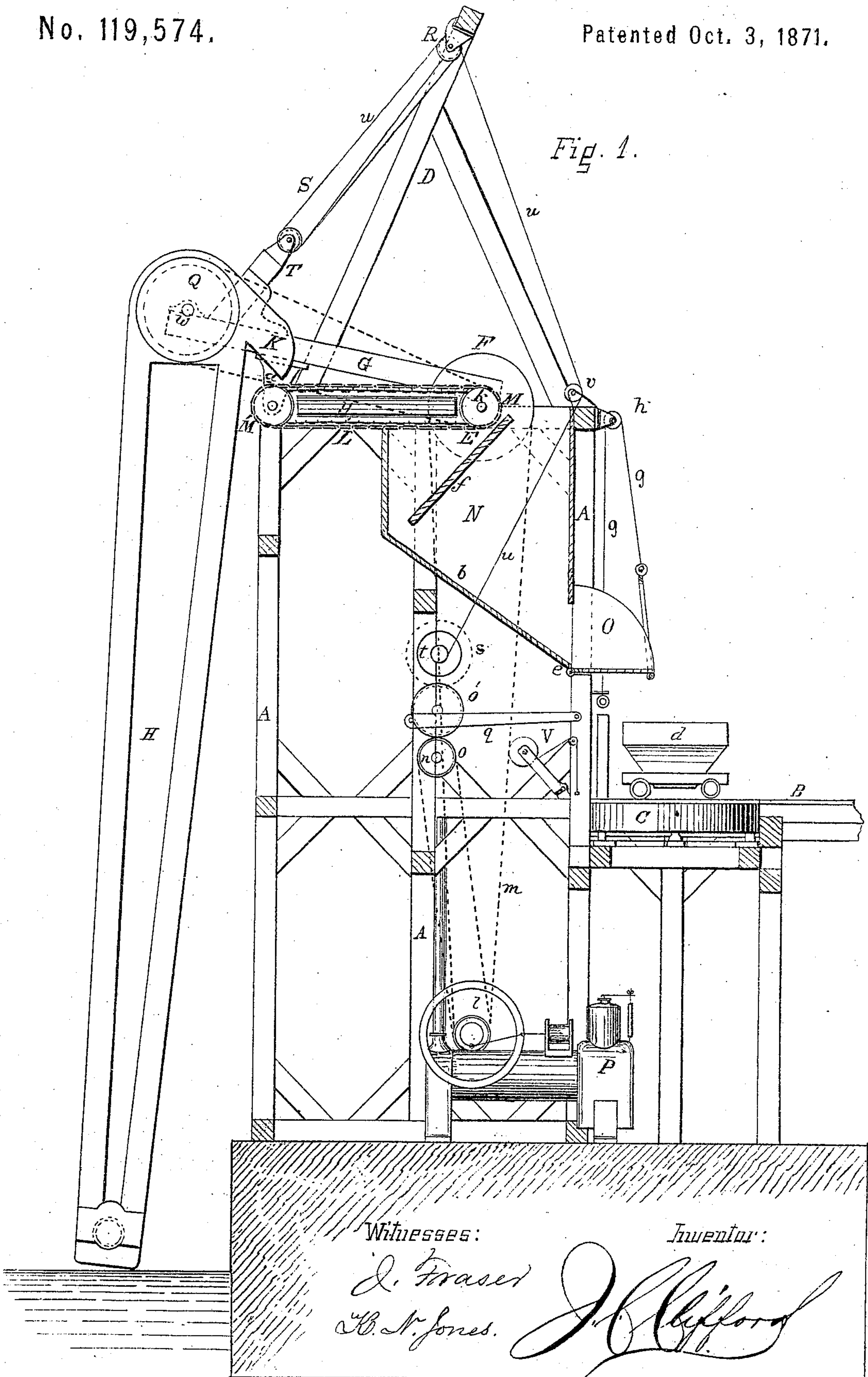


J. C. CLIFFORD.
Improvement in Coal Elevator.

No. 119,574.

Patented Oct. 3, 1871.

Fig. 1.



Witnesses:

J. Graser
W. H. Jones.

Inventor:

J. C. Clifford

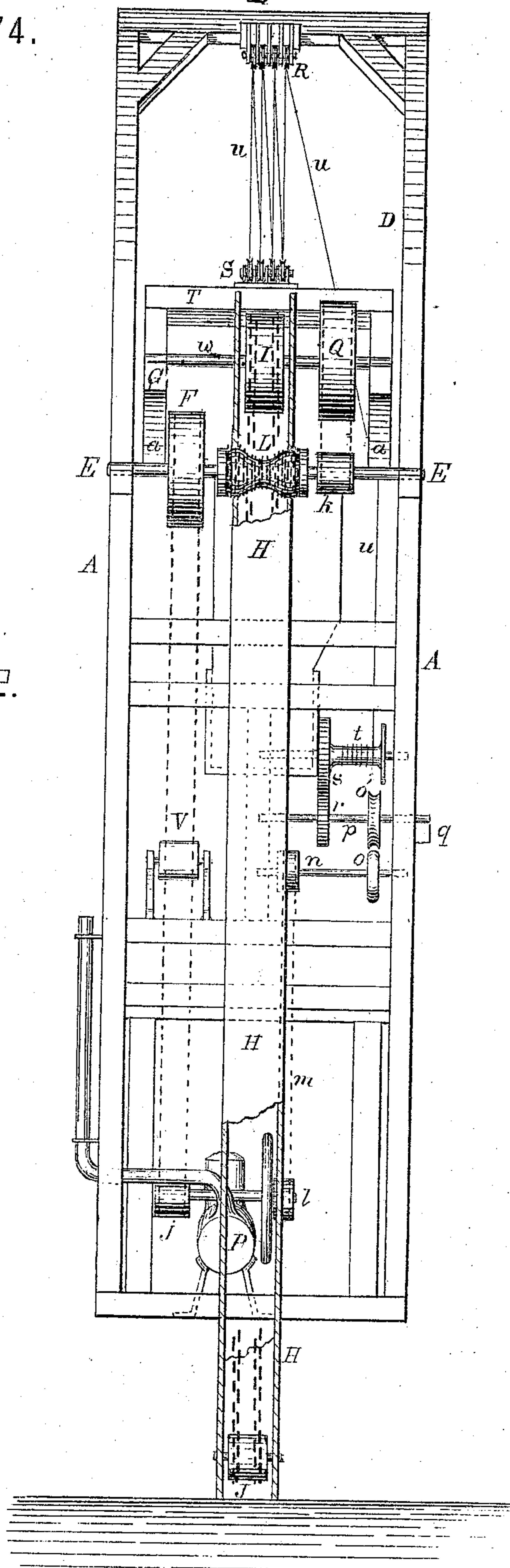
J. C. CLIFFORD.
Improvement in Coal Elevator.

3-Sheets--Sheet 2.

No. 119,574.

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Fig. 2.



J. C. CLIFFORD.
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Fig. 4.

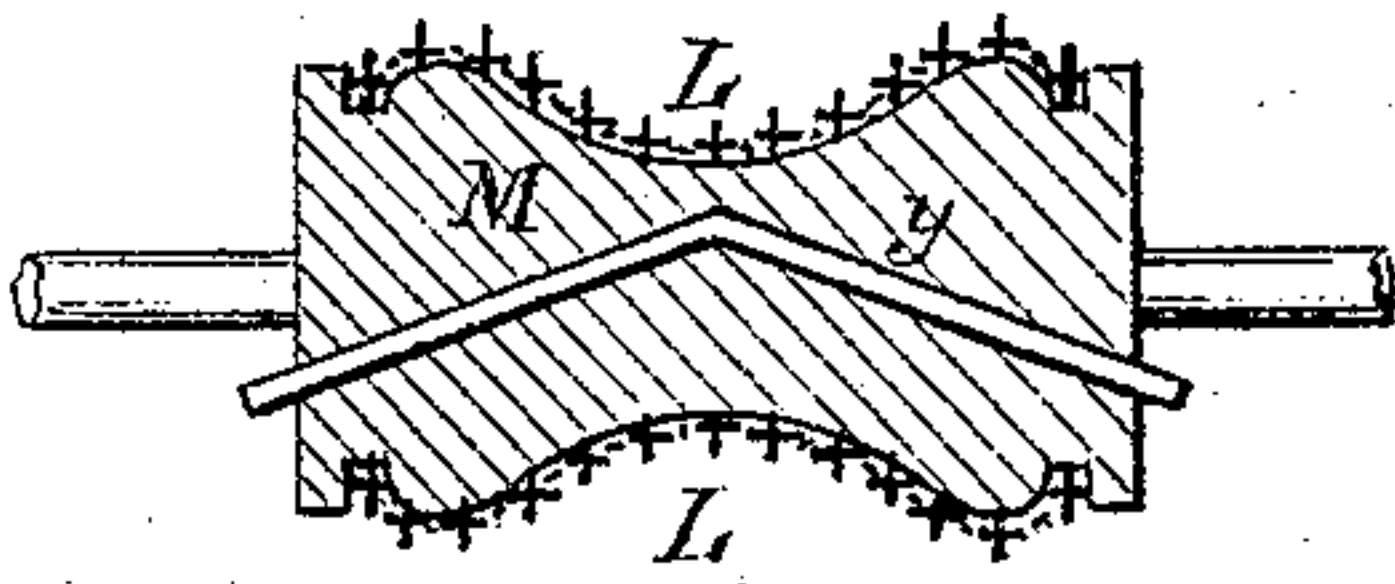


Fig. 5.

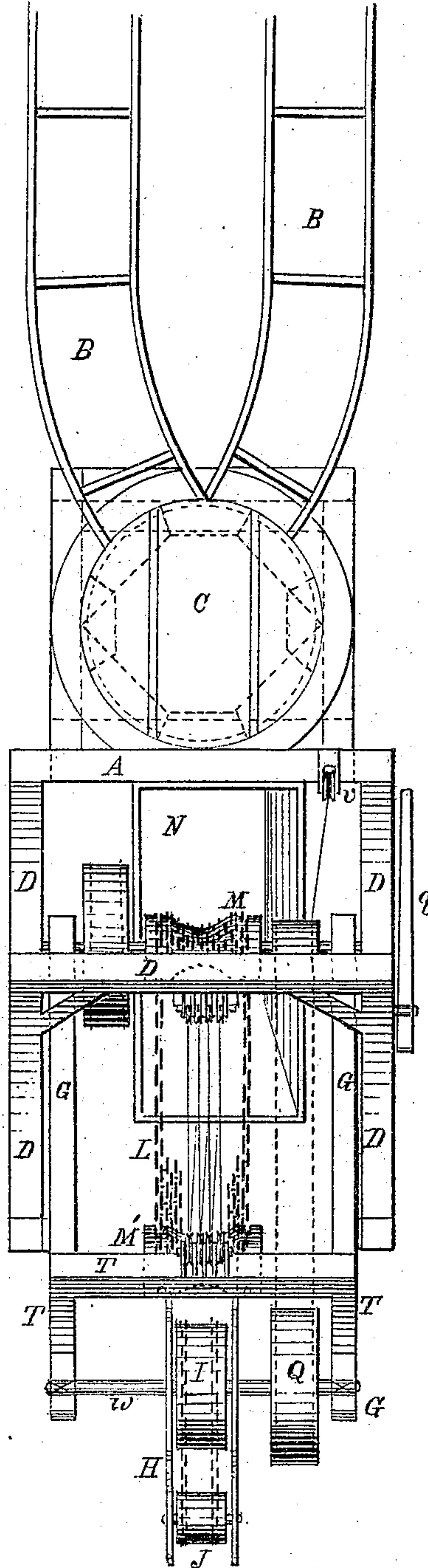
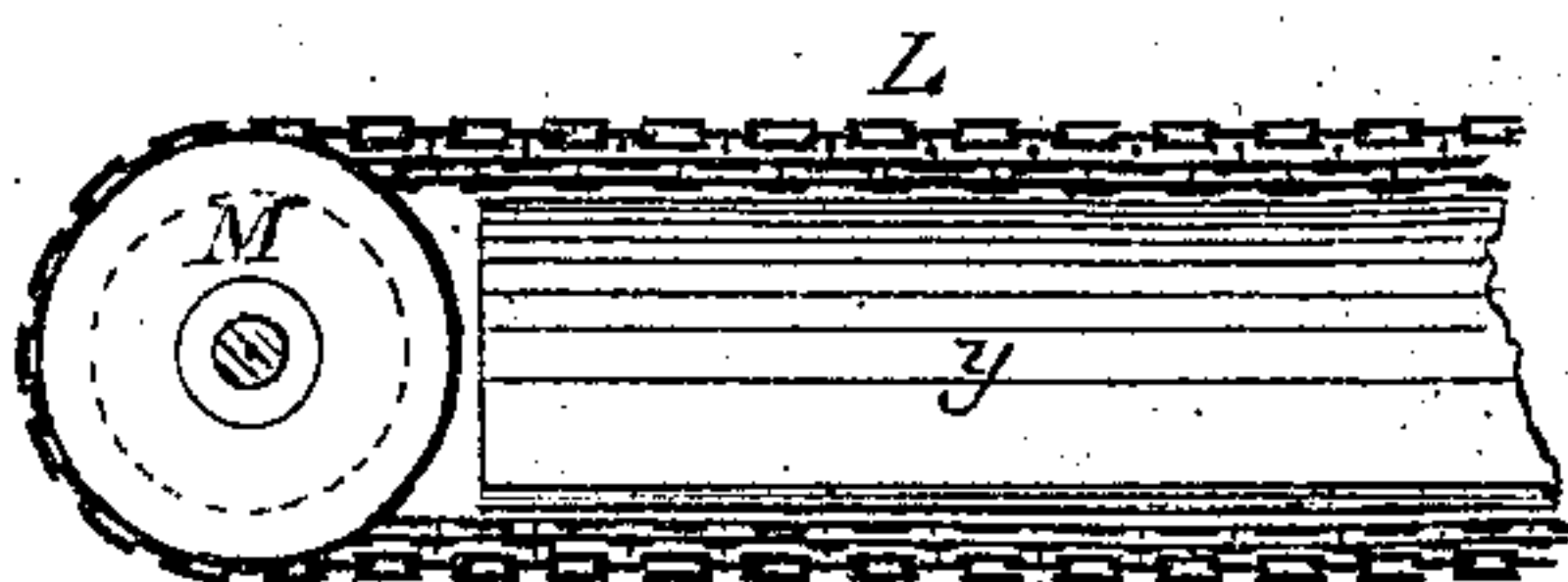


Fig. 3.

UNITED STATES PATENT OFFICE.

JOHN C. CLIFFORD, OF YONKERS, NEW YORK.

IMPROVEMENT IN COAL-ELEVATORS.

Specification forming part of Letters Patent No. 119,574, dated October 3, 1871.

To all whom it may concern:

Be it known that I, JOHN C. CLIFFORD, of Yonkers, in the county of Westchester and State of New York, have invented an Improved Coal-Elevator, of which the following is a specification:

My invention has for its object to provide an apparatus for transferring cargoes of coal from vessels to cars or other receptacles more or less elevated, or elevate it in other situations and for other purposes, and to accomplish it with the minimum of fall and friction necessary to overcome the required elevation, thereby preventing loss by breakage, friction, and waste of power; and it consists in the arrangement of a conveyer with the discharge-spout of the elevating-leg, whereby the amount of descent with which the coal is delivered to the former remains the same whether the leg and spout be more or less elevated, that descent being the minimum amount required. Also in the construction of the conveyer, consisting of an endless chain-belt passing over concave pulleys, producing a surface concave in cross-section upon its upper side; and in the construction of a pivoted and counterbalanced mouth-piece to the receiving-hopper, for delivering the coal to the cars with the minimum of fall and friction, and affording means for cutting off the delivery at the proper moment.

Figure 1 is a vertical section through the frame of my improved elevator, showing in side elevation the elevating-leg H, conveyer L, and receiving-hopper N, with the engine for supplying power to drive the same, and also the tackle and gearing for sustaining, raising, and lowering the elevator-leg. Fig. 2 is an elevation of the machine in view transverse of Fig. 1, showing the elevating-leg in front. Fig. 3 is a plan view of the machine, showing also the railway-tracks and turn-table on which the cars are loaded. Fig. 4 is a transverse section of the concave chain-conveyer L and slide *y*, and Fig. 5 is a side view of a portion of the same.

In carrying my invention into practice a quadrangular frame, A A, or other structure of suitable dimensions, strength, and height, is erected upon the dock or pier where coal-laden vessels are to unload. A railway track, B, or preferably two tracks, converging to a turn-table, C, approach the side of this structure so that cars may be brought conveniently near to receive the coal. On the top of the frame A a derrick, D, is erected, to

afford a support for the tackle by which the elevator-leg is raised or lowered and on which it is mainly supported, as will hereafter be described. Also, on the top of the frame A, underneath the derrick, is a transverse shaft, E E, carrying a large drum-wheel F, which is the main driving-wheel. This shaft is the center of motion or axis of the elevator-leg, the head of which is connected with it by means of arms G G, which cause it to move, as it is raised and lowered, in an arc concentric with the shaft, while at the same time it has an independent motion on the axis *w*, enabling the lower extremity to be moved to or from the dock. The leg is constructed in the usual manner, with an endless belt, having suitable buckets attached, running over the pulley I at the top and smaller pulley J at the foot. The discharge-spout K delivers directly into a conveyer, L, consisting of an endless chain-belt, (hereinafter more fully described,) which runs on pulleys M M', the former of which is on the shaft E, and the latter has its bearings in brackets *a a*, which hang from the arms G G. By this arrangement the relative position of the spout K to the surface of the conveyer remains nearly the same however much the elevator-leg may be raised or lowered, the supports of the pulley M' rising and falling with the arms G G, to which both they and the axis *w* of the elevator-leg are connected. Immediately below the terminal end of the conveyer is a receiving-hopper, N, having an inclined bottom, *b*, which extends as far as the outer frame of the structure, bringing it to or over the turn-table C, where the car *d* is stationed to be loaded. The coal falls from the conveyer on an inclined chute, *f*, down which it slides by an easy inclination in a backward direction to the inclined bottom of the hopper, this arrangement preventing any heavy concussion or undue friction tending to pulverize the coal. At its lower extremity the hopper is provided with an adjustable mouth-piece, O, hinged at *e*, and having segmental sides, which close into spaces provided between the vertical sides of the hopper and false outer sides. The mouth-piece is counterbalanced by a weight attached to the chain *g* passing over the pulley *h*, so that its position may be adjusted with slight force. When lowered it forms, in connection with the inclined bottom *b*, a chute for the delivery of the coal to the car *d*, which, when placed upon the turn-table, is directly underneath it. When the car is filled

the flow is stopped by elevating the mouth-piece, which is easily effected by the attendant pulling on the chain *g* sufficiently to overcome the weight of the small amount of coal which is at the time passing through the mouth-piece; or this movement may, if desired, be effected automatically in connection with weighing machinery and the amount delivered to each car definitely ascertained. This manner of controlling the flow or delivery of the coal to the car possesses the advantages, first, of stopping and starting the movement of the coal from the hopper with the least violence and the lowest expenditure of power, from the fact that the pivoted mouth-piece is practically a continuation of the inclined chute *b* and the lowering and raising of its mouth only varies its inclination sufficiently to allow the coal to move by its gravity, or arrest its motion, which results require but a slight movement of *O* on its axis; secondly, of adapting the discharge end of the chute to the elevation of the car, and of the surface of the load as the car is filling, so as to obviate too great a fall of the coal as it enters the car. The conveyer *L* is formed of a series of endless chains connected together at intervals by cross-links, or it may be formed of sections jointed like a coat of mail. The pulleys *M M'* are made concave on their faces and grooved as at *i i* to receive the outer chains, which are preferably heavier and stronger than the others of the series in order to maintain a greater degree of lateral rigidity. The form of the pulleys produces a concave or trough-shaped surface to the outer side of the endless belt, which adapts it to carrying coals of any ordinary size without their falling off at the sides. The dust falls through the interstices of the chain-conveyer onto a slide, *y*, placed between the pulleys *M M'*. A jar may be used to facilitate the separation of the dust. This device, therefore, performs the offices both of a conveyer and of a screen.

The operation is as follows: The engine *P* has a pulley, *j*, Fig. 2, from which a belt, shown by dotted lines, runs to the main driving-wheel *F* on the shaft *E E*. This shaft carries a small pulley, *k*, with belt to large drum *Q* on the axis *w* of the elevator-leg, on which shaft the wheel *I* carries the bucket-chain of the leg *H* by which the coal is elevated and emptied through the spout *K*, whence it is carried by the conveyer *L* into the receiving-hopper *N*, its delivery from the conveyer to the car *d* being effected by gravity in the manner previously described. It is obvious that the foot of the elevator-leg must be lowered to introduce it into the hold of the vessel, and capable of working equally at different elevations and of being moved to and from the dock. The raising and lowering are effected by means of tackle sus-

pending from the derrick and attached to the arms *G G*, whereby the motion effects only the movement of the head of the elevator in an arc around the axis of the driving-shaft without altering its radius, so that the driving-belt is not deranged. The arms *G G* act as radial braces, and as the leg is raised it is drawn inboard and may be hoisted on the dock when not in use, and when lowered they project it outboard, in addition to which it is capable, from being pivoted on the axis *w*, of having its foot swung in or out to the extent required to enter the hold of the vessel. The adjustment of so heavy a body as the leg is effected by means of the steam power in the following manner: From a pulley, *l*, on the engine fly-wheel shaft runs a belt, *m*, driving shaft *n*, which carries a concave-faced friction pulley, *o*, the mate of which, *o'*, on shaft *p*, is thrown into or out of gear with it by the shifting hand-lever *q*. Shaft *p* has a toothed pinion, *r*, gearing with wheel *s* on the windlass-shaft *t*, and a rope, *u*, which extends over the guide-pulley *v* on the top frame to the sheaves of the tackle-block *R*, hung in the top of the derrick *D*, thence downward to the tackle-block *S* hung to the cross-frame *T* of the elevator-leg. Thus the support of the leg is divided between the arms *G G* and the rope *u* and tackle *R S*, and its elevation can be instantly changed by raising by the power of the engine, or lowering by the letting down of the windlass *t*, which is provided with any suitable clutch or brake to control it. A hanging pulley, *V*, is employed to tighten the driving-belt, so that it can be slackened and thrown out of gear when it is required to elevate the leg.

I claim as my invention—

1. The endless chain-conveyer *L*, constructed substantially as described.
2. The arrangement of the conveyer *L* and spout *K* of the elevator-leg, whereby their relative distance is unchanged and the fall of the coal on the conveyer maintained at its minimum when the leg is more or less elevated, substantially as set forth.
3. The pivoted mouth-piece *O*, in combination with the receiving-hopper *N*, arranged and operating as and for the purposes set forth.
4. The arrangement of the radial arms *G G*, in combination with the shaft *w* of the elevator-leg, whereby the position of the latter when raised and lowered is maintained at the same radius from the central axis *E E*, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOHN C. CLIFFORD.

Witnesses:

K. N. JONES,
W. W. PHILLIPS.

(63)