(No Model.) 4 Sheets—Sheet 1.

R. LEE.

ELEVATOR FOR MINING PURPOSES.

No. 318,757. Patented May 26, 1885.

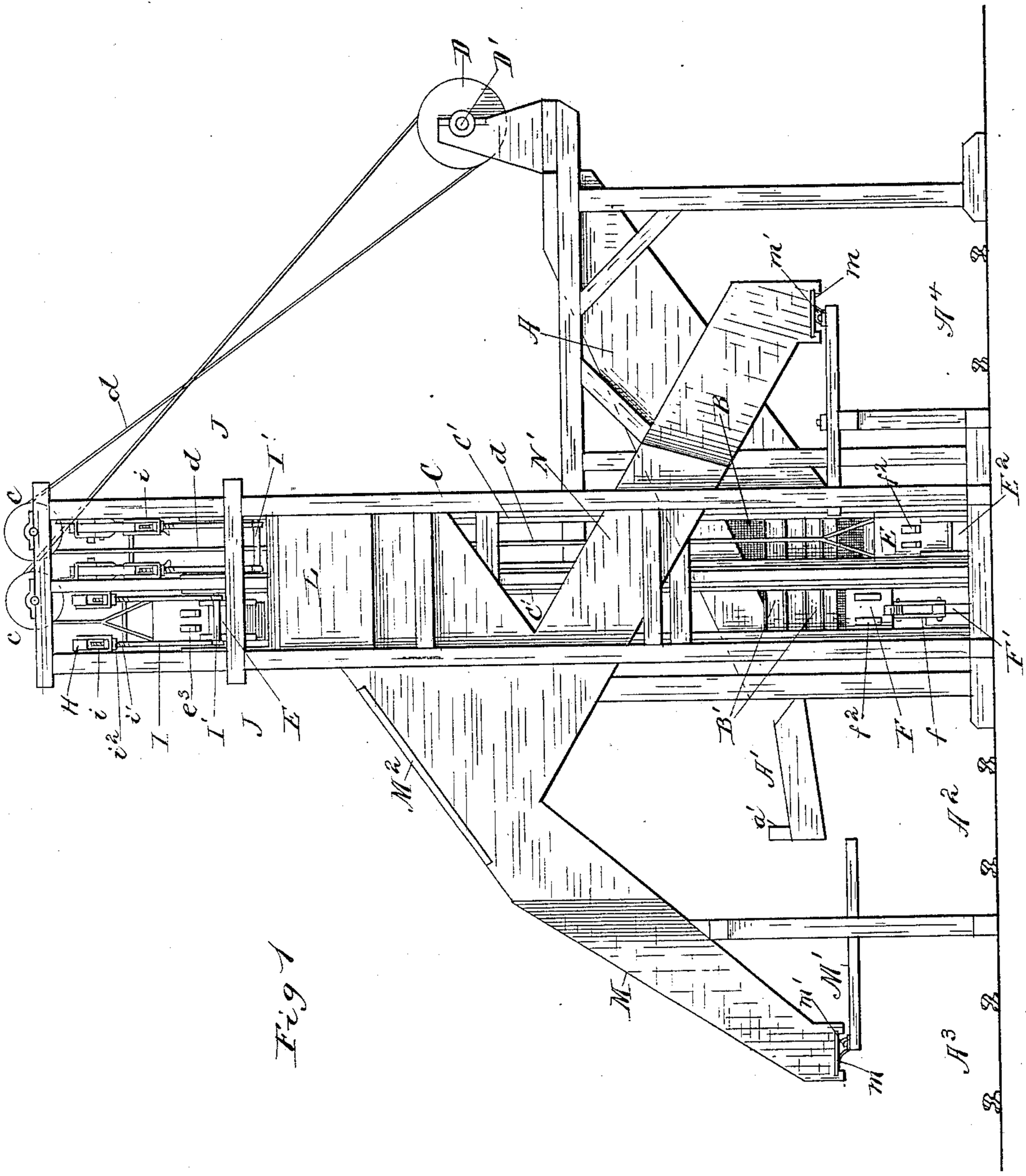

Fig. 1.

Witnesses
H. C. Curtiss
A. M. Best

Inventor
Robert Lee
By Coburn & Thacher
Attorneys

(No Model.) 4 Sheets—Sheet 2.

R. LEE.

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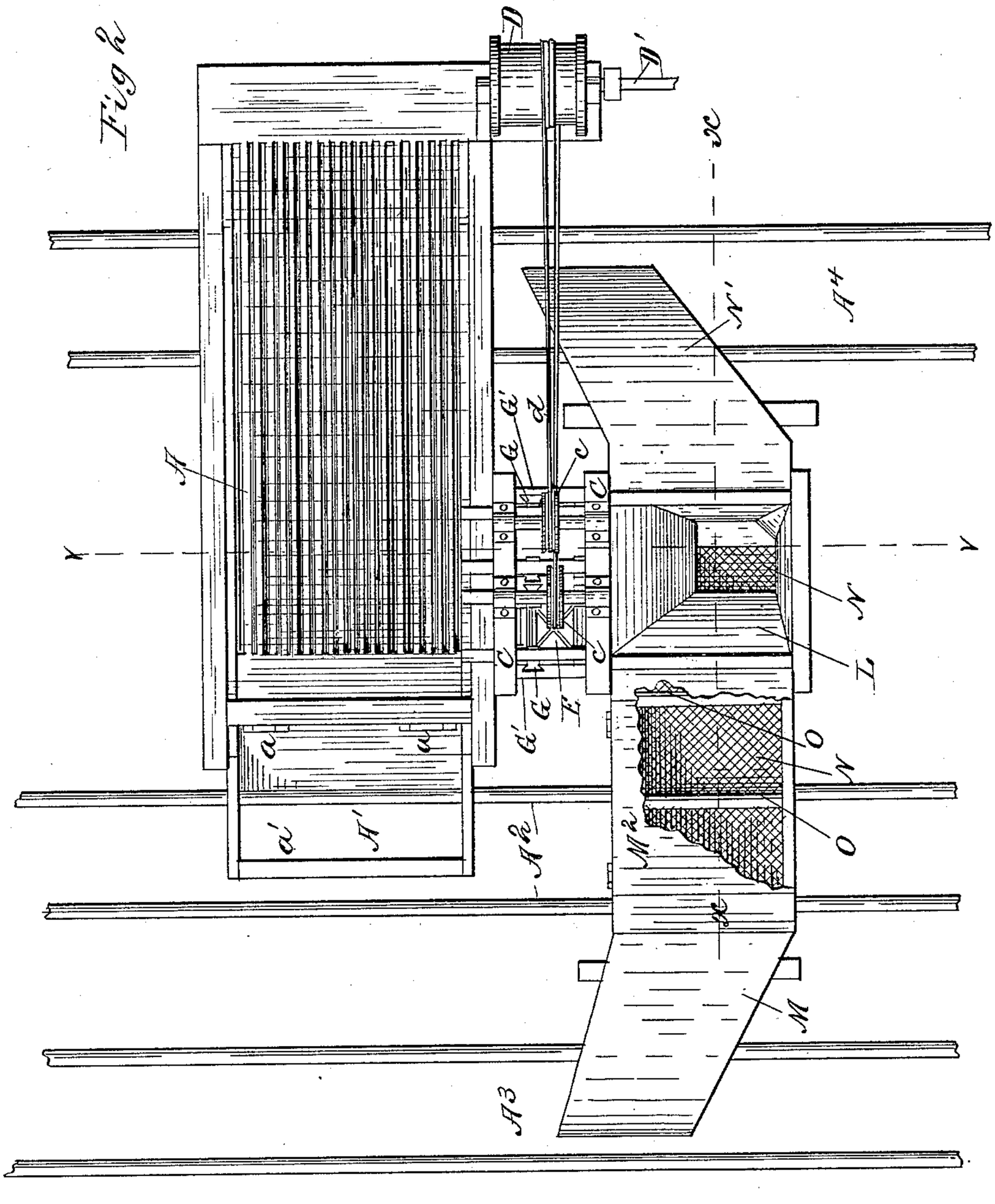

Witnesses
W. C. Curtis
A. M. Best.

Inventor
Robert Lee
By Coburn & Thacher
Attorneys

(No Model.) 4 Sheets—Sheet 3.

R. LEE.

ELEVATOR FOR MINING PURPOSES.

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Fig. 3.

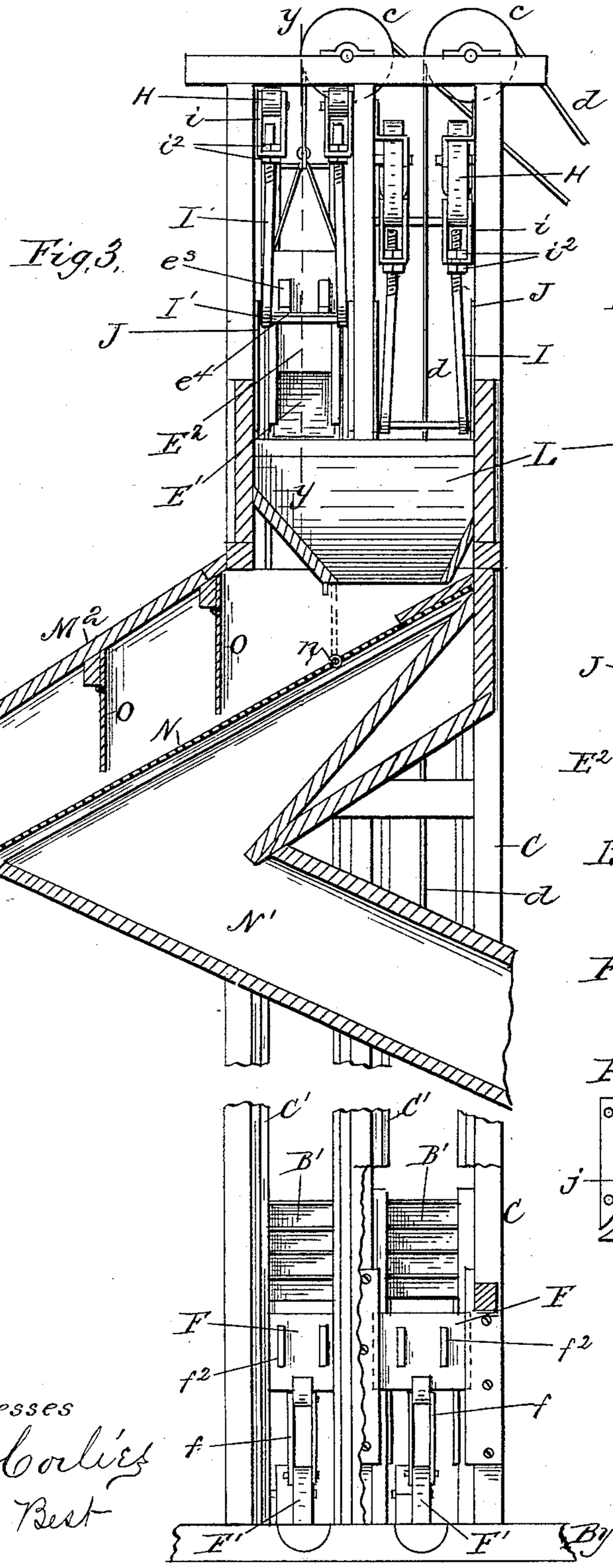


Fig. 4.

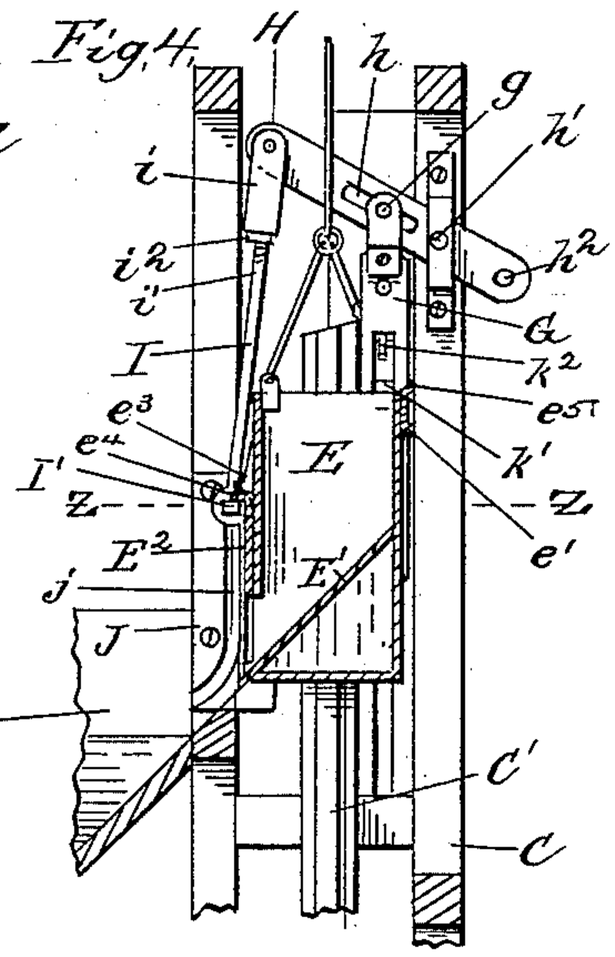


Fig 5

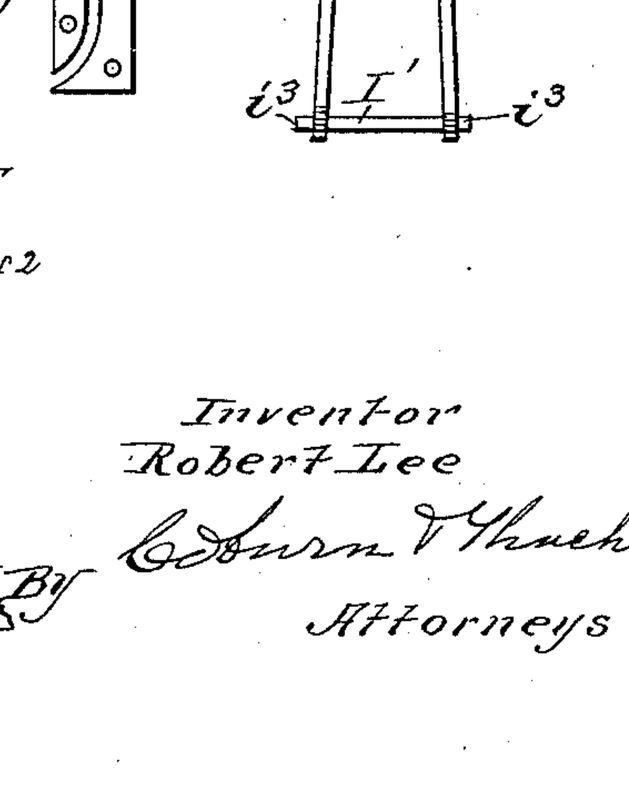


Fig 6

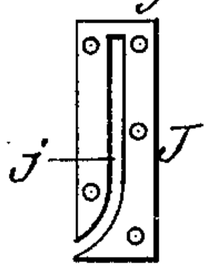
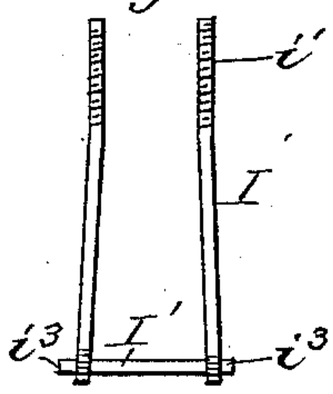


Fig 7



Witnesses
W. C. Corlies
A. M. Best

Inventor
Robert Lee
Coburn & Thacher
Attorneys

(No Model.) 4 Sheets—Sheet 4.

R. LEE.

ELEVATOR FOR MINING PURPOSES.

No. 318,757. Patented May 26, 1885.

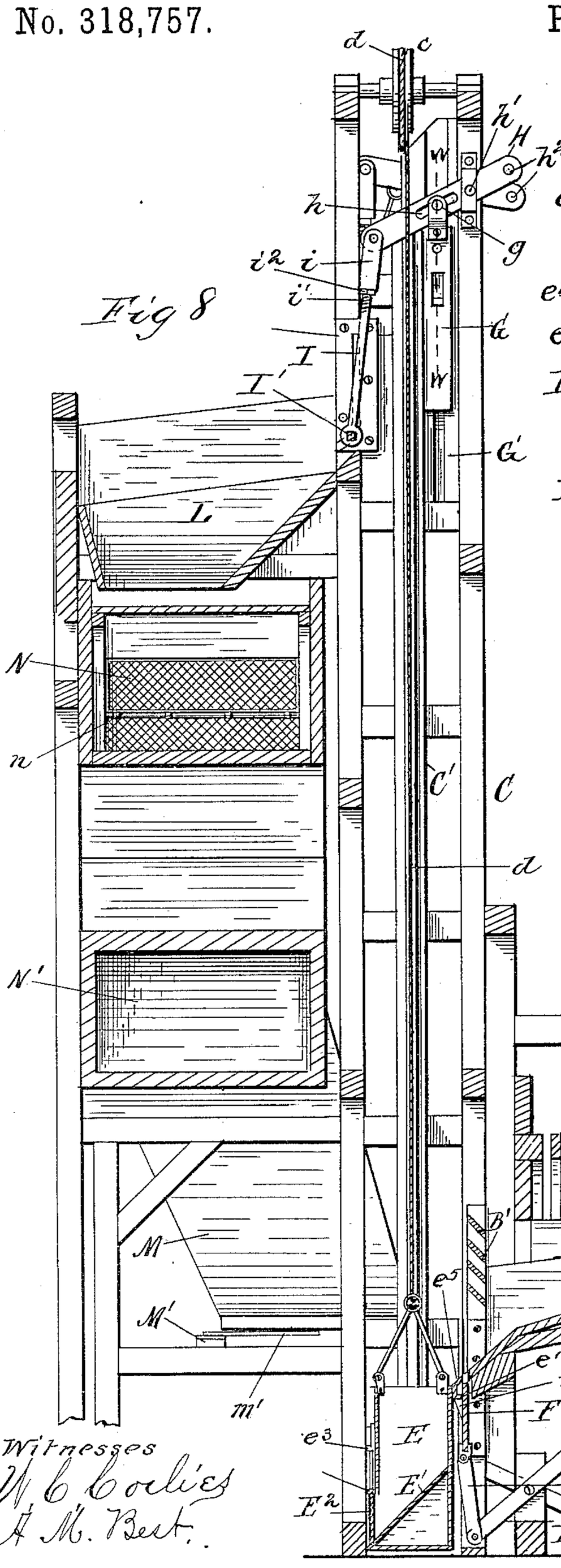


Fig 8

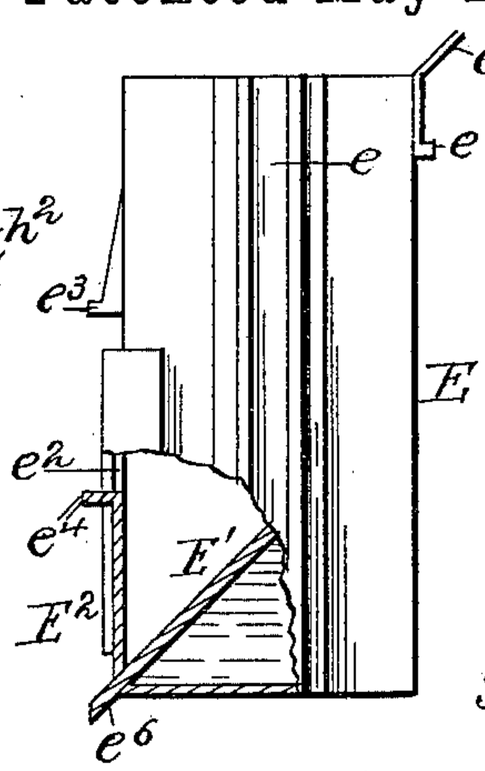


Fig 9

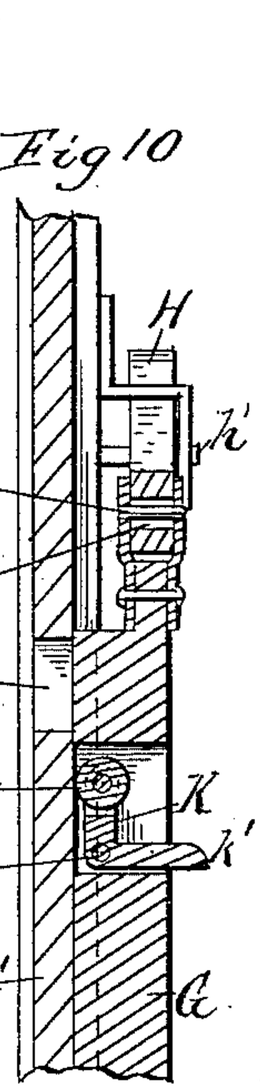


Fig 10

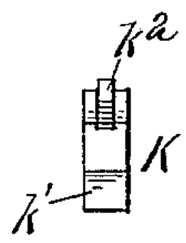


Fig 11

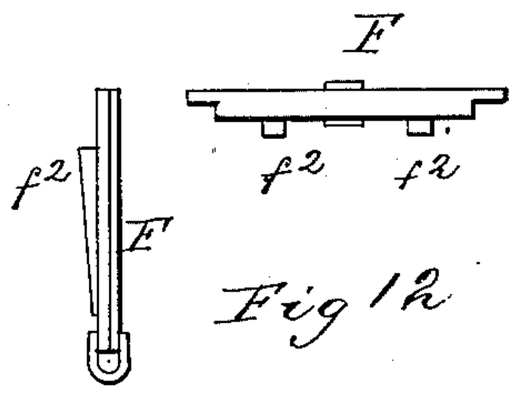


Fig 12

Witnesses
W. C. Dodge
A. M. Best.

Inventor
Robert Lee
Coburn & Thacher
Attorneys

UNITED STATES PATENT OFFICE.

ROBERT LEE, OF CABLE, ILLINOIS.

ELEVATOR FOR MINING PURPOSES.

SPECIFICATION forming part of Letters Patent No. 318,757, dated May 26, 1885.

Application filed March 10, 1885. (No model.)

To all whom it may concern:

Be it known that I, ROBERT LEE, a citizen of the United States, and residing at Cable, in the county of Mercer and State of Illinois, have invented certain new and useful Improvements in Elevators for Mining Purposes, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation of a construction embodying my invention; Fig. 2, a plan view of the same, part of the chute being broken away to show the internal construction; Fig. 3, a sectional view of the same on the line *x x* of Fig. 2; Fig. 4, a detail sectional view on the line *y y* of Fig. 3; Fig. 5, a detail plan section on the line *z z* of Fig. 4; Fig. 6, a detail view of one of the plates containing the guiding-groove for the lifting-arm; Fig. 7, a detail view of the lower portion of the lifting-arm detached; Fig. 8, a sectional view on the line *v v* of Fig. 2; Fig. 9, a detail view, on an enlarged scale, of one of the elevator-buckets, a portion of the side thereof being broken away to show the internal construction; Fig. 10, a detail sectional view taken on the line *w w* of Fig. 8, and on an enlarged scale, showing the safety-catch; Fig. 11, a detail plan view of the bell-crank lever which forms the safety-catch, and Fig. 12 a detail view of one of the sliding gates which closes the lower chute.

Like letters refer to like parts in all the figures of the drawings.

My invention relates to apparatus for elevating and handling coal, and more particularly coal of that quality known as "slack," it being, however, adapted for use in handling other substances, its object being to provide means for automatically filling, raising, and emptying the elevator-buckets, and for separating the nut and pea coal from the slack proper, thereby dispensing with the labor of several men.

I will now proceed to describe a construction in which my invention is practically carried out in one form, and will then specifically point out in the claims those features which I believe to be new and desire to protect by Letters Patent.

In the drawings, in which I have represented my improvements as used in connection with the screen which receives the coal after it has left the mine, A represents the said screen, upon which the coal is dumped as it comes from the mine. This screen is inclined, as shown, the larger lumps of coal passing down over its surface and being delivered to a car or other suitable receptacle at the lower end thereof.

A′ indicates a stop or guard, hinged to the lower end of the screen A at *a* and provided with a cross-bar, *a′*, to prevent the coal from being carried by its velocity over and beyond the car standing upon the track A^2. This guard hangs slightly above the level of the top of an ordinary coal-car, the hinges *a* permitting it to be swung up out of the way to allow a car of greater height, or a locomotive, to pass the foot of the screen.

Underneath the screen A is arranged a pocket, B, into which that portion of the coal which is small enough to pass through the screen A drops. This pocket has an inclined bottom, *b*, so as to cause the coal which lodges therein to pass out into the elevator-buckets as soon as the sliding gates which close the lower end of the pocket are opened, as hereinafter described.

At the lower end of the pocket B is arranged the elevator-tower C, which may be of any suitable construction, and is provided at its upper end with pulleys *c*, over which pass the ends of the rope or chain *d*, which raises and lowers the elevator-buckets, this rope also passing over a drum, D, mounted on a shaft, D′, operated by any suitable mechanism. The tower C is provided with guideways C′, embraced by suitable flanges, *e*, on the buckets E, attached to the lower ends of the hoisting-rope *d*.

In the construction shown in the present instance the tower C is arranged for two buckets, though, of course, only one bucket may be used, or more than two, and as the construction on both sides of the tower and the mechanism for operating both buckets are identical I will only describe one set thereof, it being understood that the same description is applicable to the other.

At the bottom of the pocket B, near the bottom of each side of the elevator-tower, the lower end of the said pocket is closed by means

of a gate, F, sliding in vertical ways in the frame-work of the structure. This sliding gate is connected by means of a pivoted link, *f*, to one end of a lever, F′, the opposite end of which is provided with a weight, *f′*, of sufficient size to normally hold the gate F up in position to close the lower end of the pocket B at that point. Other equivalent means—such as a spring or weighted cord and pulley—may be employed to effect this result; but I prefer the construction shown. On the outer face of the sliding gate F are formed projections f^2, two being shown in the present instance, though more or less than this number may be employed. These projections are arranged in the path of a corresponding projection or flange, *e′*, on the bucket E, so that upon the descent of the bucket the projection *e′* will engage the projections f^2, and the weight of the bucket in descending, being sufficient to overcome the resistance offered by the weight *f′* on the lever F′, will carry the gate F down along with it in the position shown in Fig. 8 of the drawings, thereby lowering the said gate to such an extent as to open the lower end of the pocket B and allow the coal therein to pass, by reason of the inclination of the bottom of the said pocket, into the bucket E. Upon the ascent of the bucket the weight *f′* will cause the lever F′ to raise the gate F to its former position, thereby closing the lower end of the pocket B once more. In filling a bucket from the pocket in this manner, owing to the large quantity of coal which the pocket contains, more coal passes from the pocket than the bucket can hold, it being banked up on that side of the bucket toward the pocket. In order to return this surplus to the pocket I arrange above the mouth of the pocket, which is closed by the sliding gate F, a series of inclined plates, B′, having their outer edges higher than their inner edges, with spaces between them, substantially as shown in Fig. 8 of the drawings. It will be seen that as the bucket rises the surplus coal, being on that side of the bucket toward the pocket, will pass through the spaces between the inclined plates B′ and fall back into the pocket B, thereby preventing any loss, while at the same time the inclination of the said plates is such as to prevent the coal in the pocket from passing out between the plates. By reason of this device I supply the bucket E with just sufficient coal to properly fill it, any surplus being automatically returned to the pocket, and not allowed to fall upon the ground and be lost. Each bucket E is provided with an inclined bottom, E′, at the lower end of which is formed an opening in the side of the bucket, closed by a gate, E^2, sliding in suitable ways, e^2, provided therefor. The bottom E′ projects somewhat, to form a stop for the gate E^2 at the lower end of its travel, and on the side of the bucket above the opening therein are arranged two projections, e^3, forming stops to limit the upward motion of the gate, as hereinafter described, two of these stops being shown in the present instance, though more or less than that number may be employed.

It will be observed that from the inclination of the bottom E′ of the bucket E the contents of the bucket will be discharged as soon as the gate E^2 is raised. In order to effect this, when the bucket has reached the end of its upward travel I arrange at the upper end of the tower C a mechanism for automatically opening the said gate and discharging the contents of the bucket. On each side of the path of the bucket is arranged a slide, G, moving on a suitable way attached to a support, G′, secured on or forming a portion of the framing of the tower. This slide is pivotally connected at its upper end to a lever, H, the pivot-bolt *g* passing through a slot, *h*, in the lever, in order to allow of the necessary play between the two parts, since the slide moves in a straight line, while the lever moves in the arc of a circle. A connecting-link pivoted both to the slide and to the lever may be substituted for this connection, if desired. Each lever H is pivoted at or near one end at *h′*, its other end being pivotally connected to a lifting-arm, I. Each lifting-arm is preferably constructed in two pieces, the upper portion consisting of a stirrup, *i*, pivoted to the outer end of the lever H, while the lower portion, *i′*, which forms the body proper of the lifting-arm, is screw-threaded at its upper end to receive nuts i^2, arranged above and below the stirrup at the point where the lower portion, *i′*, passes through the said stirrup. By reason of this construction the length of the lifting-arm can be readily adjusted by unscrewing one of the nuts i^2 and screwing up the other one to a corresponding extent. The lower ends of each pair of lifting-arms are connected by means of a cross-bar, I′, the ends of which project slightly at each side, as shown at i^3 in Fig. 7 of the drawings. These projections are arranged to slide in guide-grooves *j*, formed in plates J, arranged on each side of each half of the elevator-shaft.

It is obvious that the projections i^3 may be formed independently of the cross-bar I′, and also that the guide-grooves J may be formed in the frame-work of the structure itself, instead of in a separate plate, although I prefer the construction shown. The guide-grooves are straight for the greater portion of their length, their lower ends, however, being curved outward, substantially as shown in Fig. 6 of the drawings.

It will be seen from the above description that upon the ascent of the bucket, when it comes in contact with the slides G, or with a suitable projection thereon arranged in the path of the bucket, the slides will move upward, carrying with them the levers H, thereby raising the lifting-arms, and causing the cross-bar I′ to move in the guide-grooves *j*. It will be seen that as the lifting-arms are attached to the levers at their extremities, while

the slides are connected to them near their fulcra, the rate of motion of the lifting-arms will be considerably greater than that of the slides or of the bucket by which they are actuated. As the lifting-arms begin to move, being in their normal or lowest position, they are first carried inward along the curved portion of the guide-grooves *j* until the cross-bar I′ comes in contact with the side of the bucket at a point just below a projection, e^4, formed on the gate E^2, which closes the opening in the bucket. As the bucket continues to move upward the cross-bar I′, moving in the straight portion of the guide-grooves *j* and at a higher speed than the bucket itself, as hereinbefore pointed out, will engage the projection e^4, and carry the door upward along with it, thereby uncovering the opening in the bucket and allowing the contents thereof to be discharged. When the sliding gate E^2 is fully opened, the bucket E has reached the highest point of its travel and, being emptied, begins to descend. Upon this descent of the bucket the weight of the levers H, slides G, lifting-arms, and cross-bars are, as a rule, sufficient to cause these parts to return to their normal position, as shown in Fig. 8 of the drawings, thereby allowing the sliding gate E^2 to close automatically by its own weight; but in order to overcome any tendency which these parts might have to remain in an elevated position after being raised, I have provided the stops e^3, hereinbefore mentioned, which engage with the upper end of the gate E^2, and cause the latter as the bucket descends to positively return the lifting-arms, levers, and slides to their original position. These stops e^3 may, as a rule, however, be dispensed with, the weight of the parts being generally sufficient, as hereinbefore pointed out, to return them to their normal position. The projecting ends of the levers H, as shown at h^2 in Fig. 8 of the drawings, may be provided with counterweights, if necessary, in order to properly balance the slides and lifting-arms, so as to reduce the weight necessary to be lifted by the bucket, when in contact with the slides, to a minimum.

In practice it is found to be somewhat difficult to stop the bucket precisely at the proper point at the upper end of its travel, and as any excess of movement of the bucket in this direction would be liable to damage the mechanism just described for automatically opening the gate E^2, I have provided the combined safety catch and stop shown in detail in Figs. 10 and 11 of the drawings. This consists of a bell-crank lever, K, pivoted at K′ within each slide G, one arm of the said bell-crank lever projecting out beyond the slide, as shown at *k*′, while the other end, k^2, is provided with an anti-friction roller which bears normally against the support G′, as shown in Fig. 10 of the drawings. This anti-friction roller may of course be dispensed with, but I deem its use preferable. The projecting end *k*′ of the lever K is arranged in the path of the bucket E, the upper edge of which engages therewith as the bucket ascends, and owing to the resistance offered by the other end of the bell-crank lever, which is in contact with the support G′, the lever cannot turn, and the end *k*′ will remain in the position shown in Fig. 10 of the drawings, thereby causing the slide to be carried upward by the upward motion of the bucket.

At a suitable point in the support G′ is formed a slot or recess, *g*′, arranged in the line of travel of the end k^2 of the lever K. It will be seen that if the bucket E continues to move upward beyond the point where it should stop the end k^2 of the bell-crank lever K will come opposite the recess *g*′, and owing to the pressure of the bucket against the oppoiste end, *k*′, of the lever the end k^2 will be thrown into the said recess, thereby permitting the bell-crank lever to turn upon its pivot and withdraw the end *k*′ within the plane of the outer surface of the slide, when the bucket may continue its upward motion without any corresponding motion of the slide. It is obvious that by reason of this construction, upon the hoisting of the bucket too far, either by accident or otherwise, the upward movement of the slides, levers, and lifting-arms will be prevented and any breakage of these parts thereby obviated.

The shaft D′, upon which is mounted the drum D, around which the hoisting-rope *d* is coiled, is connected with any suitable motor capable of imparting to it a rotary motion in either direction, so that as the said drum revolves one of the buckets E ascends while the other descends, and while one of the buckets is being automatically filled at the bottom of the elevator, as hereinbefore described, the other one automatically discharges its contents at the top of the elevator. Upon reversing the motion of the shaft D′ and drum D the filled bucket ascends and the empty one descends, when they are respectively emptied and filled once more, the operation being continued indefinitely, the only supervision necessary being that involved in the reversal of the movement of the drum.

It will be observed that each bucket is provided at the upper edge of its rear portion with an inclined flange or collar, e^5, which fills the space between the bucket and the edge of the pocket B while the bucket is being filled. The projecting end e^6 of the inclined bottom E′ of the bucket performs a similar function upon the other side of the bucket, filling the space between the said bucket and the receptacle into which it discharges its contents, thereby preventing any waste or loss of material.

At the side of the elevator-tower C, at the point where the buckets discharge their contents, is arranged a hopper, L, into which the said contents fall when discharged. The bottom of this hopper opens into a chute, M, the

lower end of which is closed by a slide, *m*. Below this end of the chute is arranged a track, A^3, to receive the cars, which are to be loaded at this point. The slide *m*, which closes the end of the chute, is operated by means of a lever, M′, connected to the said slide by the pivoted link *m′* so that by operating the said lever the slide *m* may be withdrawn to open the end of the chute, or slid back into position to close the said end. At the upper end of the chute M, near the hopper L, the bottom of the said chute, is cut away, and the opening thus formed is covered by a screen, N, below which is arranged a second chute, N′, extending in the opposite direction from the chute M and terminating over the track A^4, being provided at its lower end with a plate, *m*, for closing the said end, and mechanism for operating the said plate, as in the case of the chute M.

In separating the coal as it comes from the mine and sorting it into sizes, it is sometimes found desirable to separate that size of coal known as "pea-coal" from the slack proper, while at times this separation is not made, the whole being put upon the market together as slack. In the structure which I have described the screen A is of such dimensions as to allow both the pea-coal and the slack to pass through together, and in order to separate them it is necessary that they should be screened once more. In order to effectuate this, as the pocket B is not of a sufficient height above the surface of the ground to allow of another screening at this point by gravity alone, I employ the elevator hereinbefore described to hoist the coal to a sufficient height to rescreen it. Upon discharging the coal into the hopper L it falls into the chute M and passes over the screen N. While passing over this screen the smaller fragments thereof, which form the slack proper, will pass through the screen and fall into the chute N′, while the larger fragments, which form the pea-coal, cannot pass through the screen, and will descend through the chute M. The slides *m*, which close the lower ends of these chutes, allow me to make the operation of hoisting a continuous one, and render it unnecessary to stop the hoisting apparatus when a car has been filled at either chute, and to wait until another car has been brought up to receive the contents of the buckets. With my construction the hoisting operations may be continuous, the chutes filling up while the lower ends thereof are closed, and being opened when it is desired to fill a car or other receptacle and closed again when it is filled until it is desired to fill another.

In case it be desired to render the separation of the pea and slack coal very thorough, I employ a device for retarding the motion of the coal while it passes through the screen N. This device is shown as consisting, in the present instance, of one or more depending plates, O, capable of yielding either by the natural elasticity of the material of which they are constructed—such as sheet-iron, for instance—or by means of a hinged joint, as shown. It is obvious that as the coal descends it will come in contact with these depending plates, so that its movement will be retarded, and none of the finer fragments of the coal will be carried by their velocity over the screen without falling through the same, while at the same time the plates are so constructed as to yield to the pressure of the coal to a sufficient extent to allow the larger fragments to pass beneath them and prevent any choking of the chute.

In case it be found desirable, for any reason, not to separate the pea-coal from the slack proper, but to put both upon the market together, I provide means whereby the coal may be discharged into the chute N′ in the condition in which it comes from the buckets of the elevator. The upper end of the screen N is made capable of flexure at a point, *n*, some little distance below its upper edge, either by a hinged joint or otherwise, so that the portion of the screen above the said point may be detached and bent up out of the way, as shown in dotted lines in Fig. 3 of the drawings, thereby leaving an aperture, through which the coal may pass directly from the hopper L into the chute N′ without any screening to separate the pea-coal from the slack. This result may also be effected by constructing the upper end of the screen separately, so that it may be removed entirely. That portion of the top of the chute M which is immediately above the screen N may be provided with a hinge or otherwise removable section, M^2. By raising this section the screen may be inspected, cleaned, or repaired, as may also the retarding-plates O.

Although I have shown and described my improved elevator as applied in an apparatus for the purpose of elevating and delivering slack, I do not wish to be understood as limiting myself to this particular application thereof, for it is obvious that it may be used in various ways and for various purposes. For instance, it may be applied directly to the shaft of a mine, or it may be employed for hoisting other materials than coal, being adapted for use in the mining of certain kinds of ore and in the handling of various substances. It is also obvious that various mechanical modifications may be made in the details of construction without departing from the principle of my invention. For instance, although I have shown two sets of slides, levers, and lifting-arms employed in conjunction with each bucket-shaft, it is obvious that a single slide, lever, and lifting-arm may be employed, although I prefer the construction hereinbefore set forth, and shown in the drawings, as being more simple and effective in operation. I therefore do not wish to be understood as limiting myself strictly to the precise details of construction hereinbefore set

forth, and shown in the drawings, reserving the right to make such changes as may fairly be considered as coming within the scope of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the elevator-bucket, of a pocket closed by a gate adapted to be opened by the bucket upon its descent, substantially as and for the purposes specified.

2. The combination, with an elevator-bucket, of a pocket provided with a sliding gate arranged to close the lower end of the pocket, and to be engaged by the bucket upon its descent to lower the said gate, substantially as and for the purposes specified.

3. The combination, with the elevator-bucket, of a pocket provided with a gate for closing the lower end of the said pocket, and adapted to be lowered by the bucket upon its descent, and a suitable weight or spring to return the said gate to its normal position upon the ascent of the bucket, substantially as and for the purposes specified.

4. The combination, with the bucket E, of the pocket B, provided with a sliding gate, F, having one or more projections, f^2, arranged in the path of the bucket, and the lever F′, connected to the said gate at one end and provided with a weight, F″, on the other end, substantially as and for the purposes specified.

5. The combination, with the bucket E and pocket B, provided with a gate for closing the lower end thereof, of one or more inclined passages arranged above the said gate to return any surplus coal from the bucket to the pocket, substantially as and for the purposes specified.

6. The combination, with the bucket E and pocket B, provided with a gate to close the lower end thereof, of a series of inclined plates, B′, arranged above the said gate and forming inclined passages, substantially as and for the purposes specified.

7. The combination, with an elevator-bucket provided with a discharge-opening closed by a sliding gate, of a lifting arm or arms actuated by the movement of the bucket to raise the said gate, substantially as and for the purposes specified.

8. The combination, with an elevator-bucket provided with a discharge-opening closed by a sliding gate, of a slide or slides actuated by the said bucket and connected to a lever or levers pivoted at or near one end, and having connected to the other end a lifting-arm adapted to engage and open the sliding gate, substantially as and for the purposes specified.

9. The combination, with the bucket E, provided with gate E^2, of the slides G, levers H, connected thereto, and lifting-arms I, having projections to engage the guiding-grooves j, substantially as and for the purposes specified.

10. The combination, with the bucket E, provided with gate E^2, having projections e^4, of the slides G, levers H, and lifting-arms I, provided with cross-bar I′, to engage the projection e^4, substantially as and for the purposes specified.

11. The combination, with the levers H, of the adjustable lifting-arms I, substantially as and for the purposes specified.

12. The combination, with the levers H, of the lifting-arms I, each composed of an upper stirrup-section pivoted to the levers and a lower section passing through the said stirrup and screw-threaded to receive a nut above and below the stirrup, substantially as and for the purposes specified.

13. The combination, with the lifting-arms I and the mechanism for operating the same, of the cross-bar I′, connecting the lower ends of the lifting-arms, and having its projecting ends i^3 arranged to slide in the guide-grooves j, substantially as and for the purposes specified.

14. The combination, with the bucket E, having sliding gate E^2, and the mechanism for raising the said gate, of a stop or stops, e^3, arranged above the said gate to limit the upward motion of the same, substantially as and for the purposes specified.

15. The combination, with the slide or slides G, which operate the discharge mechanism, of a safety-stop to limit the upward motion of the said slide or slides, substantially as and for the purposes specified.

16. The combination, with the slide G, of the bell-crank lever K, pivoted therein, and having one end, k', thereof arranged to project normally in the path of the bucket, and the other end, k^2, bearing against a suitable support provided with a slot or recess, g', to receive the said end to limit the upward motion of the slide, substantially as and for the purposes specified.

17. The combination, with the elevator-bucket E, having inclined bottom E′, of the discharge-opening arranged at the lower edge of the said inclined bottom and provided with a sliding gate to close the said opening, substantially as and for the purposes specified.

18. The combination, with the elevator-bucket E, of inclined flanges e^5 and e^6, substantially as and for the purposes specified.

19. The combination, with an elevator, of one or more chutes connected therewith and having their lower ends provided with plates to close the said ends, substantially as and for the purposes specified.

20. The combination, with the chute M or N′, of the plate m, sliding in suitable ways at the lower end of the said chute, lever M′, and connecting-link m', substantially as and for the purposes specified.

21. The combination, with the chute M, having screen N, of retarding devices arranged above the said screen to retard the motion of the coal as it passes over the screen, substantially as and for the purposes specified.

22. The combination, with the chute M, hav-

ing screen N, of the dependent hinged plates O, arranged above the screen, substantially as and for the purposes specified.

23. The combination, with the chutes M and N′, of a screen arranged at the junction of the two chutes, a portion of the said screen being capable of being raised to allow the coal to pass freely from one chute to the other without passing through the screen, substantially as and for the purposes specified.

24. The combination, with the chutes M and N′, of the screen N, arranged at the junction of the two chutes, the upper portion of the said screen being capable of flexure at the point *n*, substantially as and for the purposes specified.

ROBERT LEE.

Witnesses:
W. C. CORLIES,
A. M. BEST.