(No Model.) 3 Sheets—Sheet 1.

A. E. BROWN.

Hoisting and Conveying Machine.

No. 232,236. Patented Sept. 14, 1880.

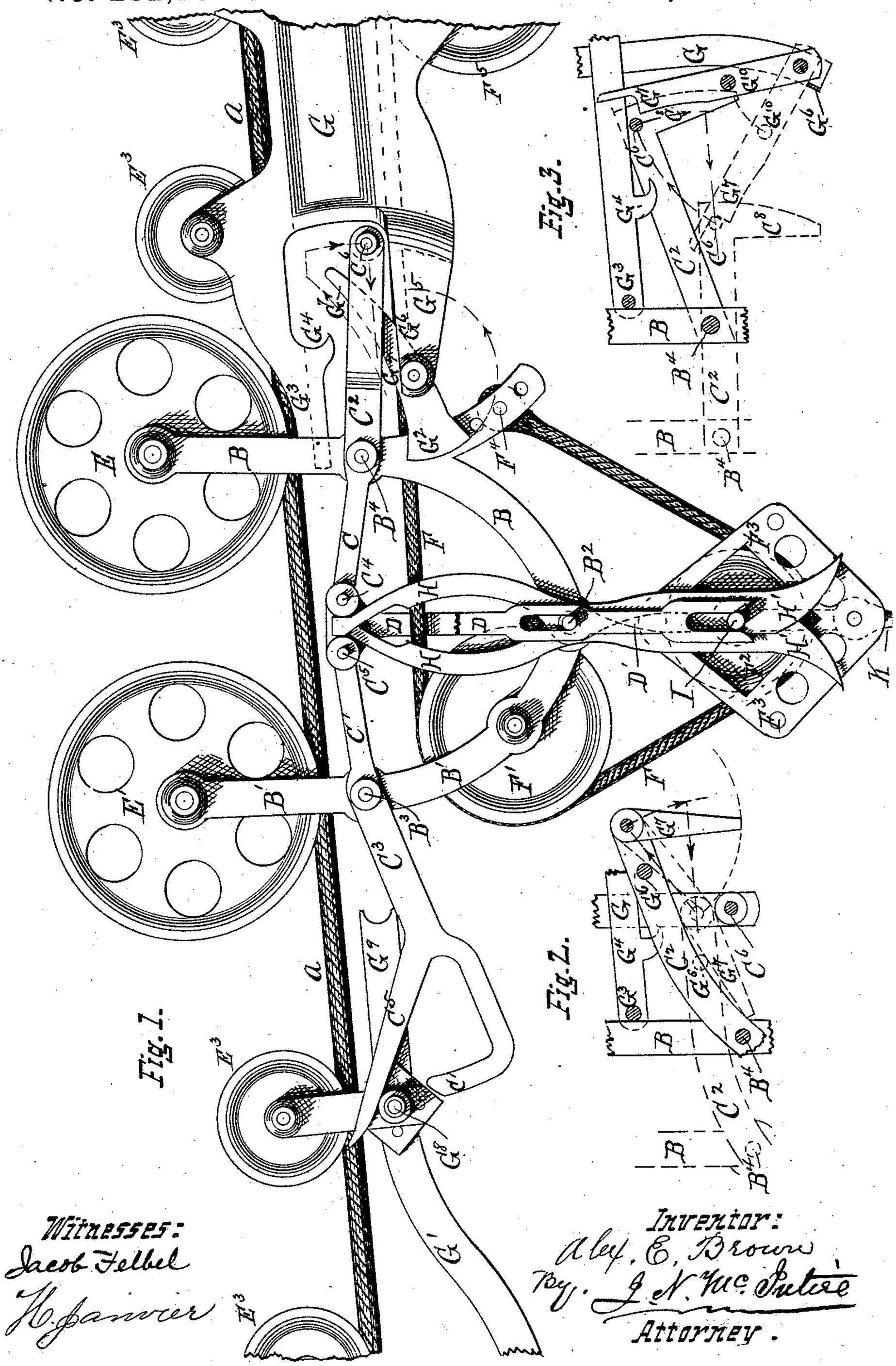

Fig. 1.

Fig. 3.

Fig. 2.

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(No Model.) 3 Sheets—Sheet 2.

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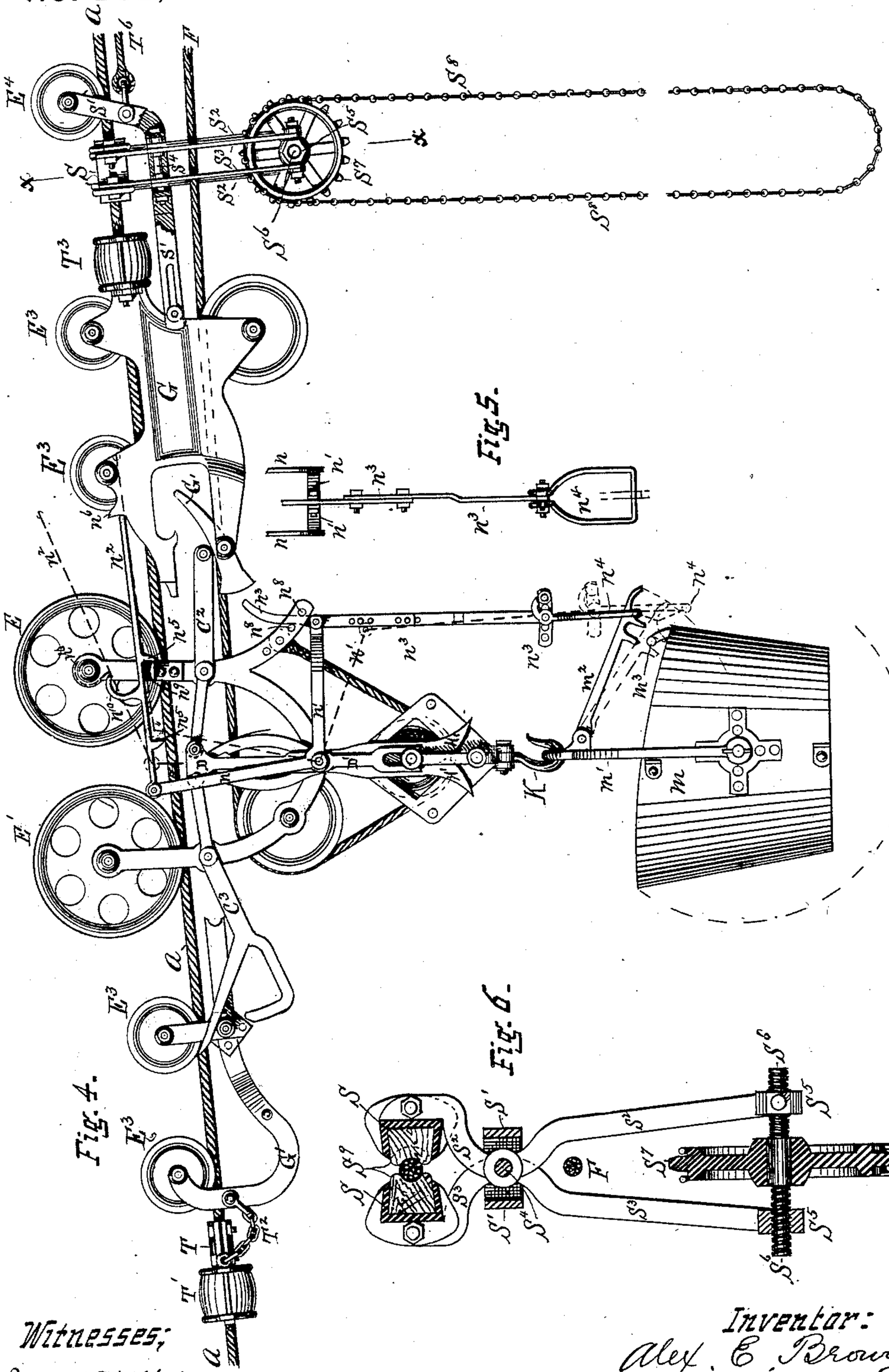

Fig. 4.

Fig. 5.

Fig. 6.

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(No Model.) 3 Sheets—Sheet 3.

A. E. BROWN.

Hoisting and Conveying Machine.

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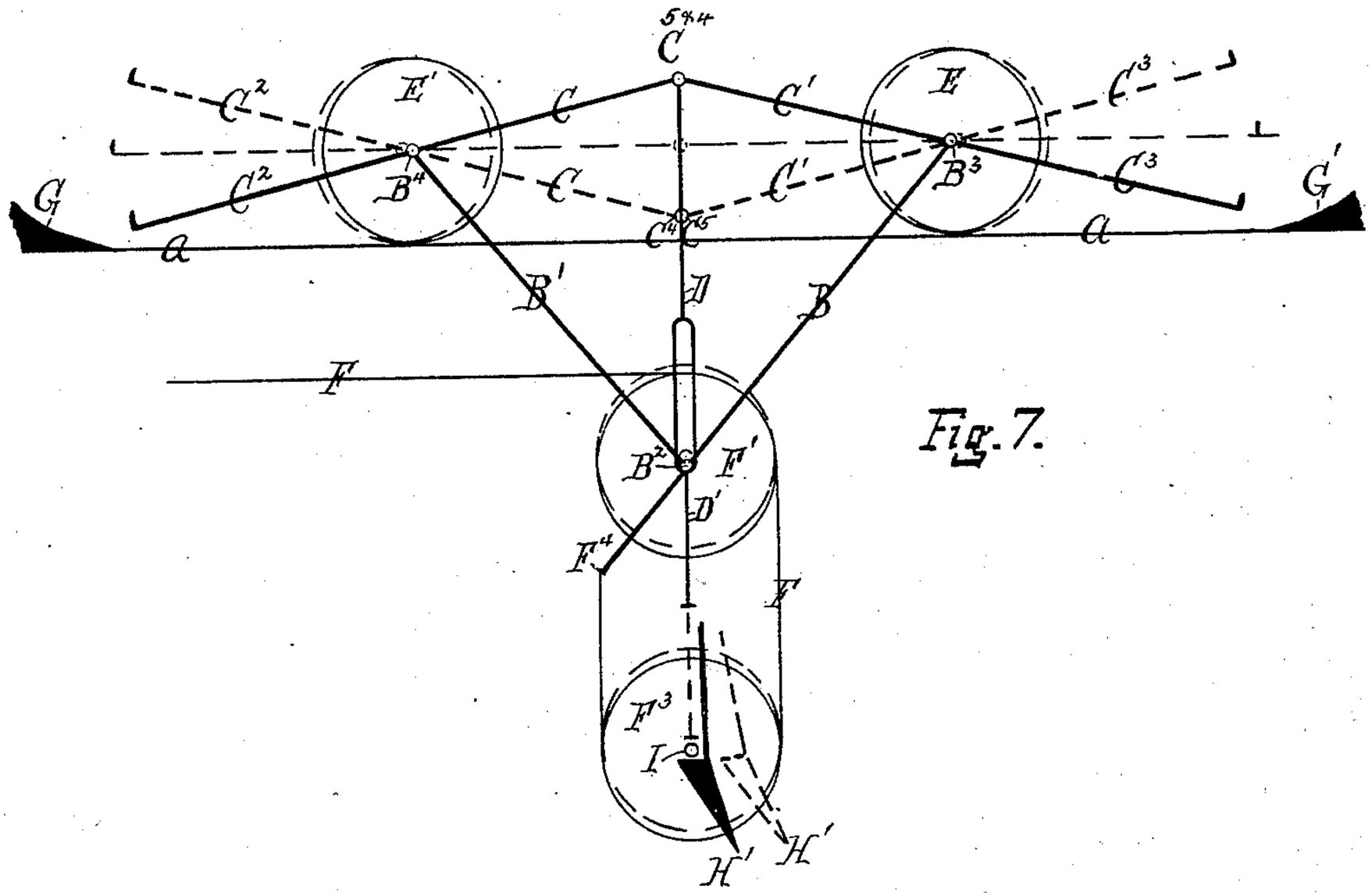
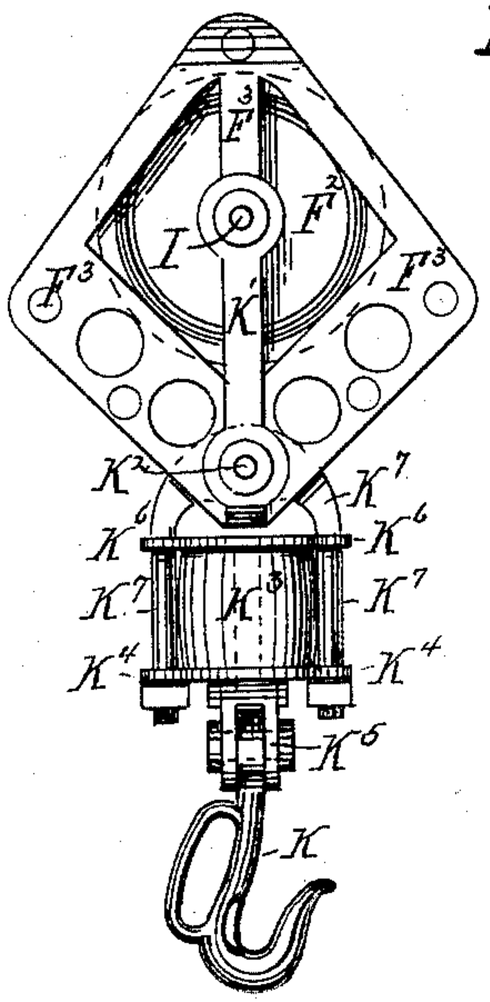
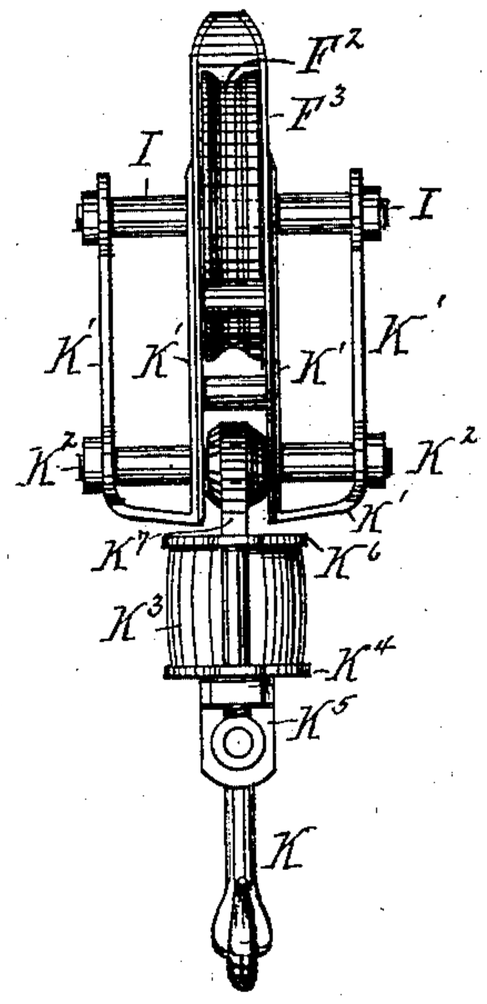


Fig. 7.

Fig. 8.





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UNITED STATES PATENT OFFICE.

ALEXANDER E. BROWN, OF CLEVELAND, OHIO.

HOISTING AND CONVEYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 232,236, dated September 14, 1880.

Application filed June 24, 1880. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER E. BROWN, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Hoisting and Conveying Machines; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification.

Previous to my invention machines or apparatus for hoisting or raising coal, ore, earths, &c., from vessels, mines, and other places, and transferring the same to piers, cars, and other localities or receptacles, have been devised of different constructions and in various forms; but in all such previous machines or contrivances of which I have any knowledge either the principle of construction or the mode of operation, or both, has been imperfect or defective in some one or more particulars, and to such a degree as to render such machines incapable of performing satisfactorily the work for which they have been designed.

In view of the fact that a machine or contrivance designed for the purposes for which my invention is designed must, in order to meet all the practical requirements of such an apparatus, embody a great many and very peculiar characteristics of structure and operation, it is not remarkable that no machine has heretofore been made to meet fully all these requirements satisfactorily; and it is the main object of my invention to provide one which shall do so either completely or at least to a far greater extent than has heretofore been attained.

From the following-named qualifications and capacities, which appear to me to be necessary to a perfectly-successful machine for the purposes alluded to, it will be seen that many—and in some measure conflicting—peculiarities of construction and operation must be combined in the one contrivance to make it practically successful. In the first place the machine must be perfectly adapted to be applied to and to perform successfully all the operations required of it while supported upon any one of the cheap forms of tramway—such, for instance, as a suspended wire cable or rail-track. In the next place it must be adapted to be operated on so as to perform all its designed functions by means of motive power derived from a source located at a greater or less distance from the machine and beyond its limits of travel, and at the same time be adapted to effect the transference of the load from its original locality to its place of final deposit with the least possible changes in the direction of motion of the motive device and the fewest possible cessations of motion in said device. In the next place, during the accomplishment of the object just above referred to, it must be capable of hoisting, carrying along to some distant locality the load, and then either discharging or first lowering and then dumping the material, and while in the performance of all these operations must be under the perfect control of the operator (who is at some given locality) as to the regulation of all these operations. In the next place, while the performance of all its functions is under the control of the operator, it must be capable of operating automatically and rapidly during any and all of the movements of its working parts. In the next place the machine must be as light and strong as possible, with the fewest number of parts and the least liability of derangement under the rough usage to which such machines are naturally subjected, and while being of such construction that all its actions are positive and certain in their nature, it must at the same time involve such a mode of operation that whenever any sudden change in the direction of motion of the load being carried has to occur, instead of the necessity for the presence (as usual heretofore) of spring-bumpers or other means for taking up the momentum of the suddenly-shifted load, the inertia of the load itself shall take up or assist in overcoming any shock to which any of the parts of the apparatus might otherwise be subjected; and, finally, the organization must be such that all the before-mentioned positive movements of the parts during all the automatic operations of the machine shall be derived directly from the bodily movement of the apparatus.

I will now proceed to more fully explain wherein I have, I believe, embodied in a successfully-operative organism all of the above-recited prerequisites of a desirable contrivance

for the designed purposes of my invention, and will, by reference to the accompanying drawings, making part of this specification, so describe my invention as to enable those skilled in the art to make and use the same.

In the accompanying drawings, Figure 1 is a partial side view of one of my improved hoisting and conveying machines adapted for use on and shown as applied to a wire cable or suspended flexible rail-track, such as heretofore commonly employed, but having the dumping attachment omitted to avoid unnecessary complication in this figure of the drawings. Figs. 2 and 3 are detail skeleton views, representing modifications of certain parts of the contrivance seen at Fig. 1, and which will be hereinafter alluded to. Fig. 4 is a side view, showing the whole apparatus, and on a smaller scale than that of Fig. 1, while Fig. 5 is a detail view of certain parts seen in Fig. 4 and on the scale of said figure. Fig. 6 is a detail sectional view at the line *x x* of Fig. 4 on an increased scale, and designed to more clearly illustrate the clamping device seen in elevation at said last-mentioned figure; and Fig. 8 represents, in side and edge views, the hoist block and sheave having a spring-like attachment for the hook, as for a purpose to be presently explained; and Fig. 7 is a diagram for purposes of more intelligible explanation hereinafter of certain principles of operation involved in the machine.

In the several figures I have denoted the same parts wherever they occur by the same reference-letters

The parts B B′, C C′, and D constitute the carriage-frame proper, which is provided at its upper portion, as shown, with two traveling or cable sheaves, E E′, that bear and travel on the cable-way *a*.

F is the hoisting-rope, one end of which is secured, preferably as represented, to a projecting portion, F^4, of the carriage-frame, said rope being passed thence beneath and partially around the sheave F^2 of the hoisting-block, thence partially around and over a sheave, F′, journaled in the carriage-frame, as shown, (or, if deemed expedient, having its axis coincident with that of the pin B^2,) and thence off to the source of the lifting-power.

The parts C and C′ of the carriage-frame are extended outward from the latter in opposite directions, as seen at C^2 and C^3, for the double purpose of balancing, respectively, the parts C and C′, and also the part D, jointed thereto, and to form, in connection with the part D and the stops arranged at the ends of the line of travel of the machine on the cable *a*, a means for actuating the parts of the machine to produce the necessary changes in the directions of its motions.

The stops are seen at G and G′, the first named being the upgrade and the last mentioned the downgrade stop, and each made and arranged as will be presently explained.

H H′ are two levers formed or provided with hook-like lower portions, as shown, and arranged to move about a common fulcrum which is coincident with the pivotal pin B^2 of the carriage-frame. The hook-like portions of the said levers serve to retain the load to be manipulated in a suspended condition, and this suspension of the load is effected, preferably, by causing these hook-like devices to partially embrace and hold directly onto the laterally-projecting lugs I, which are coincident with the arbor or journal of the hoisting-sheave F^2, and which in practice I propose to have form mere outward extensions of the ends of said sheave-arbor.

The upper portions of the levers H H′ are made, preferably, as shown at Fig. 1, so that their upper ends may pass freely between rollers C^4 and C^5, mounted on the portions C and C′, near their adjacent ends, and so that any vertical movement downward of the said rollers will cause the upper ends of said levers to be forced nearer together and their lower hook-like portions to be separated, to release the lugs or pins I of the hoisting-sheave, while a reverse movement of the said rollers will cause an opposite movement of the said levers to effect a re-engagement of their hook-like portions with the said hoisting-sheave arbor I.

The portion D of the carriage-frame, before alluded to, is made or provided with a downwardly-extended portion, (marked D′,) which is bifurcated at its lower end to straddle the pin I, and which thus serves to laterally retain said pin in the proper position, said part D D′ of the frame being slotted or yoked around the pin or anchor B^2, in order that it may freely move up and down around said pin.

As is clearly shown, the part D is in pivotal connection with each of the parts C and C′ at the points where the rollers C^4 and C^5 are mounted, thus forming knee-joints at said points, and the several parts B B′, C C^2, C′ C^3, and D D′ forming a lever system, the relative movements of the parts of which are limited by the extent of motion to which th slotted part D D′ is restricted by the pin B^2.

Each of the extended portions C^2 and C^3 of the frame is adapted to so operate, in conjunction with certain devices with which the up and down grade stops on the cable-way are respectively provided, that at the arrival of the carriage at either of those stops the parts C C^2 and C′ C^3 will be caused to turn on their respective fulcra, B^3 and B^4, and effect a downward thrust of the part D D′ to the extent of its restricted movement.

G and G′ represent, respectively, the upgrade and downgrade stops, each of which is secured in some proper manner to the cable-way *a* at the proper locality. I have shown these stops as being secured to the cable *a* by means of a clamping contrivance, and in such manner as to be capable of adjustment in the direction of the length of the cable, as will be presently more fully explained, said stops being supported by sheaves E^3, which bear on

top of the cable and have their weight so disposed as to bring their centers of gravity below the cable.

G^3 is a projecting portion of the frame of the stop device G, that is adapted to serve as an abutment against which a part of the carriage-frame will strike as it travels upward on the cable, and by which the upward movement of said carriage-frame will be arrested.

G^4 is a hook-like projection, lug, or other suitable device, the office and effect of which is to catch and retain the carriage, should it tend to start downgrade before a proper engagement of the hoist-block stud I with the retaining-hooks of levers H H′, by an engagement of said hook G^4 with the roller C^6 or some other projecting device of the part C^2 of the carriage-frame.

In the end of another extension, G^5, of the stop-frame G is pivoted a lever, G^2 G^7, the normal position of which (by its gravity) is nearly or quite vertical, and the extent of oscillation of which is limited to the position of the lever shown at Fig. 1 by a suitable stop shoulder formed at G^6, as per dotted lines. The longer arm, G^7, of this lever forms an inclined plane, up which the roller C^6 of part C^2 has to ride as the carriage-frame approaches its uppermost destination, and which serves to affect the proper manipulation of said part C^2 to operate the hoist-block-releasing devices.

F^5 is a sheave hung in the stop-frame G, as shown, and designed simply to guide the hoist-rope properly in any and all positions in which said stop-frame may be set. It is not indispensable to the stop-frame, but its presence is desirable for the purpose alluded to.

G′ is the downgrade-stop frame, which is somewhat different in form from the other stop-frame, and which also differs therefrom in its mode of operation, as will now be explained. It is provided at G^9 with a projection, which, when brought into action, serves the same purpose as that, G^3, of the other stop, and has a roller, pin, or other suitable projecting device at G^8, against which the inclined extension C^5 of part C^3 strikes, and by which said part is operated in the same manner and for the same purpose that the part C^2 of the carriage-frame is operated by the longer arm of lever G^2 C^7 of the stop-frame G, while the roller G^8 also serves, in co-operation with a hook-like portion, C^7, of the part C^3, to prevent any premature movement of the carriage-frame along the cable *a*. In this downgrade-stop mechanism, however, the operation, unlike that of the upgrade-stop G, is such that, except when the grade and velocity are such as that the momentum will be exactly taken up by the opening of the releasing devices, which does not often occur, the releasement of the load occurs just before the frame comes into contact with stop G^9, and therefore, the tendency of the combined action of the descending load and pull on the hoist-rope being to reverse the direction of travel of the carriage, the hook C^7 is brought up against and pulls on the roller G^8, instead of the stop G^9 coming into action.

Before specifying the general operation of the apparatus I deem it proper and desirable, in explanation of my novel machine, to briefly explain the novel principle operation on which it is designed to work, and this I can most readily explain by special reference to the diagram or skeleton view which I have drawn at Fig. 7. By a reference to this figure or diagram it will be seen that the effect of the weight of the hoist-block and the load suspended therefrom is to induce a strain or force in a direction corresponding to the downward direction of motion of the part D D′ of the carriage-frame, (which, as before explained, is, in reality, a system of levers,) and that the effect of this force is the same as if applied during all positions of the said block F^3 and its load directly to the fulcrum or point B^2, that this force thus applied at B^2 always tends to bring the points B^3 and B^4 nearer together, assuming that these points of the frame-work are prevented from descending or moving in the direction of motion to which the load inclines, which is the case by reason of the frame-sheaves E and E′, which rest on the cable-way *a*, sustaining the points B^3 and B^4, and that thus the "knee-joints," as I have called them at C^4 C^5, are subjected always to a compressive strain—*i. e.*, a force tending to move these points toward each other—and will tend to move either vertically upward or vertically downward, accordingly as its position to start will be either above or below a right line passing through or connecting the two points B^3 and B^4 of the system. The extent to which the knee-joint can move in either direction will, of course, be determined by the extent of motion of which the slotted device D D′ may be capable, and it will be seen that when at its lowest position said device is subjected to a compressive force, while when at its highest position it is subjected to a tensile strain.

It will be observed that any force operating to cause the knee-joint at C^4 C^5 to move from either direction toward a right line running from B^3 to B^4 will tend to force farther apart the pivotal points B^3 B^4, and consequently will tend to lift the point B^2 from which the load is suspended, and that the result of this tendency is, that after having arrived at and passed the said line, (or the "dead-center," so to speak,) the weight of the load will then operate to assist the movement of the knee-joint toward either of its limits of upward and downward motion.

Now, it will be seen that any construction and detail arrangement of parts involving the described principle of operation, and in which the load will be directly suspended from the carriage-frame, as described, when the knee-joint portions are at the limit of their motion in one direction, and in which the said load will be suspended indirectly from said carriage-

frame through the medium of the hoist-rope when said knee-joint portions are at the limit of their motion in the other direction, will necessarily embody the gist of my invention.

The following will suffice for a description of the general operation of the machine: Supposing the carriage to be at the upgrade-stop G, as seen at Fig. 1, and the load to be suspended on the hook-like portions of levers H H′, and imagining the downgrade-stop G′ to be located some distance off, the hoist-rope F is paid out, in the direction indicated by the arrow at Fig. 1, and the carriage, with its suspended hoist-block F^3 and load, is permitted to descend the cable-way *a* by gravity. When it starts on its descent there is no appreciable impediment offered to its movement by the device G^2 G^7, because the upper end of the lever is turned over by the action of roller C^6, which simply rides over it, when said lever by gravity assumes a vertical position.

When the carriage-frame arrives at the downgrade-stop G′ it either abuts against the projection G^9 and can go no farther, or before that is operated upon, as already described; but in coming to this position the inclined portion C^5 of the frame rides onto the roller G^8, whose axis is stationary, and is forced upward, the device C^7 in the meantime being carried up in rear of the roller G^8.

The lifting up of the arm C^3 effects a depression of the part D D′, and a consequent opening of the retaining-hooks and releasement of the arbor I of the hoist-block, from which the load is suspended, so that the weight of the hoist-block and load comes onto hoist-rope F and exerts a tendency to force the carriage back upgrade again; but any such movement is prevented by the retaining device C^7 coming against the projection or roller G^8 of the stop-frame G′, and the carriage-frame is forced to remain in the position at which it arrived during the descent, and until the return upward of the hoist-block. When, by a reversal of the motion of the hoist-rope F, the hoist-block and load shall have been raised up again, the pin I passes on up between the separated flared lower ends, H H′, of the hook-levers, and said pin then striking up into the crotch of the lower bifurcated end of the device D D′ will force the latter up, thereby raising the knee-joints at C^4 C^5 and releasing the hold of the part C^7 on roller G^8, so that the carriage-frame can begin to move upgrade at the initial movement of the carriage. However, the arbors I settle down onto the sustaining-hooks, and the parts all present the condition represented at Fig. 1, in which they were at the start, and the carriage, with its suspended load, is drawn back to the point from which it started.

It must be remarked, however, that when the releasement of the load and the engagement of the carriage-frame with the downgrade-stop G′ took place, the momentum of the carriage and load acquired in arriving at the end of the downgrade was absorbed by the necessary lifting of the load necessary to accomplish the releasement of the suspended hoist-block, and that therefore no portions of the contrivance were subject to any sudden shock or strain by either the stoppage of the onward travel of the machine and load or the sudden releasement of the latter and its descent, the weight of the released hoist-block and load coming onto the hoist-rope and partially onto the carriage-frame just at the time its inertia had been about used up, to assist in the releasing operation.

Supposing, now, the carriage to be carried with its suspended hoist-block and load upgrade for the deposit of its load at that point, the hoist-rope is drawn in a direction opposite to that at first mentioned, and when the carriage shall have been drawn up to the stop-frame G the roller C^6, riding up on lever G^7, will effect the turning of part C C^2 on pivot B^1, the consequent depression of the knee-joints at C^4 C^5 and the releasement of the suspended hoist-block pin I, the carriage-frame meantime coming to a stop against the projection G^3, and then, by a reversal of the motion of the hoist-rope F, the load is permitted to descend. In this uppermost position of the carriage-frame there may, under certain circumstances, (when, for instance, the gravity of the load is not sufficient to keep the carriage-frame forced up against the stop G^3,) be a liability of the carriage to move downward on the cable *a*. To prevent any such movement I provide the catch-like projection G^4, which, in the event of any inclination of the carriage-frame to leave its position during the descent of the hoist-block and load, will engage with the roller C^6 (or other projection for the purpose) on arm C^2 and effect the retention of the carriage-frame in place.

It will be seen from the foregoing explanations that all the requisite movements of the load may be effected with the least possible reversals in the direction of motion of the device through which the motive power is applied to the machine.

At Figs. 2 and 3 are shown two of many forms of device that may be employed as mere substitutes for the swinging lever G^2 G^7, pivoted to the upgrade-stop frame and co-operating with the rollered arm C^2. In the device illustrated at Fig. 2 the piece G^7 is attached or pivoted to the arm C^2 instead of to the stop G, the said stop being provided in this case with a pin or roller, C^6. The broken outline of C^2 and its piece G^7 shows the position as it reaches the stop G, G^7 being thrown backward by the pin or roller C^6 until C^2 rests against the stop G^6, in which position G^7 forms an inclined plane moving up on the roller C^6 until the end is cleared of or past C^6, when the arm C^2 is at its uppermost limit, or the hooks at H H′, Fig. 1, are open, and G^7 then swings by gravity to the vertical position shown in the drawings. C^2 can now be freely depressed,

and G^7 will swing over the roller C^6 as the carriage again goes downgrade.

In the arrangement shown at Fig. 3 the arm C^2 is extended downward, as shown at C^8, and a swinging piece, G^7, is pivoted to the stop-frame G, as illustrated. The swinging end of G^7 is notched out, as shown, to form a seat for pin C^6 of arm C^2 to butt against, and as the carriage is further moved upgrade the lever G^7 will be turned up toward and into the position shown in full lines at Fig. 3, said lever, in turn, operating to lift up (by means of pin C^6) the end of piece C^2 C^8 until the lower forward part of C^8, coming into contact with a pin or projection, G^{10}, of said lever G^7, begins to act on said lever, its action having the effect to further move lever G^7 and unseat the pin C^6, thus permitting the part C^2 C^8 to be forced back again to its former lowermost position, in which it will be free to travel back again downgrade with the carriage-frame. In coming down again the lever G^7 is arrested and retained in position by a stop at G^6, by which it is held in proper position for action whenever the carriage-frame shall again be brought upgrade.

In this form of contrivance the parts G^3 and G^4, it will be seen, are the same as shown at Fig. 1, and from the examples given it will be seen that various forms and combinations of devices may be employed as equivalents for the performance of those functions of the apparatus which relate to automatic movements necessary at the time of the arrival of the carriage at the upgrade-stop G.

It is also apparent that the form and precise arrangement shown of the parts composing the carriage-frame, with its knee-joints, hook-like suspension-levers, &c., may be varied without substantially changing the principle of construction of the machine. For instance, the points B^3 B^4 might be located above instead of below the cable-way *a*, and might be at the axes of the sheaves E E′, in which case it would become necessary with regard to the stop-frames to merely change their relative location to the cable and the carriage devices to render the machine capable of all its present operations.

In lieu of the extensions C^2 and C^3 of the parts C and C′, separate and independent levers or other devices might be employed to operate on the knee-joints, or suitably-constructed parts might be formed or applied to the stop-frames G and G′, that would, by direct application to the knee-joints at C^4 C^5, raise and lower the part D D′ at the proper times and in the right manner.

The levers H H′ may, of course, be operated by other means than those shown, and in lieu of the four hook-levers shown a less number may be employed, though I have preferred to use four, or at least two, in order that in the movement of said hooks to release the hoist-block journals I no tendency can occur which might operate (by frictional contact between the spindle I and any one hook) to draw the arbor I to one side, and thus embarrass the quick and perfect releasement of the hoist-block.

The details of the construction of the hook-levers and of its connections with the hoist-block may be varied; but I consider it important that the points or axis of suspension be coincident with the center-pin of the sheave F^2 of said block, for reasons which I will presently state; and it will be understood that this peculiarity of my machine may be applied with great advantage to machines in other respects substantially different from mine.

During the hoisting of the block F^3 with its suspended load both the load and block are usually subject to a swinging motion of greater or less extent, most of which is in a plane about at right angles to the axis of the hoist-block and about an axis of motion that is substantially coincident with the axis of the sheave F^2. Therefore the projections I (or others about in line with them) constitute points or places of connection that will most certainly and easily come into ready engagement with any hook-like or other engaging mechanism or device, since any device located at the point I will be least affected by the gyrations or swinging movements of the load and hoist-block at the time the latter reaches (on its ascent) the engaging mechanism.

In the use of the machine made as I have so far explained it, there would be more or less of sudden strains or jars on the suspending-hooks that hold the hoist-block lugs or pins I both at the time of the engagement of the block with the hooks (when the load has been hoisted) on account of the seating of the weighted pins I on the hooks, and during the travel of the heavily-loaded carriage along the cable-way *a*, in consequence of the vibrations of the cable-way. To partially or wholly overcome any such objectionable shocks or sudden strains on the parts of the apparatus, I have provided it with an elastic attachment of the hook of the hoist-block.

This mode of attachment of the usual "K-hook," as it is called, may, of course, with equal advantage, be applied to machines differing from mine in other respects, and the elastic medium may consist of either a rubber or metallic spring-like device, an air-cushion, or other suitable means for effecting a slightly-yielding connection between the block and its hook.

At Fig. 8 will be seen a preferable form of yielding connection.

In the form here shown the hook K is pivoted at K^5 to a piece which is secured at its upper end to the top plate, K^6, that rests on the upper surface of a rubber spring or cushion, K^3, and said cushion is supported by a bottom plate, K^4, which is, in turn, held by the lower ends of a stirrup-piece, K^7, the top and arch-like portion of which is pivoted at K^2 to the straps K′ of the block.

I will now describe the means I have devised and applied for effecting the dumping automatically of the load, where it may be necessary to use a dumping contrivance, and for easily and effectually securing the stop-frames at any desired and different points to the cable-way.

At Fig. 4, in which is shown, in side elevation, an entire apparatus, including a clamping and dumping mechanism, all of the preferable form, n n' is a bent lever, pivoted to any suitable portion of the carriage-frame—as, for instance, at B^2—and to the upper end of said lever is jointed one end of a lever or bar, n^2, that is free to turn on its pivotal point, but which, in its normal condition, rests on top of a projection or supporting-lug, n^9, of the carriage-frame.

The bar n^2 is formed or provided with stops n^5, which come against the supporting-lug n^9, when said bar may be moved endwise and operate to restrict or limit such endwise movement of the bar, in a manner and for the purpose to be presently explained.

n^3 is a bar or rod, (which may be made either of a given length or capable of adjustment to various lengths,) pivoted near its upper end to the lower end of the bent lever n n', and suitably shaped at its top to be operated on by the guides n^8 in such manner as to cause an outward movement of its upper end during its ascent, for the purpose of swinging its lower end inward or toward the dumping-bucket m whenever said rod n^3 may be lifted, to insure the proper engagement of the lower stirrup-like end of said rod with the outer end of the catch m^2 of the bucket, and the lifting up of the same to unlock the bucket and permit it to dump.

The catch-bar m^2 is, as usual, hinged to the bail m' of the bucket m, and the edge of the bucket is provided at m^3 with the usual projection or roller, with which the notched outer end of the arm m^2 engages in the manner well known.

The lower end of the device n^3 is preferably made, as shown at n^4, in the form of a stirrup flexibly attached to the rigid lower end of said device n^3, in such manner that said stirrup can vibrate or swing in a direction away from the bucket; and I have deemed it expedient to have the parts n^3 and n^4 adjustably connected, so that it may be adapted for use in connection with different dumping-buckets having differently-formed catch-bars of various lengths.

The shape of the devices n^3 n^4 and their arrangement with the lower end of bent lever n n' may be better understood, perhaps, by reference, also, to Fig. 5.

In the operation of the automatic dumping mechanism, assuming the carriage-frame to be approaching the upgrade-stop, and that the load is to be there discharged, the devices n^3 n^4 would be in a disengaged condition relatively to the catch-lever m^2, and the latter would have the bucket locked, as indicated by the dotted lines at Fig. 4, and during the approach of the carriage to the stop-frame G the free end of bar n^2 would come into contact with a projection, n^6, on the stop-frame. As the carriage comes to a stop by reason of the bar n^2 having been pushed back until its foremost stop, n^5, comes to a dead-lock with the carriage-frame and its lug n^9, the bent lever n n', it will be seen, will have been turned on its axis at B^2, and the devices n^3 n^4 thereby lifted; but in the initial lifting movement of these devices the operation on the curved upper end of n^3, effected by the guides n^8, will have caused the lower portion, n^4, of the devices to swing toward the bucket m and well under the outer end of the catch-bar m^2, so that during the ascent of n^4 the said catch-bar m^2 will be lifted up, as shown at Fig. 4, and the bucket unlocked, that it may turn over and dump its contents in the usual manner of such buckets. Upon the movement of the carriage away from the stop-frame the parts will all resume their original positions and the bucket will become relocked.

In cases where it may be desired to lower the bucket without dumping, the described automatic operations may be prevented by simply turning up and fastening in an inoperative condition the actuating-bar n^2, and to facilitate this said bar may be made with a hook, as at n^{10}, by which it may be hitched or tied up to some convenient part of the carriage-frame.

If desired, the devices n^3 n^4 may also be swung up and fastened out of the way. By the use of the curved upper end of n^3, in connection with the guides n^8, not only is the stirrup n^4 caused to swing properly under the catch to be lifted before it is lifted up to said catch, as already explained, but the devices n^3 n^4 are also prevented by said guides n^8 from swinging about and interfering with the bucket or hoisting-block, &c. The stirrup n^4 being free to swing away from the bucket, there is no danger of any accidental operation of the catch-bar m^2 in the event of any swinging to and fro of the bucket and the other carriage attachments, and all the automatic dumping mechanism being attached to the traveling carriage-frame, this mechanism must necessarily always be in place and in the proper condition for operation when the dumping of the bucket may be desired.

As the gravity of the upgrade-stop G is sufficient to effect the necessary movements of the automatic dumping mechanism, without any securement of said stop-frame to the cable-way a, the dumping of the load may be effected at various desired points along the line of upward travel of the carriage-frame by simply allowing the stop-frame G to run down to or by pulling it up to any desired place along the cable-way, which adjustment of said stop-frame may be produced by either paying out or hauling in the tail-rope T^6. (See Fig. 4.)

In cases where there may be no necessity for a frequent adjustment of the stops, or where

the time requisite to move and resecure them is of no moment, any simple form of rope-clamp T, bolted to the cable *a*, together with a suitable bumper, T′, coupled to the stop by a chain, T², all, for instance, as seen at the left-hand side of Fig. 4, will answer; but in most cases it is quite necessary to frequently change the location of the stops on the cable *a*, and the want of some means for and method of conveniently and rapidly doing this has long been desired.

The means I have devised for this important purpose I have shown in the preferable form at the right-hand side of Fig. 4 and in a detail cross-section at Fig. 6. It may be such that the necessary operations can be effected through the medium of the hoisting-machine mechanism or through the medium of means under the control of the man on the ground at the rear end of the cable. I will describe it as represented in the drawings, where it will be seen that the stop-frame and the clamp proper (shown at S) are so connected by a slotted bar, S′, that the stop-frame is capable of some motion on the cable-way *a* independently of the clamp, and that the whole is supported upon and free to travel together when the clamp is loosened by means of the three sheaves E³ E³ E⁴.

On the frame-bars S′ (see Fig. 6) are pivoted two pairs of shear-arms, S² and S³, arranged a short distance apart, the upper ends of which arms carry the clamping-jaws designed to gripe the cable *a*, and the lower ends of which are provided with right and left hand screw-nuts. Each clamping-jaw is composed, as shown, of a metallic portion, S, carrying a block of wood or other suitable material, S⁹, adapted to be pressed onto and take a firm grasp on the cable in opposition to a similar jaw, and between the lower ends of the pairs of shear-arms is a chain-wheel, S⁷, the shaft S⁶ of which, being keyed fast to the hub of said wheel, has cut on its opposite ends right and left hand screw-threads, which work in similarly-cut threads in the nuts S⁵.

Over the wheel S⁷ is placed a drive-chain, S⁸, and to the rear part of the frame-bars S′ is attached a rope, T⁶, by means of which the clamping and stop frames may be drawn up and allowed to run down on the cable (by hauling in and paying out said rope) at will.

T³ is a bumper-spring or rubber cushion attached to the rearmost part of the stop-frame G, and adapted to come against the clamp S, when made fast, to take up any jar in stopping the carriage-frame.

It will be seen that by simply manipulating the drive-chain S⁸, which may extend downward, as shown, or off to any desired locality, so as to turn the chain-wheel S⁷ in one direction or the other, the clamping-jaws may be closed upon or made to release their gripe of the cable *a* at pleasure.

It will, however, be understood that, so far as the feature of my invention relating to the adjustable stops is concerned, various devices and combinations of devices other than those shown may be employed to accomplish the purposes described, the gist of my invention in this particular consisting in the employment, in connection with the stop-frames (or either of them) of the machine, of a suitable means for clamping or securing the frames in a given locality on the cable through the medium of devices manipulated at a considerable distance from the clamping device, as set forth.

Having now fully explained the nature of my invention, so that one skilled in the art can understand and practice it, what I claim as new, and desire to secure by Letters Patent, is—

1. In a hoisting and conveying contrivance, a carriage-frame adapted to be supported and to travel on a cable or rail way, and composed of a system of levers, such as described, that the weight of the suspended load exerts a tendency to retain the parts in each of the two conditions they must assume to retain and to release the suspension of the hoisting-block and load, as set forth.

2. In a conveying contrivance, a carriage-frame for supporting and adapted to release the suspended load, so made and operating, as described, that in arriving at the downgrade-stop the momentum will gradually be absorbed either in the effort of lifting the load which has to be made, in order to effect its releasement from the suspending-hooks of the carriage, or partially by such effort and partially by the pull of the hoist-rope on the carriage in a reverse direction by the releasement of the load, as set forth.

3. In combination with the carriage provided with any suitable means of engagement with the block to be suspended, a hoist-block having the lugs or other devices designed to be held by such means of engagement located about coincident with the axis of the hoist-block sheave.

4. In combination with the carriage, a downgrade-stop device and means on the carriage for engaging therewith, the combination being and operating so that the combined action of the carriage and stop devices effect, first, the operation of the weight-suspending mechanism and arrest or partial arrest of the carriage's travel, in the manner described, and, second, the retention of the carriage against the pull of the hoist-rope, as set forth.

5. The combination, with the carriage-frame provided with load retaining and releasing devices, and an upgrade-stop frame provided with a fixed abutment for the carriage, of a means for operating the releasing mechanism, which does not interfere with either the subsequent operation of said mechanism in re-engaging the load or the subsequent return movement of the carriage and all its attachments.

6. The combination, with a cable-way or track adapted for use in a conveying or hoist-

ing and conveying apparatus, and a stop-frame adapted to be applied thereto, of means, substantially such as described, for effecting a securement to and releasement from said cable of said stop, which may be operated at a distance from the cable, as and for the purposes set forth.

7. The combination, with the carriage-frame and load-carrying receptacle or bucket attached thereto in a conveying apparatus, of an automatic dumping mechanism composed of devices substantially such as described, arranged and operating in the manner set forth.

In testimony whereof I have hereunto set my hand and seal this 14th day of June, 1880.

ALEX. E. BROWN. [L. S.]

In presence of—
JACOB FELBEL,
HARRY JANVIER.