No. 609,960. Patented Aug. 30, 1898.

A. H. DE CAMP, Dec'd.

E. A. & C. A. DE CAMP, Executors.

HOISTING AND CONVEYING APPARATUS.

(Application filed Apr. 6, 1895.)

(No Model.) 2 Sheets—Sheet 1.

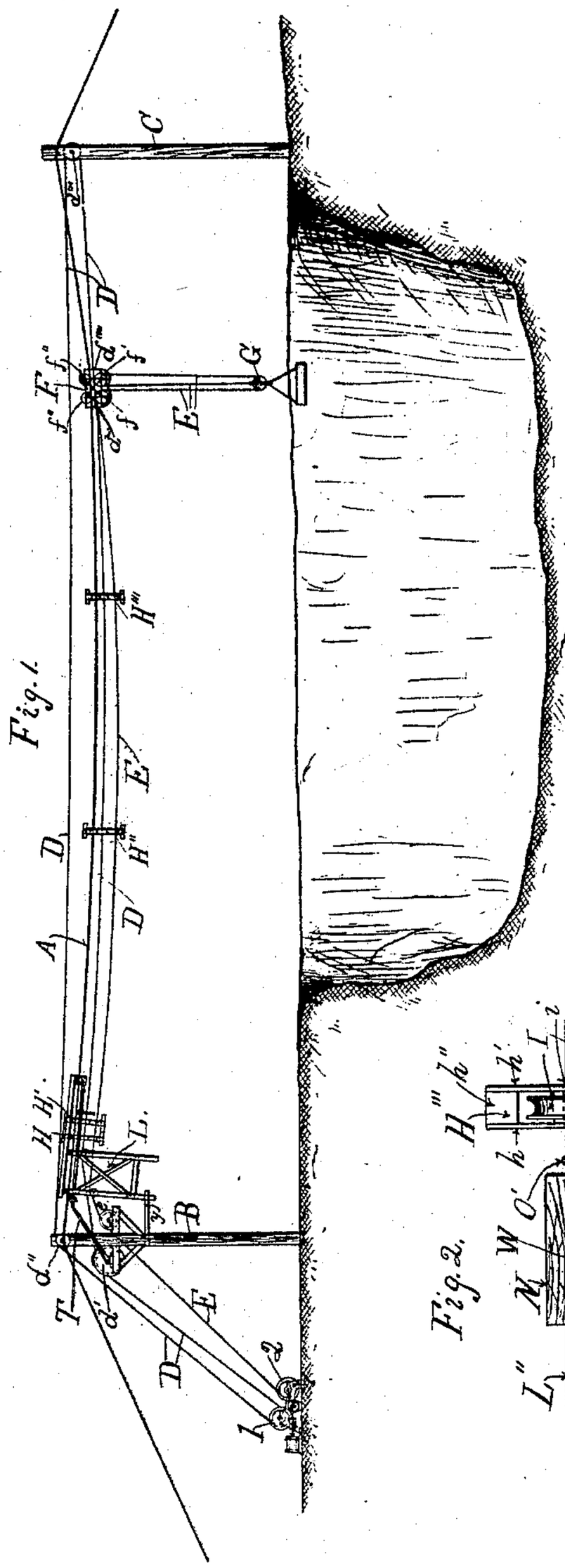

Fig. 1.

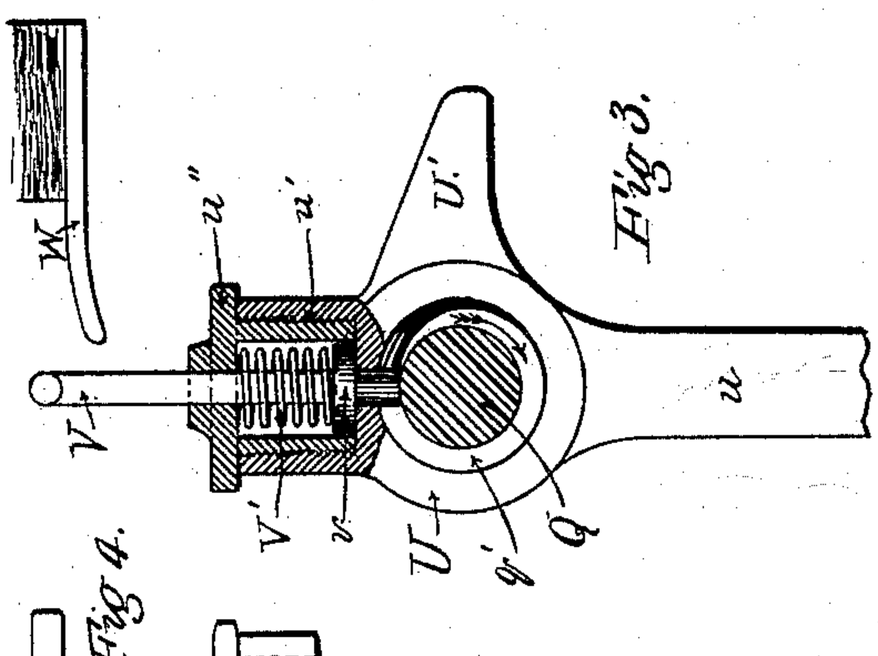

Fig. 3.

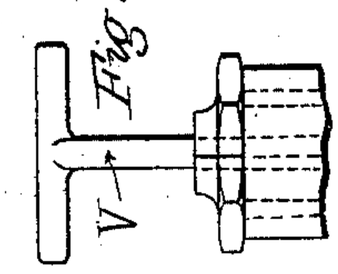

Fig. 4.

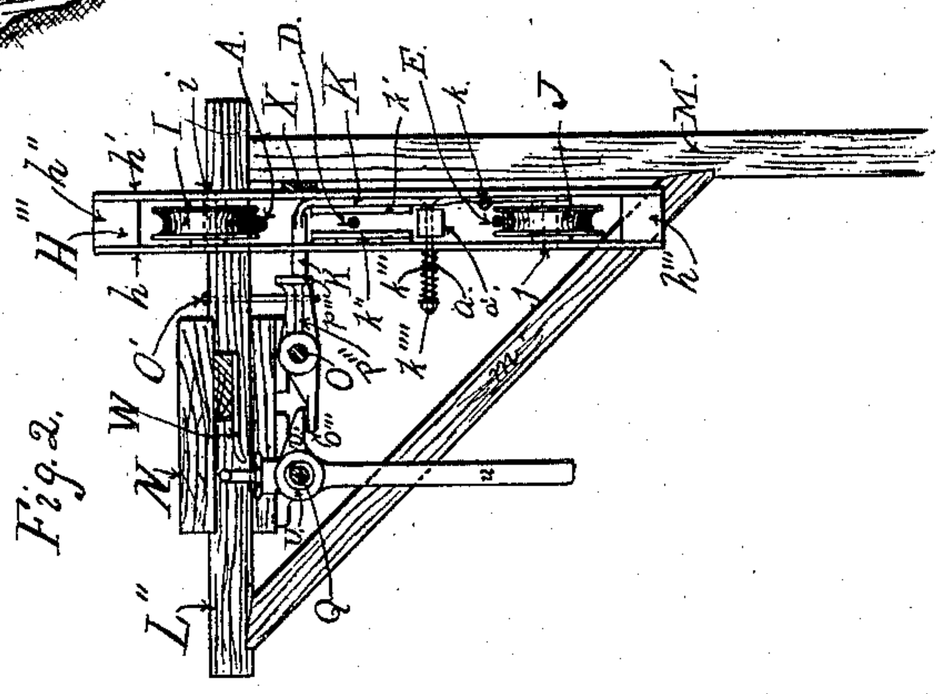

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 5.

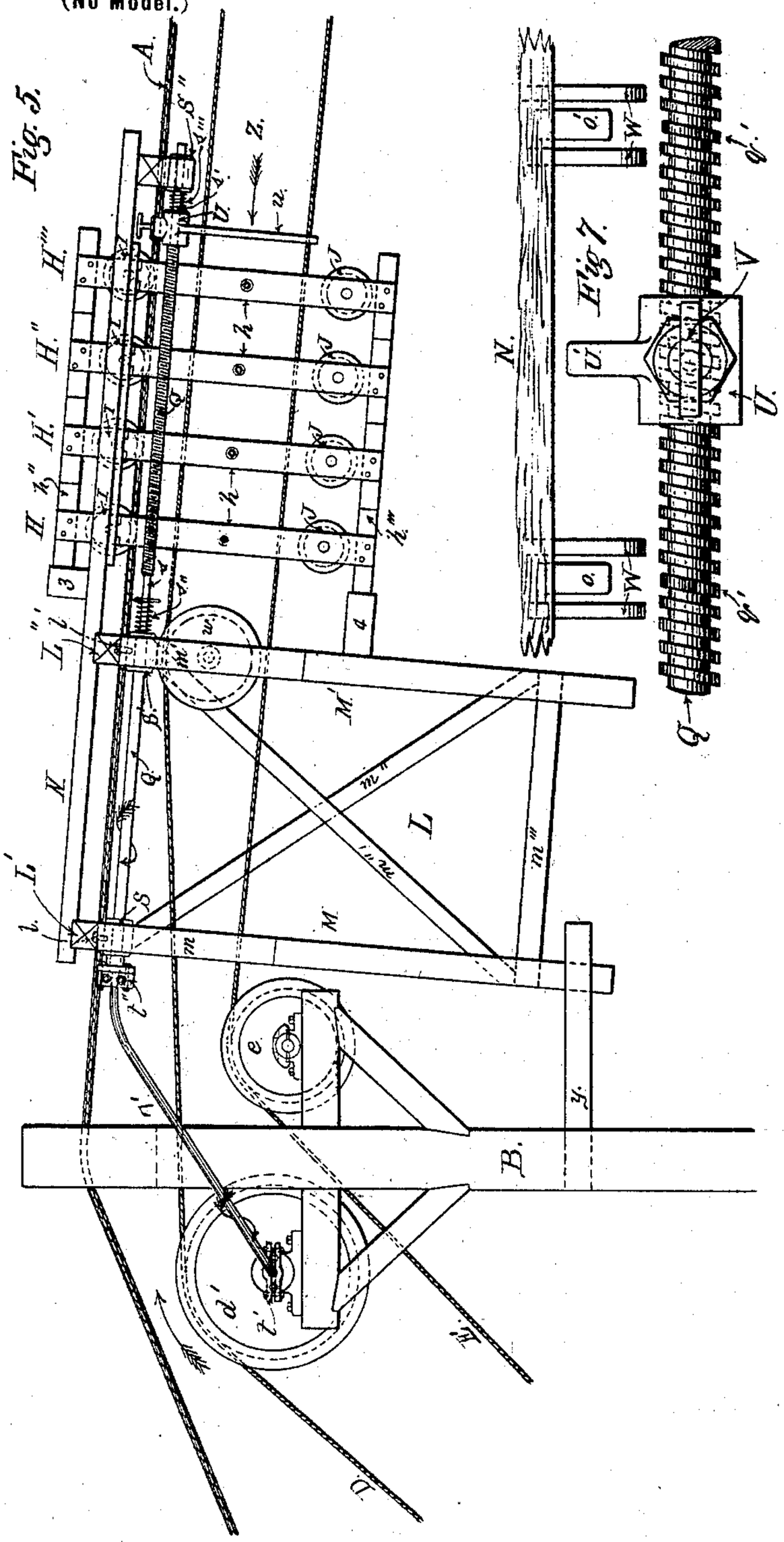
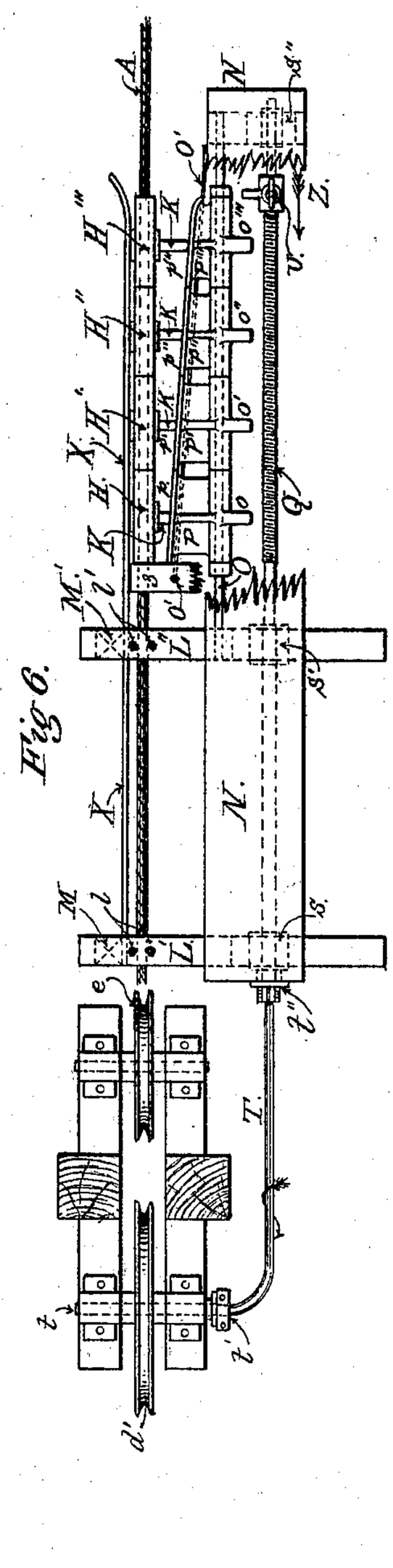


Fig. 7.

Fig. 6.



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HOISTING AND CONVEYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 609,960, dated August 30, 1898.

Application filed April 6, 1895. Serial No. 544,761. (No model.)

To all whom it may concern:

Be it known that I, ALFRED H. DE CAMP, a citizen of the United States, residing at Trenton Junction, in the county of Mercer and State of New Jersey, have invented certain new and useful Improvements in Hoisting and Conveying Apparatuses, of which the following is a specification.

My invention relates to that class of hoisting and conveying apparatuses in which shiftable carriers are provided for sustaining a fall-rope during the operation of the apparatus and embodies means for automatically shifting and disposing the said rope-carriers along the way traversed by said carriage and removing them from its path when their support for the fall-rope is unnecessary.

My said invention involves certain improvements in details of construction and operation of a prior invention, for which I have filed application for Letters Patent, Serial No. 534,237.

In the accompanying drawings, forming a part of this specification, I have shown my invention in connection with what is commonly known as a "cable hoist," though, as will be readily understood, my improvements are applicable to other descriptions of hoisting and conveying apparatuses.

Figure 1 shows a side elevation of a hoisting and conveying apparatus embodying my said improvements. Fig. 2 is a front view of one of my improved fall-rope carriers shown in connection with several of the parts provided for operating the same. Fig. 3 is a front view of a traveling nut provided for operating certain parts of the mechanism with which the rope-carriers engage, said view being partly in section. Fig. 4 is a detailed view of the top part of the traveling nut shown in Fig. 3, illustrating the construction of one of the parts operating in connection with the nut. Fig. 5 is a side elevation of the fall-rope carriers, showing them engaged with mechanism whereby they are secured and operated; and Fig. 6 is a plan view of the mechanism illustrated in Fig. 5 with a part of the member N cut away to more fully disclose the details of the structure.

In the drawings, A is a cable made taut by anchors at its ends (not shown) and supported above the ground by the terminal supports B and C. The terminal supports B and C serve not only to sustain the tram-cable of the apparatus, but also portions of the mechanism adapted to operate the same. D is a running-line, commonly called a "hauling-rope," one end of which is secured to a traveling carriage F at a point *d* on the frame thereof and passes thence through the middle portion of the fall-rope carriers H''' H'' H' H over the sheave *d'* on a bracket sustained by the terminal support B to and around the drum 1, which is operated by a hoisting-engine of any ordinary pattern, and thence to and over the sheave *d''* on the terminal support B and to and around the sheave *d'''* on the terminal support C, and thence to the frame of the carriage F, to which it is attached at the point *d''''*.

E is a fall-rope wound on the drum 2, operated by the hoisting-engine, and passing thence to and over the sheave *e* on the terminal support B, and thence to and over the sheave *f*, mounted in the frame of the carriage F, and thence to and around the sheave in the fall-block G, thence to and around the sheave *f'*, mounted in the frame of the carriage F, and thence to the top of the fall-block G, to which it is secured in the usual way. The fall-block G is of the ordinary form and provided with means for securing to it the loads to be raised and carried. The carriage F is of the usual construction and is adapted to traverse the tram-cable A by means of the grooved wheels *f'' f''*, mounted in the upper portion of the frame of the carriage and having rope-sheaves *f f'*, mounted in the lower portion of the frame, for the fall-rope E, as described.

H H' H'' H''' are fall-rope carriers of my improved construction. Each of these carriers comprises two upright side plates *h h'*. (See Fig. 2.) These side plates are rigidly secured together at top and bottom and are spaced apart by the blocks *h'' h'''*. Near the upper portion of the frame so formed and between the side plates is pivotally mounted the grooved roller I upon the pin *i*, secured in the plates. Near the lower portion of said

frames and between the side plates is pivotally mounted the grooved sheave or roller J upon the pin *j*. On the inner side of the plate *h'* is secured by a hinge *k* a vibrating piece K. This vibrating piece extends upwardly within the frame of the fall-rope carrier and at its upper portion is turned at right angles and passes out of the frame through a hole formed in the side plate *h*. By reference to Fig. 6 it will be seen that the ends of the pieces K K K K project through the several fall-rope-carrier frames varying distances, for reasons which will be presently explained. Near the upper portion of each vibrating piece K and on its inner face is rigidly secured a wearing-plate *k'*, and on the inner face of each plate *h* a similar wearing-plate *k''* is rigidly secured, as shown in Fig. 2. At a point about midway of the length of each vibrating piece K a countersunk hole is formed, and within this hole the end of a bolt *a*, with upset head, is secured. This bolt passes out of the fall-rope-carrier frame through the side plate *h*, a hole for the purpose being formed in said plate, the bolt being formed to move freely within the hole. Upon the part of the bolt extending beyond the side plate *h* is mounted the compression-spring *k'''*, and the outward end of the bolt being threaded the adjusting-nut *k''''* is secured thereon.

Upon the tram-cable A, near the terminal support B, is rigidly secured the frame L. This frame is composed partly of two cross-beams L' L''. These cross-beams rest, near one of their ends, directly upon the cable A and at right angles thereto. At the points of their contact therewith they are rigidly secured to the cable A by means of U-bolts *l l'*. Near one end of each of the cross-beams L' L'' and on their under sides are respectively framed the depending posts M M'. These posts are secured to the cross-beams by the braces *m m'*. These depending posts are braced and secured together by the diagonal braces *m'' m''* and the tie *m'''*. Across the top sides of the beams L' L'' and at right angles thereto is secured the timber N. This timber is rigidly secured to the cross-beams and extends toward the right (see Figs. 5 and 6) a considerable distance beyond the beam L'', part of this timber N being cut away in Fig. 6 to show the parts below. To the under side of the timber N and on its part projecting beyond the beam L'' is secured the shaft O. As this shaft O lies in the same plane with the shaft Q, it is not shown in Fig. 5, but appears in Figs. 2 and 6. Upon this shaft are pivotally mounted several operating-pieces P P' P'' P''', which abut at their hubs and are adapted to pivot on shaft O independently of each other. The operating-pieces P P' P'' P''' are each provided at one side with broad vertical faces *p p' p'' p'''*. These faces are so formed that when all the fall-rope supports are in their normal positions they collectively form a plane inclined to the general direction of the tram-cable A, as seen in Fig. 6. At their other sides the pieces P P' P'' P''' are provided with projecting fingers *o o' o'' o'''*. Secured to the projecting timber N is a keeper O'. This keeper passes horizontally beneath the face sides *p p' p'' p'''* of the several operating-pieces P P' P'' P''', and the operating-pieces when in normal position rest upon and are held by the keeper O'.

Q is a shaft screw-threaded for a portion of its length and supported by the bearings S S' S'', which bearings are secured to the under sides of the cross-beams L' L'' and the timber N, as shown. This shaft is connected by means of the flexible shaft T to the axle *t* of the sheave *d'*, over which the hauling-rope D passes. The sheave *d'* is rigidly secured to its axle *t*, and said axle is made fast to the flexible shaft T by means of the clamps *t'*. In like manner the shaft Q is secured to the flexible shaft T by the clamp *t''*. The shaft Q is reduced in diameter at the points *s s'* adjacent to the bearings S' S'', and at these points the diameter of the shaft is no greater than its diameter at the bottom of the thread formed upon the portion of the shaft between said two last-mentioned bearings S' S''. On each of these reduced portions of the shaft and covering a part of the length of the reduced portions the compression-springs *s'' s'''* are respectively mounted to loosely inclose the shaft.

The threaded nut U is loosely mounted upon the threaded portion of the shaft Q, and when the shaft is revolved the nut traverses it in either direction, according to the direction in which the shaft is revolved, the depending arm *u* acting as a balance-weight to keep the nut in an upright position. The upper portion of this nut is internally screw-threaded at *u'*. (See Fig. 3.) Within this screw-threaded portion of the nut is secured the externally-threaded inverted cup *u''*. This cup is closed across its upper end, with the exception of a central aperture provided for the passage of the lock-pin V. The cup is preferably formed in halves to facilitate entering the lock-pin V into the way provided for it within the cup. The lock-pin is preferably square at that part which passes through the cover of the cup *u''*, and the hole or slot in the part *u''* is shaped to conform to the pin. The upper end of the lock-pin terminates in a cross-arm (see Fig. 4) which stands normally in a direction parallel to the tram-cable A. The lower end of this lock-pin passes through an opening in the nut U, which serves as a guide to it, and the pin is permitted to come into contact with the threaded portion of the shaft Q below. Upon the lock-pin and near its lower end is rigidly secured the collar *v*. The small compression-spring V' encircles the lock-pin and is free to act within the cup *u''* and bears at its lower end on the collar *v* and at its upper end against the cover of the cup. At points along the length of the screw-thread upon the shaft Q opposite each of the fingers *o o' o'' o'''* (see

Fig. 7) the thread Q′ is cut out, one side of each cut being abrupt and the other side running out gradually to the normal diameter of the thread. (See Fig. 3.) One side of the nut U is provided with a projecting part U′, and the normal line of travel of this projection is just above the fingers *o o′ o″ o‴*. (See Fig. 2.)

Secured to the timber N on its under side are projecting pieces W, the office of which will be hereinafter explained.

On the inner side of the depending post M′ is pivotally mounted the rope-sheave *w*, over which the running-line D passes and by which it is partly supported and guided. The guide-bar X is secured to the inner sides of the depending posts M M′ at an elevation about equal to that of the upper operating ends of the vibrating pieces K of the fall-rope carriers and at such a distance from the vertical plane of the tram-cable A that the sides *h′* of the fall-rope carriers will normally rest against and slide along said guide-bar. Attached to the support B are guide-pieces *y*, one of which is shown in Fig. 5, the function of which is to prevent lateral movements of the frame L. To the timber N and to the post M′ are respectively attached the stop-blocks 3 and 4 to limit the movement of the fall-rope carriers.

The operation of the apparatus is as follows: Starting with the carriage near the terminal support B the fall-rope carriers and the traveling nut U are in the positions shown in Figs. 5 and 6. As the carriage moves away from the terminal support B the running-line D revolves the sheave *d′* in the direction of the arrow, and the flexible shaft T and threaded shaft Q are revolved in the direction shown by arrows, while the threaded nut U is moved along the threaded shaft in the direction indicated by the arrow Z. As the nut U progresses the projecting portion U′ thereof comes directly over the finger *o‴* of the first operating-piece P‴. Up to this point the lock-pin V has traveled directly on top of the thread *q′* of the shaft Q; but at this point the end of the lock-pin V meets one of the cut-out portions of the thread and follows the eccentrically-curved face of the cut until it reaches the abrupt termination thereof. The nut then becomes locked on the shaft by the pin V, and as the shaft revolves it turns the nut in the same direction. (See Fig. 3, where the course is indicated by the arrow.) The nut now revolving, the projecting portion U′ contacts with the finger *o‴* of the operating-piece P‴ and depresses it, which causes the faced end *p‴* of the operating-piece to rise until it is entirely clear of the point of the vibrating piece K, with which it has been engaged. When the faced end *p‴* of P‴ has been sufficiently elevated, the cross-bar top of the pin V contacts with the releasing finger or trip W. As the nut further turns the cross-bar top of the pin V slides along the releasing finger or trip W until the whole pin is raised, so that its lower point clears the abrupt face of the cut in the threaded shaft Q. The nut then being free to revolve on the shaft, the weighted lower end causes it to revolve in a reverse direction and come to its normal position, the end of the pin V dropping and slipping upon the top of the thread *q′*, as before, the spring V′ insuring contact at all times between the end of pin V and the thread *q′* of shaft Q except at the moment when the pin is raised by the releasing finger or trip W, as described. The projecting end of the vibrating piece K‴ having been released by this operation, the spring *k‴* acts to draw the vibrating piece K‴ toward the side *h* of the carrier-frame, and the running-line D, which runs between the wearing-strips *k′ k″*, is consequently clamped between these wearing-strips with such force that the carrier is immediately drawn by the running-line out upon the cable A, its roller I supporting it on the cable, and the fall-rope E drops upon the sheave J of the carrier and is thereby sustained. This operation is continued, and the carriers are successively moved out upon the cable A and properly spaced thereon so long as the running-line continues to move in the same direction. As will be readily understood, when the motion of the running-line is stopped, the carriage being at its proper station, its load is either received or delivered by operating the fall-rope, which of course is sustained throughout its length by the rollers J on the several carriers, and the motion of the apparatus is reversed to return the carriage to its station nearer the terminal support B. Upon drawing in the running-line D the carrier H is moved into the frame L and passes all of the operating-pieces P‴ P″ P′ without contact therewith, because the projecting part of its vibrating piece K is too short to reach them; but when it reaches the operating-piece P it contacts with the face *p* thereof, and sliding along this inclined face it is thereby forced back to throw the vibrating piece into the position shown in Fig. 2, and it permits the running-line to pass through the carrier thereafter without friction upon the wearing-plates *k′ k″*. The thrust of the point of the part K is resisted by the guide-piece X, against which the side *h′* slides, and the binding of the parts by means of such pressure holds the carrier from slipping out upon the cable A. (In practice I slightly notch the faces of the piece P transversely at the normal position at which the points of *k* rest against the faces *p* of P, which further serves to lock the carriers in their required position.) This operation may be continued until all the carriers are returned to their places, as shown in Figs. 5 and 6. While the carriers are moving into their positions within the frame L, the motions of the sheave *d′* and shaft Q having been reversed the traveling nut likewise moves backward until it attains its position shown in Figs. 5 and 6, and as the nut is thus

returning when the lock-pin thereof reaches any of the cut portions of the thread q' it drops off the edge of the abrupt side of the cut and rides freely out of the cut by the eccentric curved portion thereof, and of course the nut is not revolved at any time during its progress in this direction along the shaft. Should the nut reach the end of the shaft Q before the carriage of the apparatus has reached its designated position and before the fall-rope carriers attain their requisite positions, it simply passes off the threaded portion of the shaft and against one of the springs s'' s''', which hold the nut against the end of the thread on the shaft until the motion of the shaft is reversed, when the nut will immediately take onto the thread and traverse the shaft in the proper time. The top and bottom blocks h'' h''' perform the same function for each succeeding carrier. The flexible shaft T forms a convenient connection between the axle of the sheave d' and the shaft Q and affords considerable latitude in locating and mounting the several parts. The small rollers a', mounted on the bolts a, confine the fall-rope E and the running-line D to their respective portions of the carriers.

I have shown all of the operating-pieces P P' P'' P''' of the same length along the shaft Q and all of the fingers o o' o'' o''' equally spaced apart. By this arrangement all the carriers are equidistant from each other when spaced along the cable A and running-line D; but it is evident that the pieces P P' P'' P''' may be proportioned so that they will be disengaged at predetermined irregular intervals, if desired. It will also be readily understood that by proportioning the diameter of the operating-sheave d' to the pitch of the thread of the shaft Q in any desired manner the exact spacing of the carriers when in operation may be readily predetermined.

I have shown the mechanism for engaging and releasing the gripping devices upon the carriers operated by the running-line of the apparatus. This I consider the most desirable method of operating said mechanism, but, as will be readily understood, the mechanism may be operated by an independent belt connected with the operating-drums of the apparatus. I have also shown and described the gripping devices on the fall-rope carriers as operating to grip the running-line, commonly called the "hauling-rope," of the apparatus, which I consider a preferable arrangement of the device; but it is obvious that any running-line independent of the "hauling-rope," so called, passing over sheaves upon the supports of the apparatus at a proper height and in a proper plane may be used for moving the fall-rope carriers out upon the line of the apparatus and restoring them to their positions within the framework shown. The fall-rope supports may be movably supported also upon a way other than the way upon which the carriage of the apparatus travels, and various other modifications of the means shown and described will suggest themselves to any person conversant with the art. I have not, therefore, deemed it necessary to illustrate or describe such modifications in detail, as I consider them all within the scope of my said invention.

What I claim, therefore, is—

1. In a hoisting and conveying apparatus, an elevated way, a running-line, a fall-rope, a fall-rope support movably sustained on said way and means on said fall-rope support for automatically gripping said running-line, in combination with a mechanism stationarily located relatively to the way, said mechanism comprising a revoluble threaded shaft, a device adapted to traverse said shaft as it revolves and throw the said means on the fall-rope carrier into gripping contact with said running-line, and means for releasing such grip; substantially as shown and described.

2. In a hoisting and conveying apparatus, an elevated way, a running-line, a fall-rope, a fall-rope support movably sustained on said way, and means on said fall-rope carrier for automatically gripping and releasing said running-line, in combination with a mechanism stationarily located relatively to said way, said mechanism comprising a revoluble sheave operated by said running-line, a revoluble shaft having a broken thread formed upon it, said shaft being connected with said sheave to revolve with it, a nut adapted to traverse said shaft in a normally upright position when said shaft revolves, means on said nut adapted to take into the break in the thread on said shaft and cause the nut to turn with the shaft, means on said nut for throwing the gripping device on said fall-rope carrier into operative contact with the running-line, and means for restoring said nut to its normal upright position on said shaft; substantially as shown and described.

3. In a hoisting and conveying apparatus, the combination of an elevated way, a running-line, a fall-rope and a fall-rope support movably sustained upon said way, means on said fall-rope support for gripping said running-line and a mechanism stationarily located relatively to said way, said mechanism comprising a sheave operated by said running-line, a shaft so connected with said sheave as to revolve simultaneously with it, said shaft having a broken thread formed upon it, a nut on said shaft, said nut having a threaded portion adapted to take onto the thread upon said shaft and to cause said nut to move lengthwise of said shaft when the same is revolved, said nut having also a lock-pin adapted to travel upon the thread on said shaft and catch in the break in said thread, an operating-piece swung between the lines of travel of the said nut and the said fall-rope carrier and adapted to contact with and operate the gripping device on said fall-rope carrier, a tripping device on said nut for contacting with said operating-piece, and a tripping device fixed at a point opposite the break in

the thread of said shaft for contacting with said lock-pin and raising it from the thread of said shaft; substantially as shown and described.

4. In a hoisting and conveying apparatus, the combination of an elevated way, a carriage adapted to travel on said way, means for moving said carriage on said way, a running-line beneath said way in a vertical plane therewith and passing over sheaves upon the supports of the said apparatus, a fall-rope passing over a sheave on said carriage and a series of fall-rope supports sustained upon said way, means on said fall-rope supports for gripping said running-line, and a mechanism stationarily located relatively to said way, said mechanism comprising a sheave operated by said running-line, a shaft so connected with said sheave as to revolve simultaneously with it, said shaft having a thread formed upon it and said thread being broken at intervals, a nut on said shaft, said nut having a threaded portion adapted to take onto the thread upon said shaft and to cause said nut to move lengthwise of said shaft when the same is revolved, said nut having also a lock-pin adapted to travel upon the thread on said shaft and catch in the breaks in said thread, a series of operating-pieces pivotally swung between the lines of travel of the said nut and the said fall-rope carriers and adapted to contact with and operate the gripping devices on said fall-rope carriers, a tripping device on said nut for contacting with said operating-pieces, and a series of tripping devices, one of each of which tripping devices is fixed at a point opposite a break in the thread of said shaft for contacting with said lock-pin and raising it from the thread of said shaft; substantially as shown and described.

5. In a hoisting and conveying apparatus, the combination of a tram-cable, a carriage adapted to travel on said tram-cable, a running-line connected with said carriage, means for operating said running-line a fall-rope passing over a sheave on said carriage, and a series of fall-rope supports sustained upon said tram-cable, means on said fall-rope supports for gripping said running-line, and a mechanism stationarily located relatively to said way, said mechanism comprising a sheave operated by said running-line, a shaft connected with said sheave to turn with it, said shaft having a thread formed upon it, said thread being broken at intervals, a nut on said shaft, said nut having a threaded portion adapted to take onto the thread upon said shaft and to cause said nut to move lengthwise of said shaft when the same is revolved, said nut having also a lock-pin adapted to travel upon the thread on said shaft and catch in the breaks in said thread, a series of operating-pieces pivotally swung between the lines of travel of the said nut and the said fall-rope carriers and adapted to contact with and operate the gripping devices, a tripping device on said nut for contacting with said operating-pieces, and a series of tripping devices, one of each of which tripping devices is fixed at a point opposite a break in the thread of said shaft for contacting with said lock-pin and raising it from the thread of said shaft, and means on said threaded shaft for timing the movements of the nut to the movements of the fall-rope carriers; substantially as shown and described.

6. A tripping mechanism comprising a revoluble shaft having a broken thread, a nut adapted to traverse said shaft in a normally upright position when said shaft is revolved, a locking device on said nut for taking into the break in the thread of said shaft and causing the nut to revolve with the shaft, a trip on said nut, and means for releasing the locking device from the break in the thread of the shaft; substantially as shown and described.

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Witnesses:
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