

No. 666,267.

Patented Jan. 22, 1901.

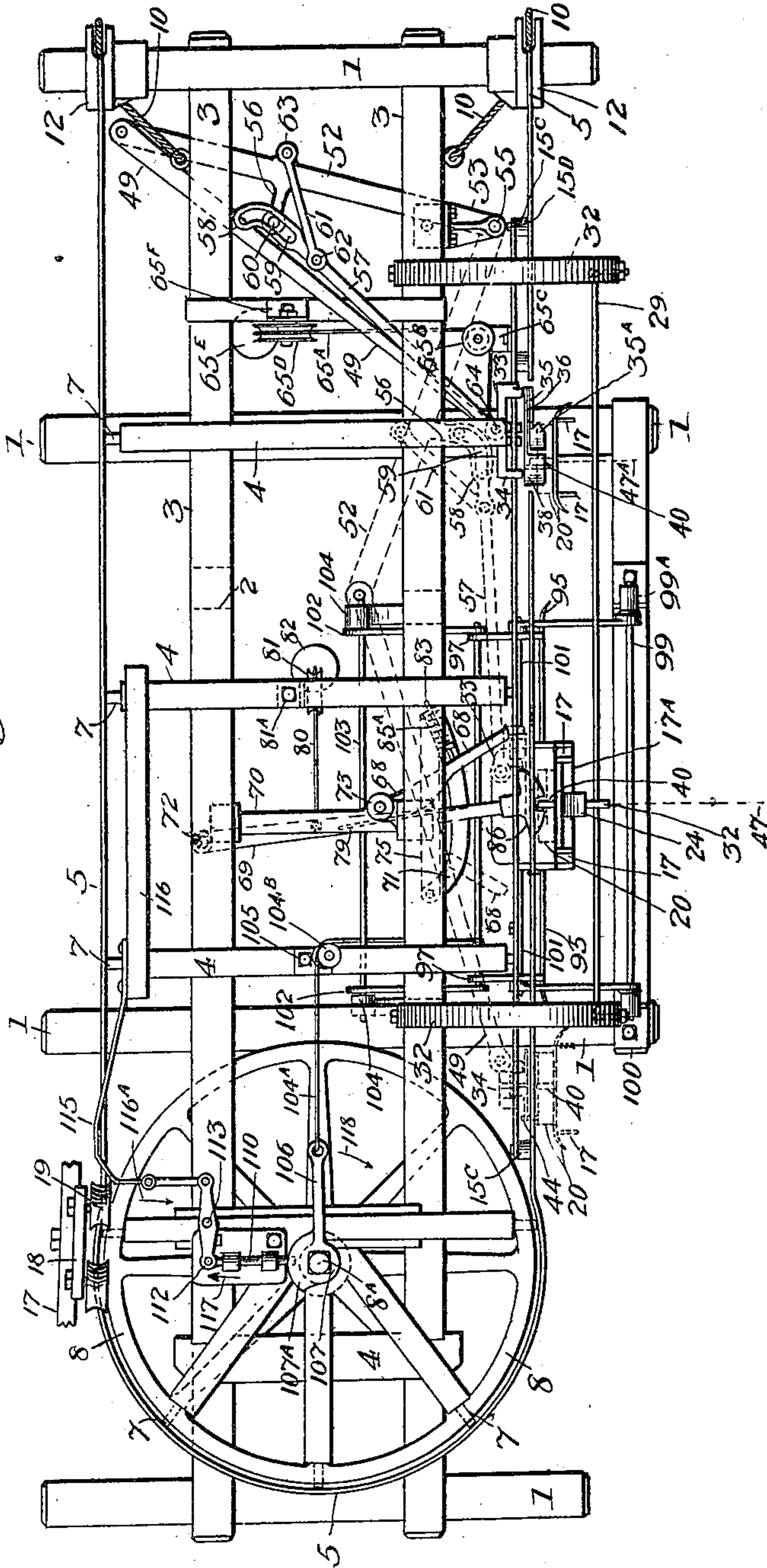
C. T. FINLAYSON.
TRAMWAY TERMINAL.

(Application filed Oct. 27, 1899.)

(No Model.)

6 Sheets—Sheet 1.

Fig. 1.



Witnesses:

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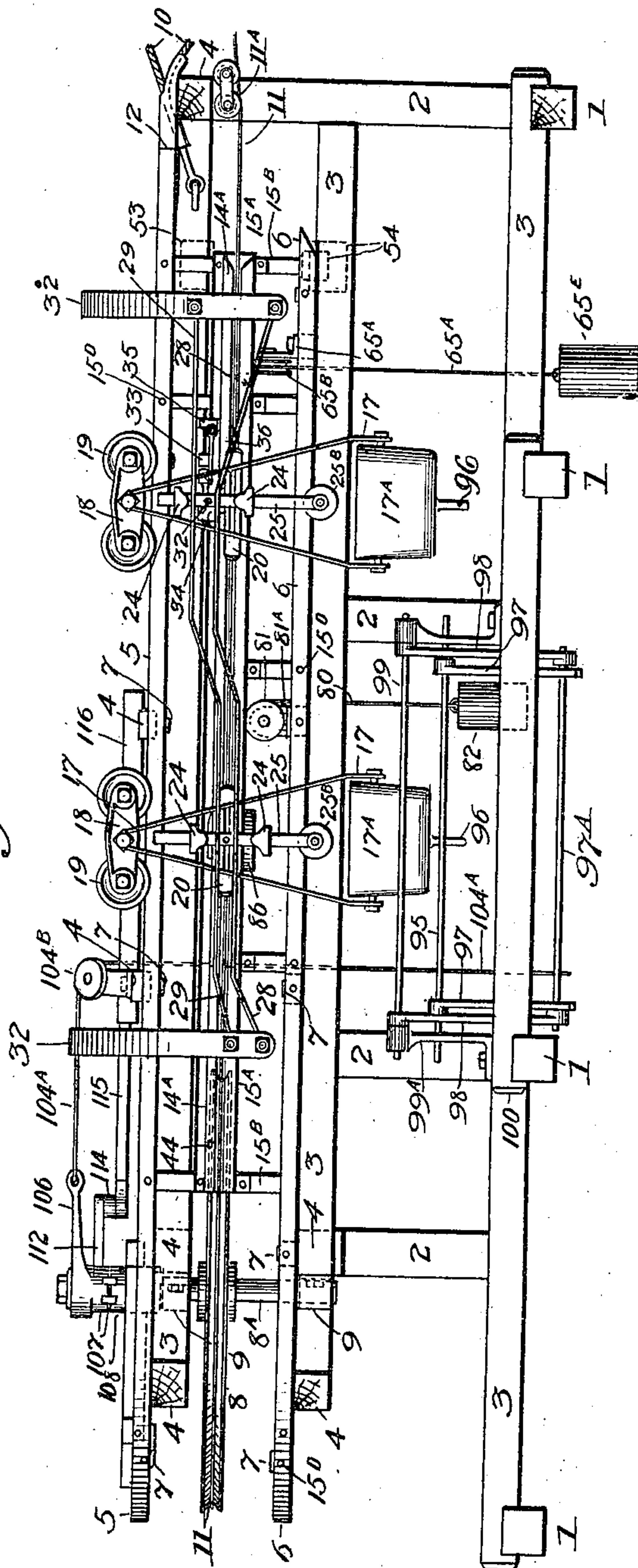
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6 Sheets—Sheet 2.

Fig. 2.



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6 Sheets—Sheet 3.

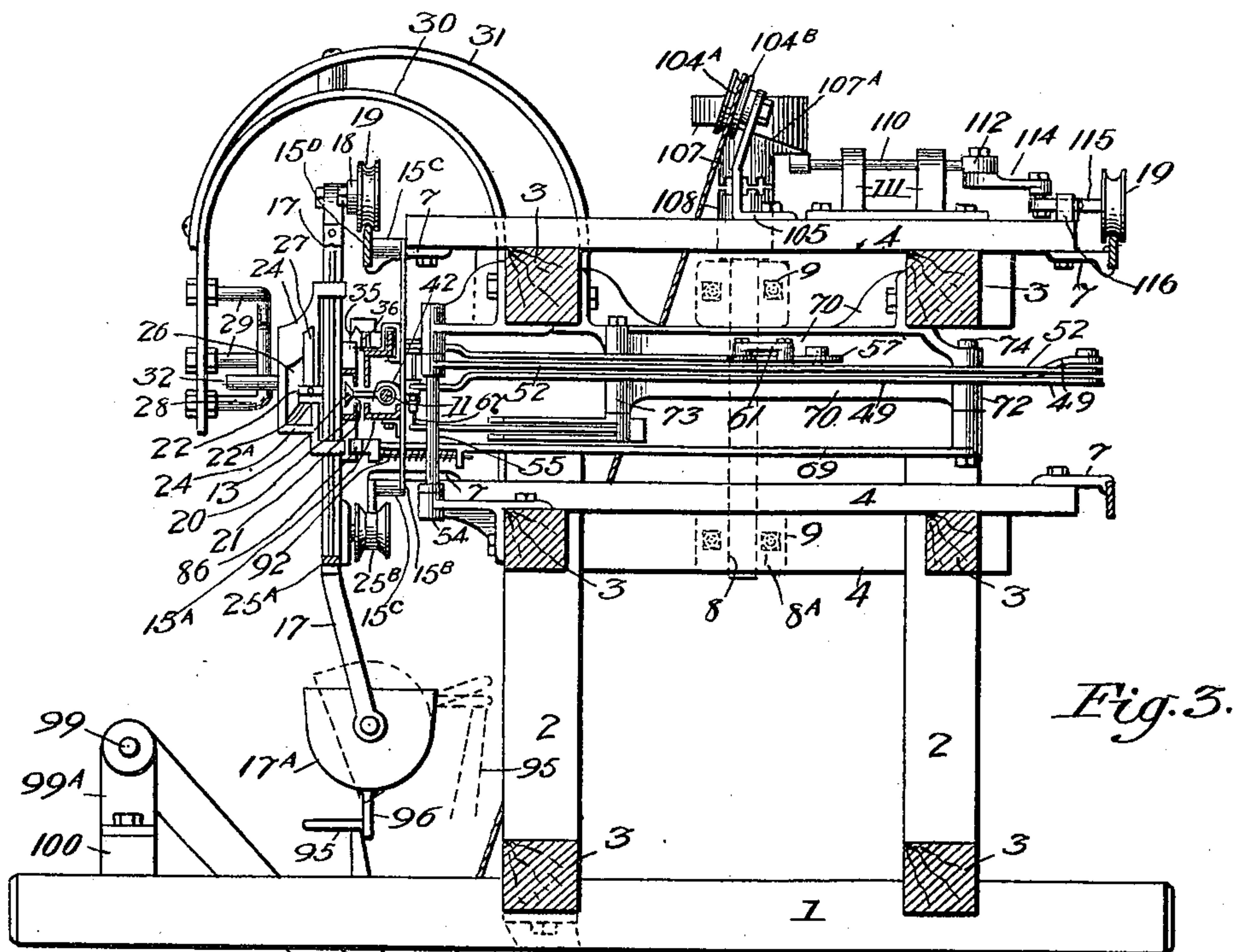


Fig. 3.

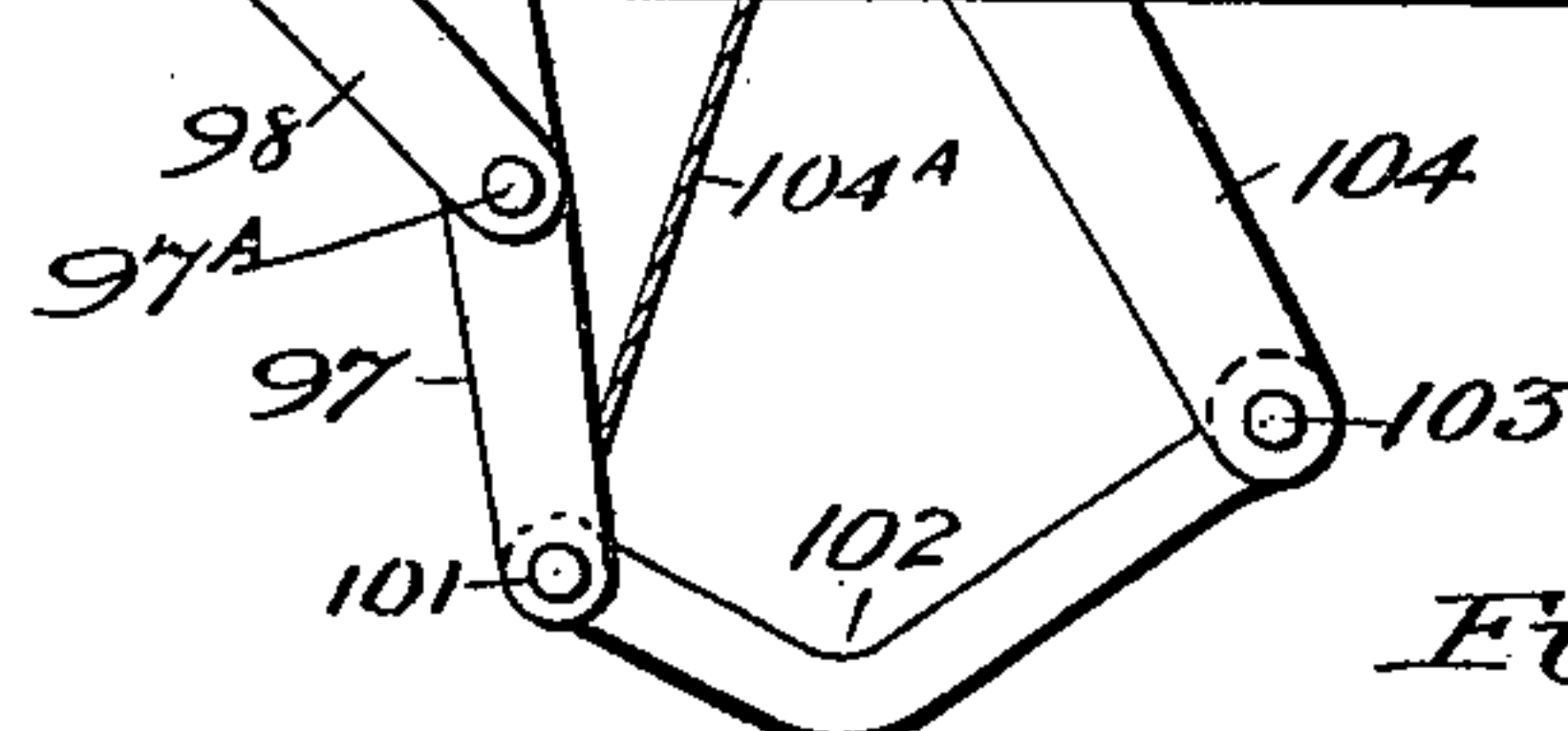


Fig. 5.

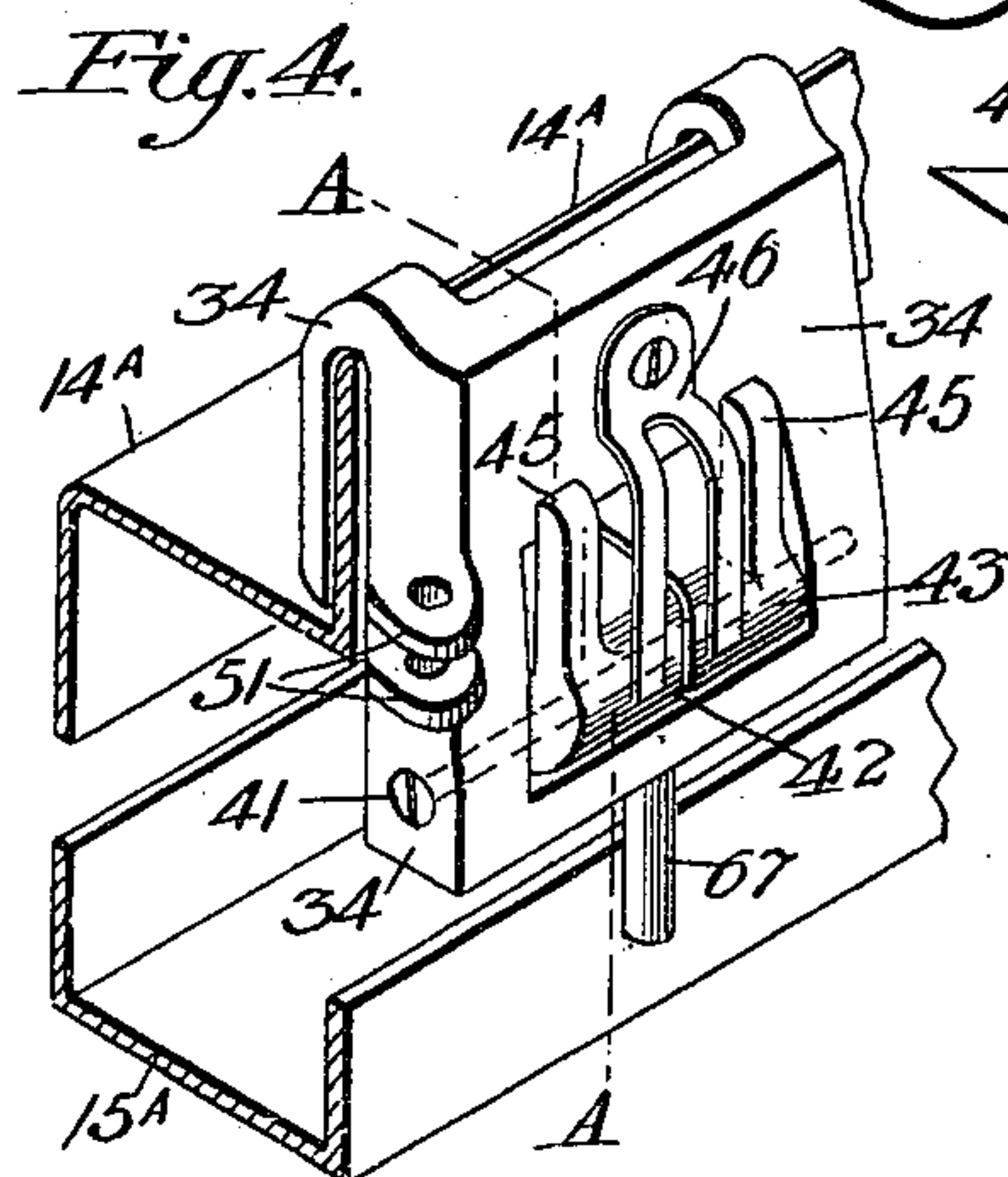


Fig. 4.

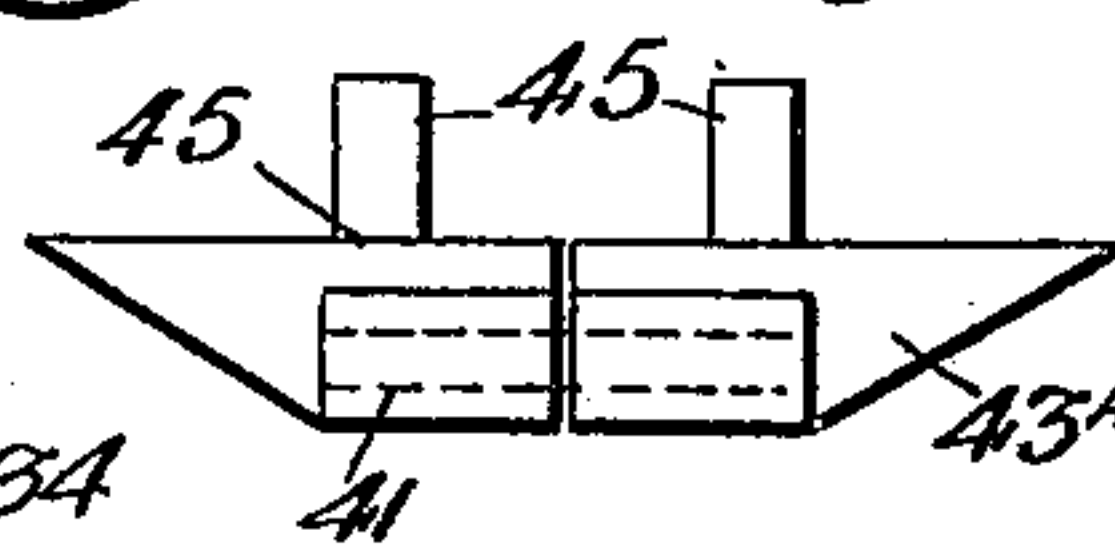


Fig. 6.

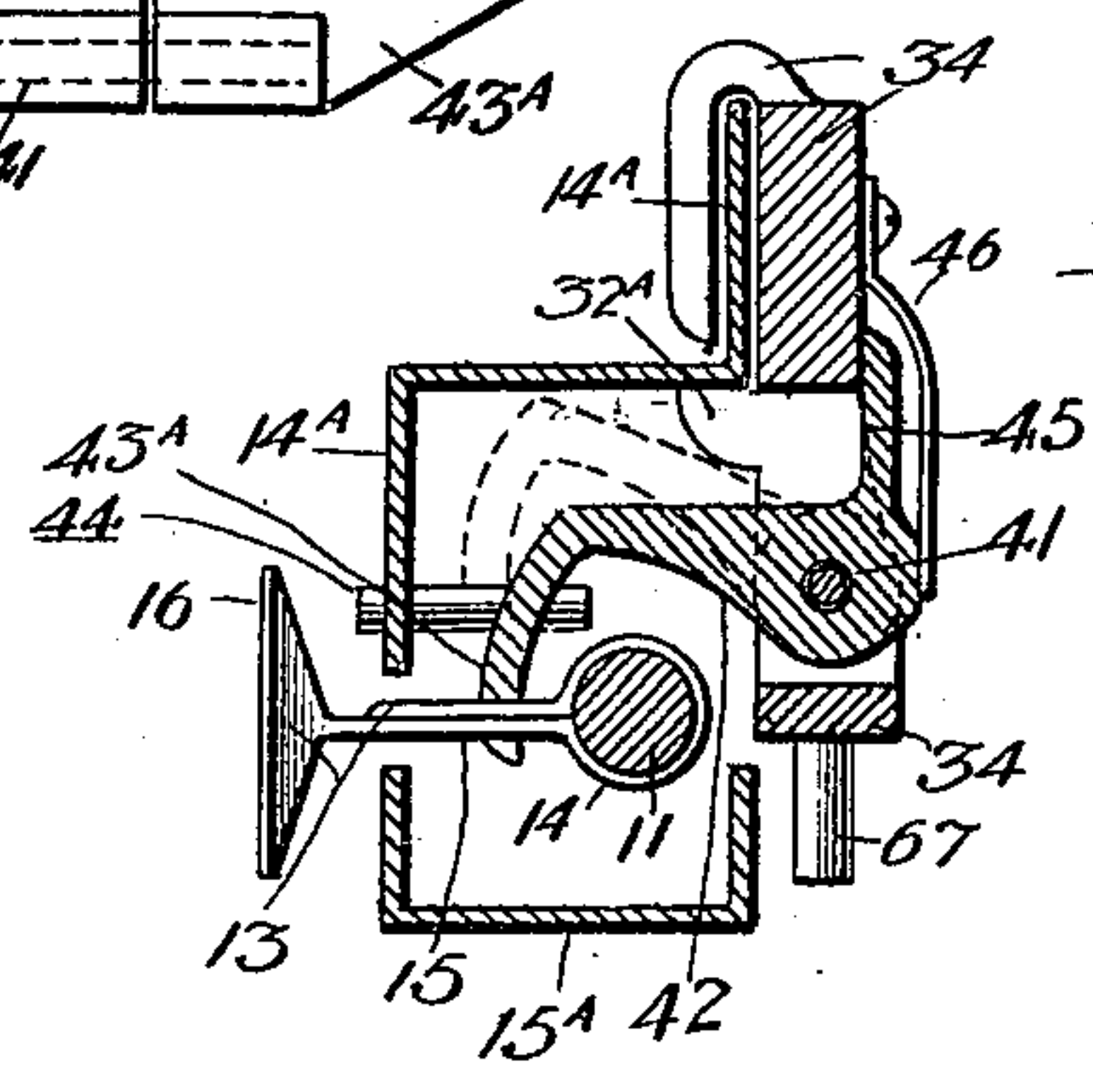


Fig. 7.

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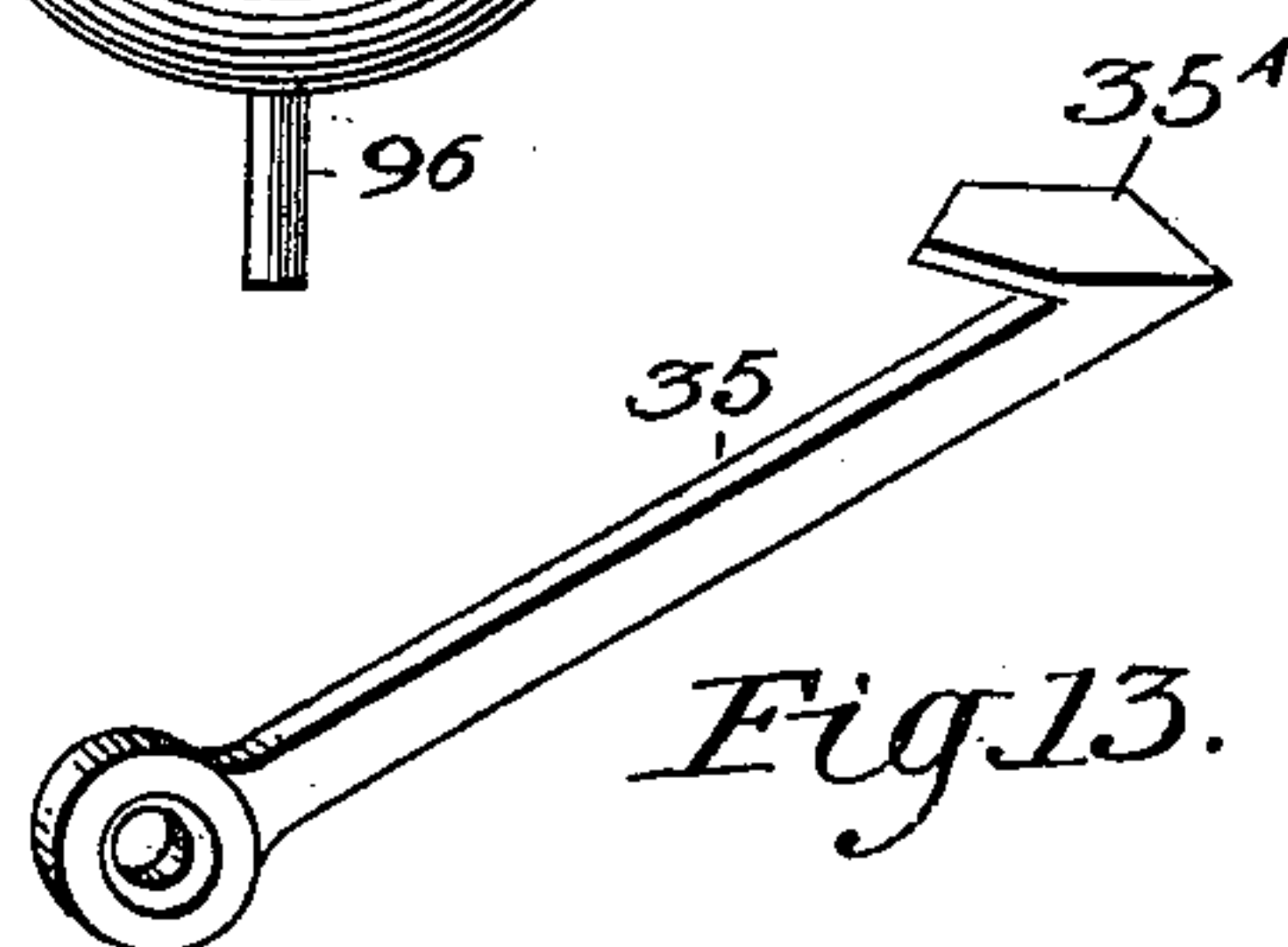
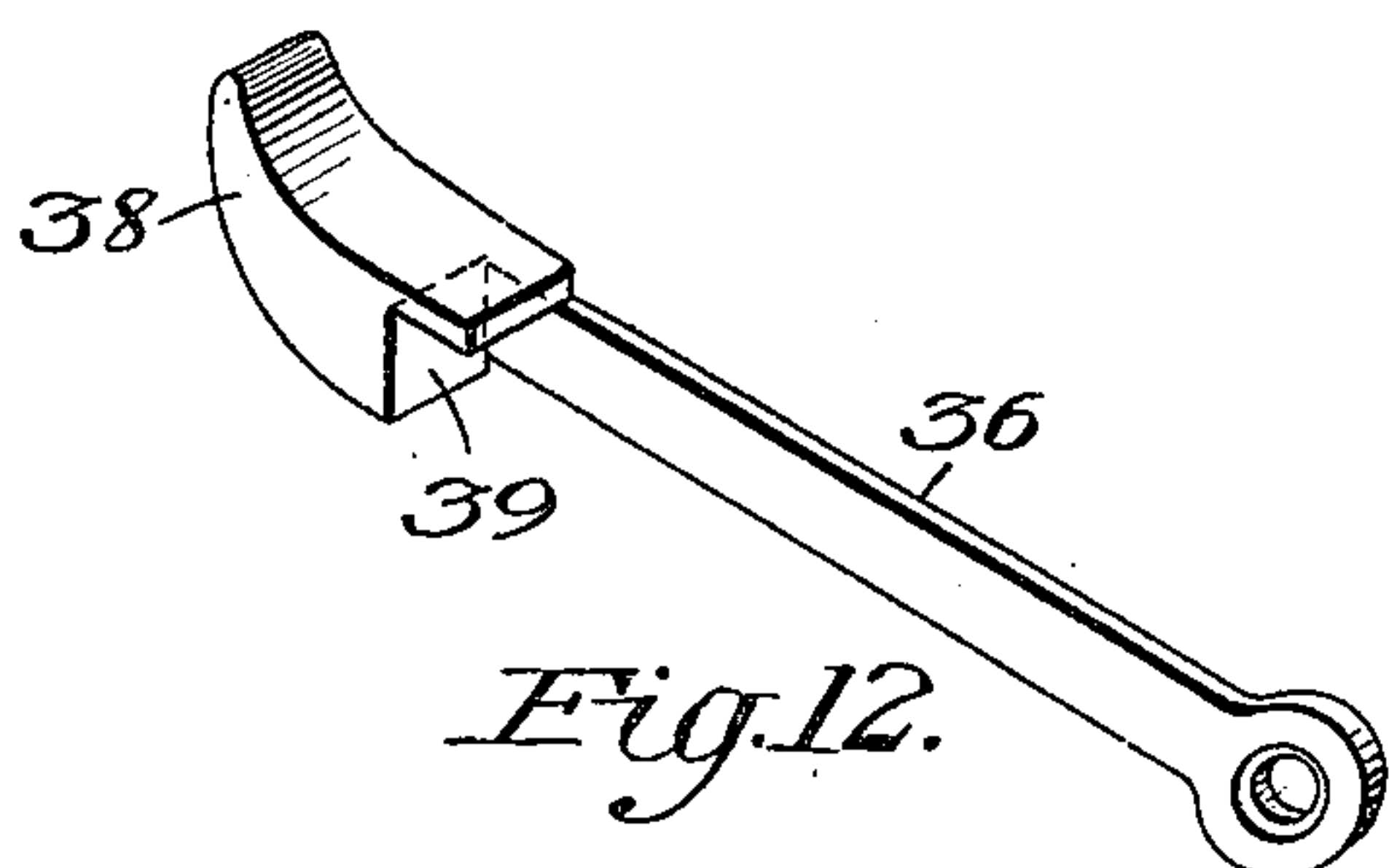
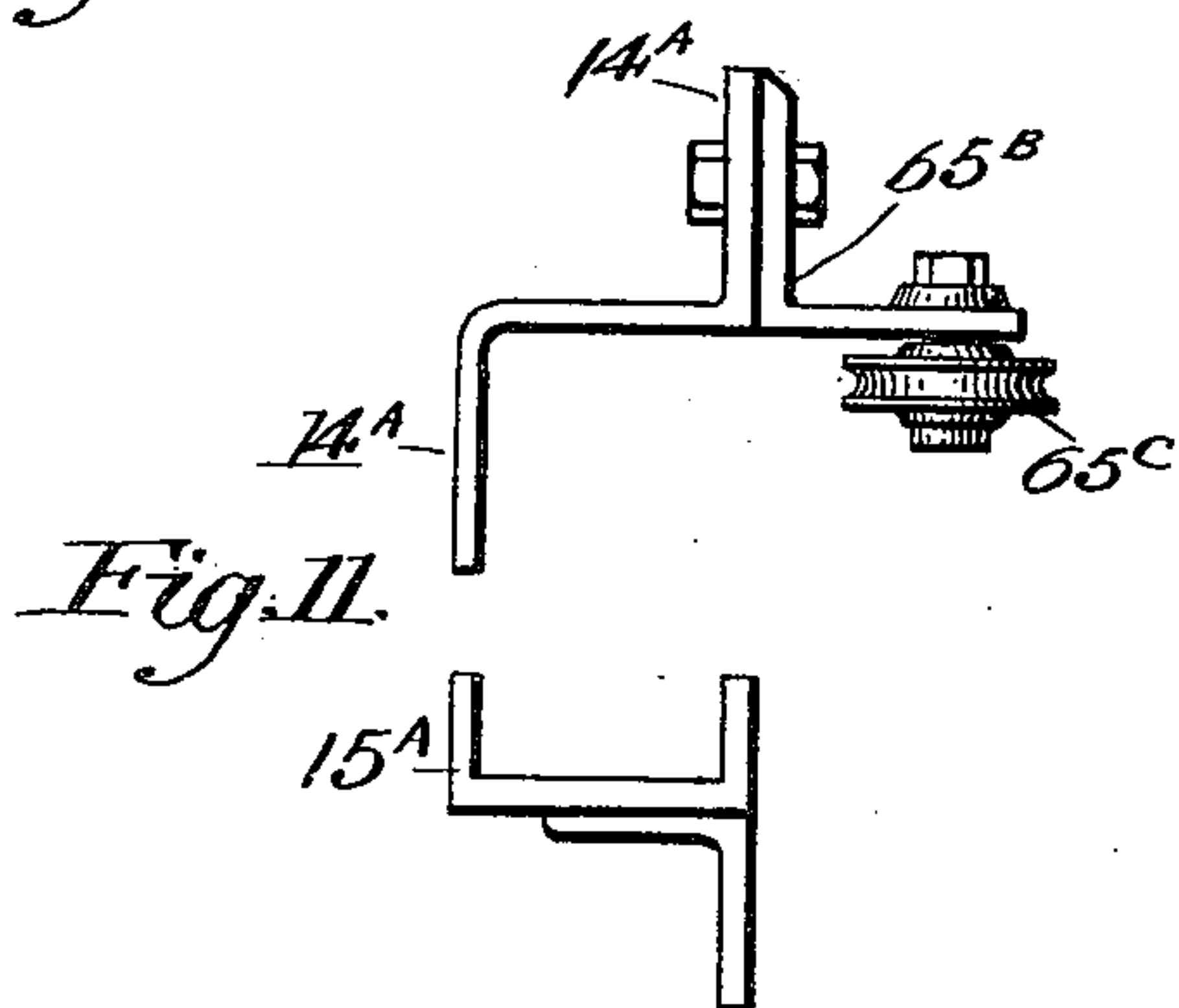
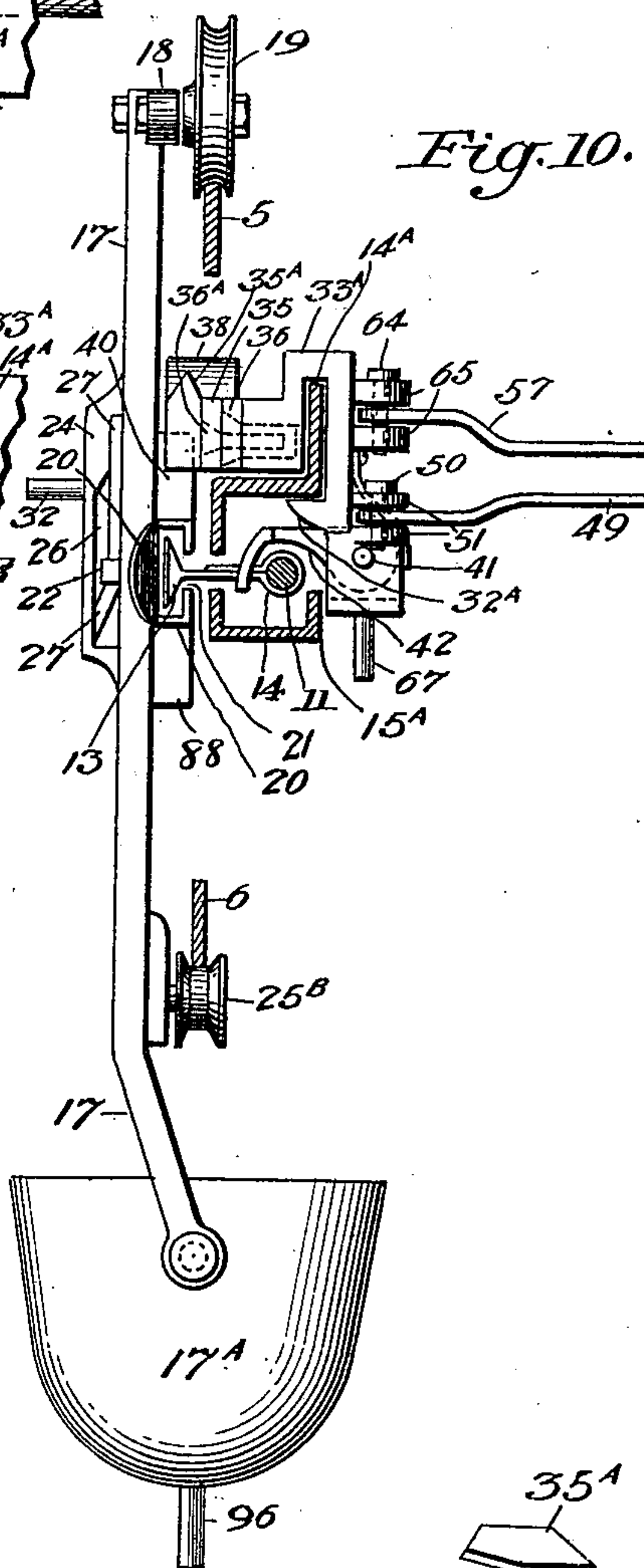
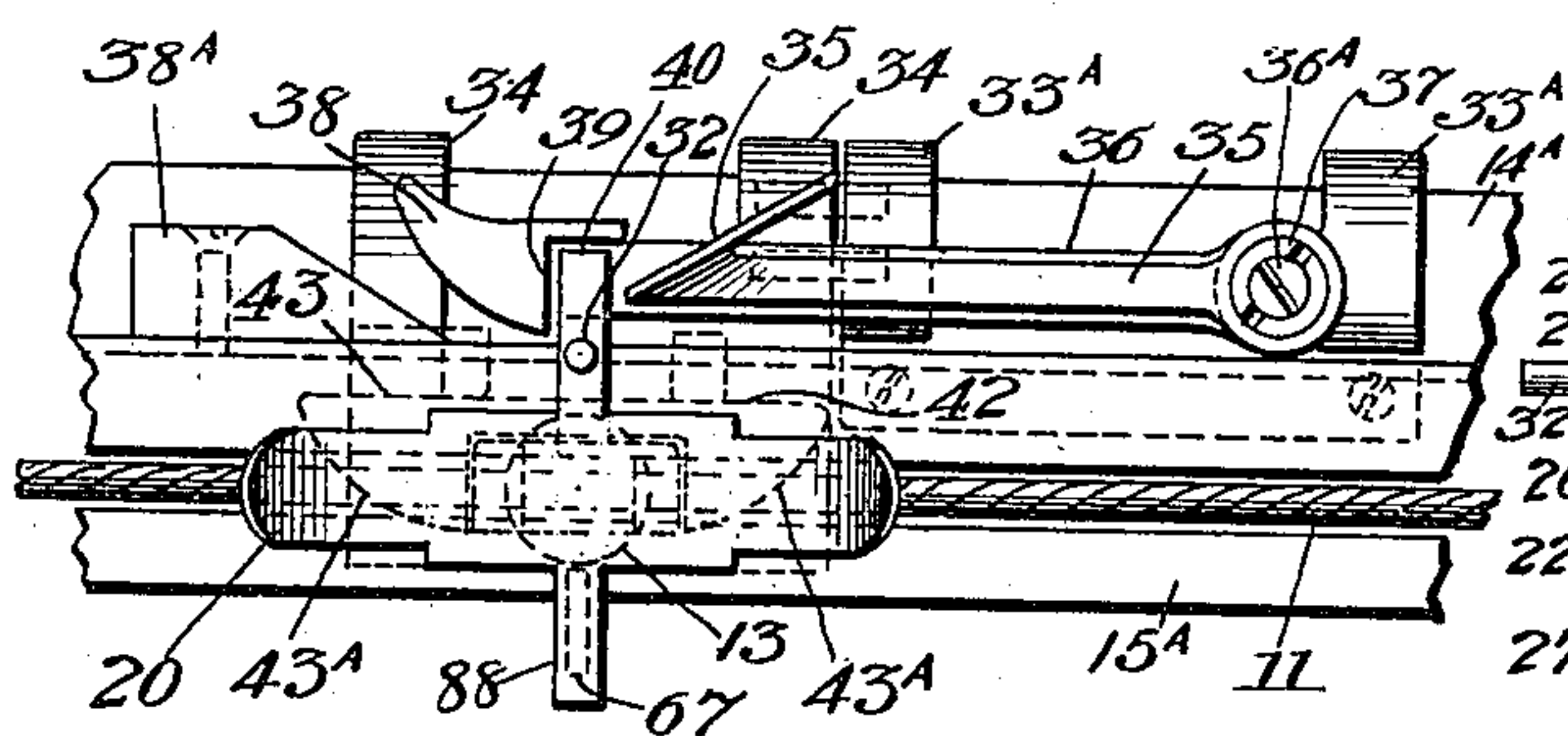
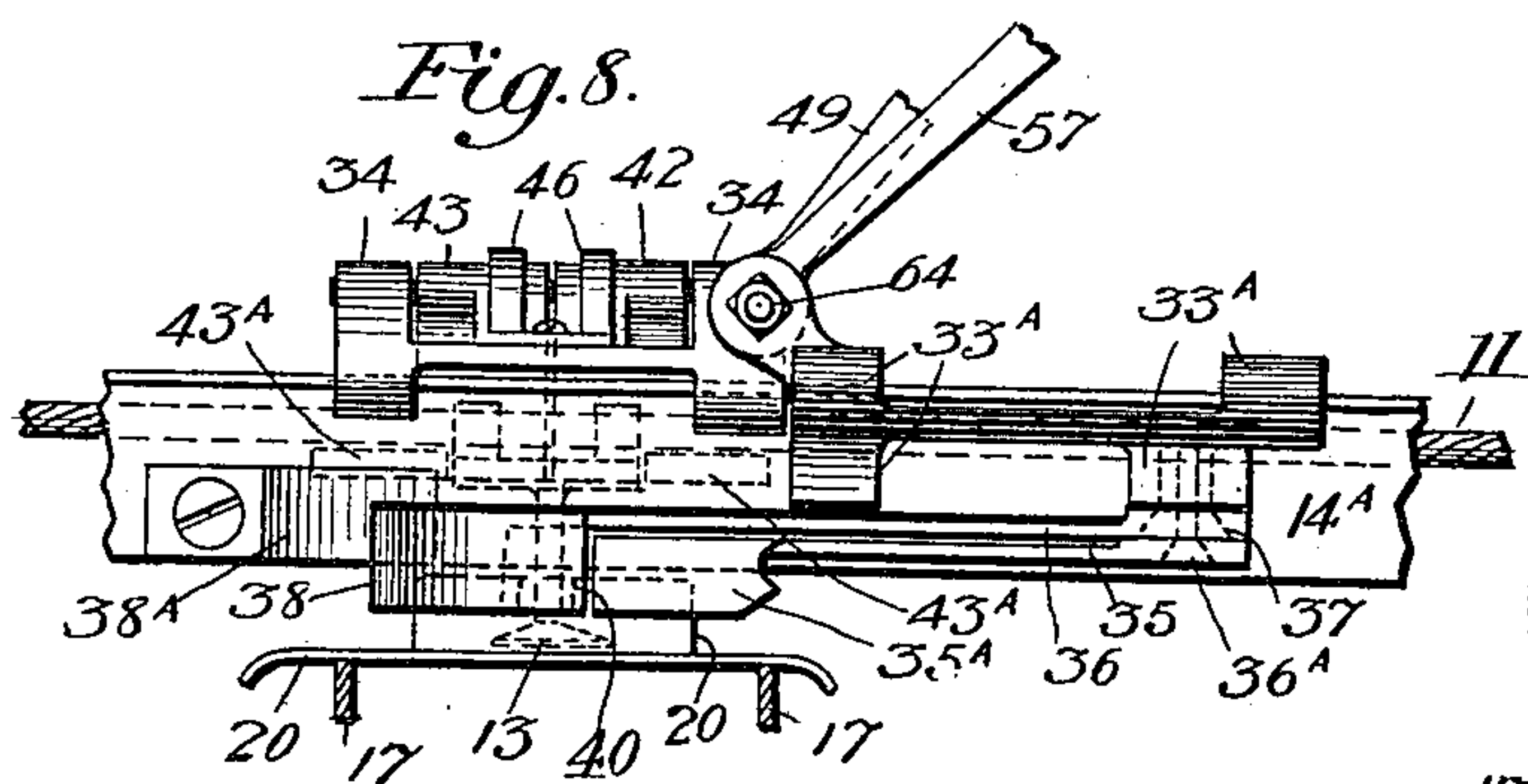
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6 Sheets—Sheet 4.



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6 Sheets—Sheet 5.

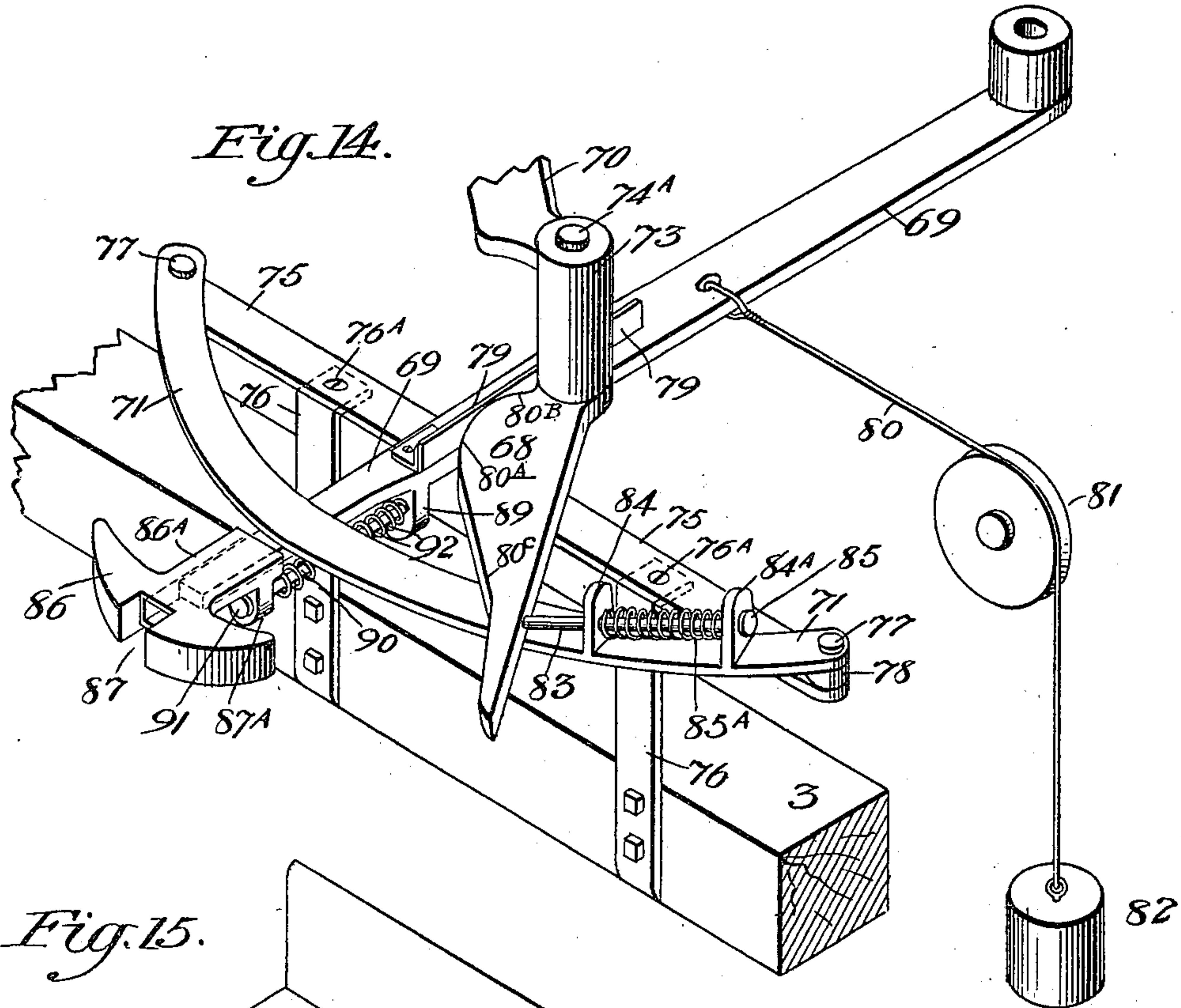
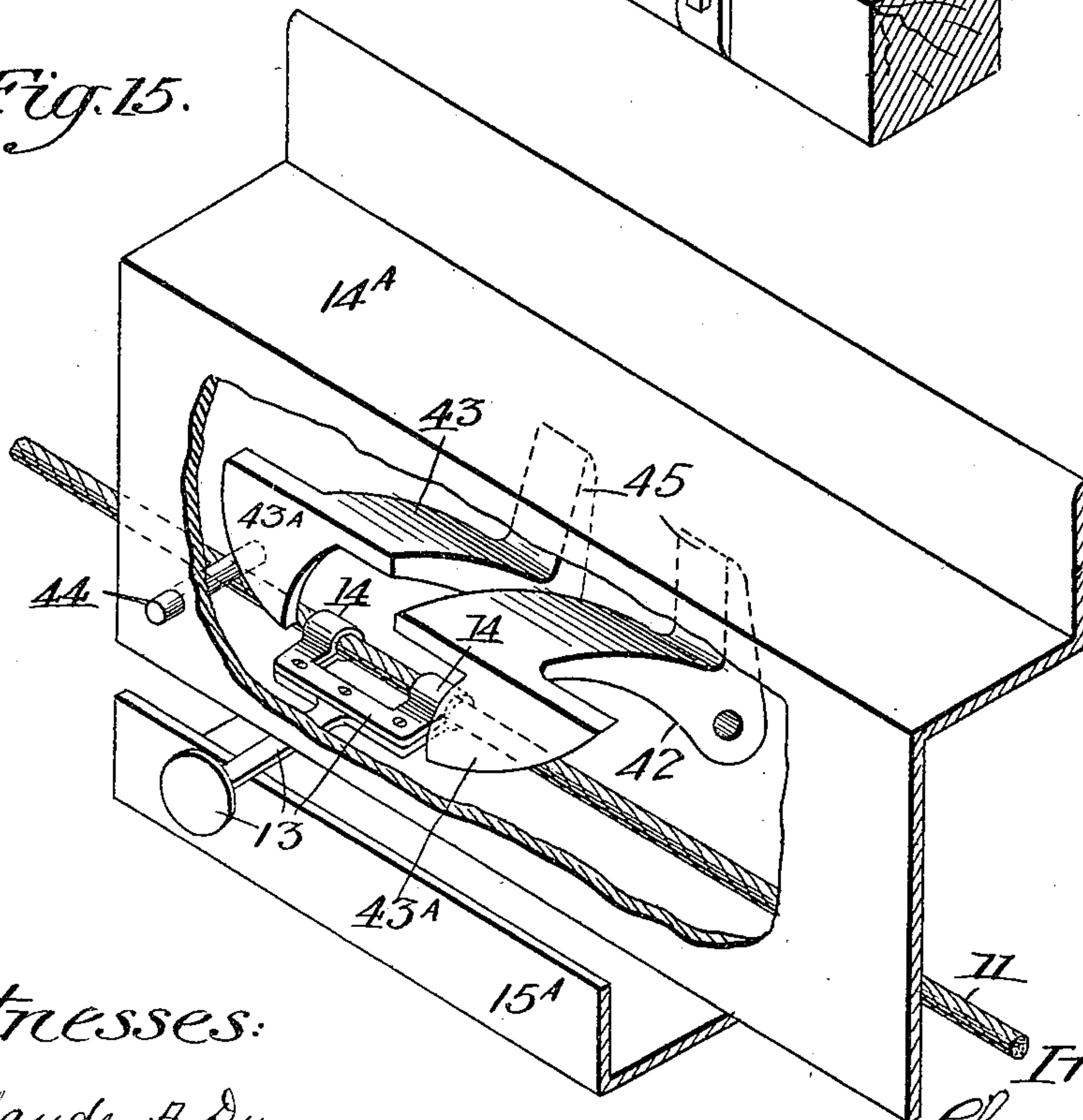


Fig. 15.



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UNITED STATES PATENT OFFICE.

CHRISTOPHER T. FINLAYSON, OF DENVER, COLORADO, ASSIGNOR TO THE
A. LESCHEN & SONS ROPE COMPANY, OF ST. LOUIS, MISSOURI.

TRAMWAY-TERMINAL.

SPECIFICATION forming part of Letters Patent No. 666,267, dated January 22, 1901.

Application filed October 27, 1899. Serial No. 734,979. (No model.)

To all whom it may concern:

Be it known that I, CHRISTOPHER T. FINLAYSON, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Tramway-Terminals; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in wire-rope tramways; and the objects of my invention are, first, to provide an endless double-rope bucket-tramway with loading and dumping terminals, one rope of which is a stationary bucket-supporting rope on which the bucket runs and the other is a traction and bucket-moving rope which automatically picks up a standing bucket at a predetermined point at each terminal and carries it to the opposite terminal and leaves it at a predetermined point and picks up the standing bucket which is at a short distance from the one it leaves when the one it has just left is moved to the standing position and is either loaded or dumped as the buckets are at the loading or dumping terminal; second, to provide terminals for wire-rope tramways having means for releasing the buckets from the traction-rope and for catching and holding to them and successively retarding their movement until they stop at a predetermined point; third, to provide positive operating mechanism for stopping and holding a bucket at a predetermined point as it runs off the standing rope onto the tracks of the terminals; fourth, to provide means for automatically grasping the rope-clip of each bucket at the predetermined point at which they are stopped and held on entering the terminals and for holding the clip until it is automatically locked to the standing loaded or dumped bucket, as the case may be; fifth, to provide positively-operating mechanism for grasping, holding, and moving said buckets and for positively retarding the movement of the bucket coming onto the terminal tracks to be

loaded or dumped during its movement from its first stopping position to its final standing or loading and dumping position and for positively and automatically accelerating the movement of the loaded or dumped bucket from its standing position until it attains the speed of the traction-rope and is locked to the rope-clip that leaves the incoming bucket, thereby insuring the positive releasing of the rope-clips from each bucket as it enters each terminal, positive stopping of each bucket at a predetermined point until the clip just released from it registers in the lock of the bucket at the loading or dumping station, positive movement of both buckets at each terminal, the one at the loading or dumping station on its way out and the one just in to the standing-point to be loaded or dumped, positive accelerating movement of the loaded or dumped bucket from the standing, loading, or dumping point and positive holding to it and movement of it until it is locked to the rope-clip, and positive holding and moving of the bucket just in independent of the traction-rope from its first stopping position, and a positive retarding movement of this bucket to the standing, loading, or dumping position in order that the standing bucket may be out of its way and that both may move in relative unison while the rope-clips are unlocked from and leaving one and engage with and are locked to the other while the traction-rope is moving continuously and the buckets are loaded and dumped, and, sixth, to provide means for dumping the buckets automatically. I accomplish these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of the unloading-terminal with some minor parts of the buckets broken away and some other parts left off to avoid confusion at the dumping and clip-release stations. Fig. 2 is a side elevation of Fig. 1. Fig. 3 is an end elevation with the frame of the terminal and the bucket-pendant shown partially in section. Fig. 4 is a fragmentary perspective view of the dogs and their supporting-slides that engage the rope-clip when it enters either terminal and that keep in engagement with the clips while they leave one bucket and pick up another and as-

sist in governing the movement of the buckets relative to one another. Fig. 5 is a front elevation of these clip-engaging dogs. Fig. 6 is a perspective view of one of the clip-engaging dogs. Fig. 7 is a cross-section of Fig. 4 on line A. Fig. 8 is a plan view of a portion of a terminal, showing the clip-slide and bucket-slide that engage the clip and buckets as they come in off the line. Fig. 9 is a side elevation of Fig. 8. Fig. 10 is an end elevation of Figs. 8 and 9, showing in addition a complete bucket in elevation. Fig. 11 is an elevation of the clip-guide of the terminals, showing a weight rope-pulley secured thereto. Fig. 12 is a perspective view of the inside lever of the bucket-clip illustrated in Figs. 8 and 9. Fig. 13 is a perspective view of the outside lever shown in Figs. 8 and 9. Fig. 14 is a perspective view of the bucket-accelerating device and its supports. Fig. 15 is a perspective fragmentary view of the exit end of the clip-guides, showing the releasing-dog raised above the clip by engaging the pin and releasing the slide from it. Fig. 16 is a perspective view of the slide and dogs of the bucket.

Similar numerals of reference refer to similar parts throughout the several views.

Referring to the drawings, each of the terminals comprises a structure framed together of heavy timbers, of which the numeral 1 designates the sills, 2 the posts, and 3 longitudinal ties. Upon the ties cross-beams 4 are secured at intervals, to which an upper track 5 and a lower track 6 are secured by brackets 7. The tracks curve concentrically around a horizontally-arranged rope-gripping wheel 8, that is supported by a vertical shaft 8^A, which is journaled in suitable boxes 9, which are secured to cross-ties at the outer end of each terminal. The terminals are designated, respectively, as "loading" and "dumping" terminals. The loading-terminal is almost always placed in a plane above the dumping-terminal and may be placed any distance from a few hundred feet to several miles from the dumping-terminal. The stationary and traction ropes extend from one terminal to the other, being supported at suitable intervals by derricks. The loaded buckets are attached to the traction-rope 11 by clips, and where the difference in height between the terminals is sufficient the buckets run down the stationary ropes 10 by gravity, moving and carrying the traction-rope 11, to which they are attached by said clips, along with them. The traction-rope, which is endless, enters the terminals over the sheaves 11^A and passes around the grip-wheel 8. The speed of the traction-rope, and consequently of the buckets, is governed by means of any suitable brake mechanism which may be attached to the shaft of the grip-wheel. There are two stationary ropes 10, one on each side of each terminal. They are, however, considered as one rope, as they form, with the tracks 5, an endless track for the trolley of the buckets,

and each rope passes into each terminal through a sleeve 12, secured to the ends of the top side ties 3 and is secured to them or to any convenient part of the frame structure comprising the terminals. The traction-rope is provided with clips 13, spaced at about equal distances apart, which are adapted to be locked to the buckets. The number of these clips depends on the number of buckets the tramway is to have, which is governed by the tonnage or the material it is desired to transport over it. Each of the clips 13 is comprised of two eyes 14, which are folded over the rope, their inner surfaces being preferably grooved spirally to register over the spiral lay of the strands of the rope. These eyes are riveted to a T-shaped member 15, the stem of which contains an enlarged round head portion 16. The traction-rope on entering the terminals passes into a clip-guide composed of a Z-shaped member 14^A and a channel member 15^A, which are arranged a short space apart, forming a slot between them, into which the clips pass as the traction-rope enters the clip-guide. The Z member and the channel member are secured to uprights 15^B, which are secured to the tracks 5 and 6 by washers 15^C and bolts 15^D. Each of the buckets comprises a loading portion or receptacle 17^A, pivoted to the side frames 17. These side frames extend above the body portion and converge together at their upper extremities, where they are pivoted to a cross-arm 18, which is carried by the trolley-wheels 19. These wheels run on the track 5 and stationary ropes 10 and carry the weight of the bucket and its load. A bar 20 extends across the pendants of the bucket. From this bar two opposite angled members project and are arranged with the outer members of their angle turned toward and facing each other, but separated enough to form a slot between their angled edges, which will admit freely the stem of the clip 13 and also a slot between their angled edges and the adjacent side of the bar of which they form an integral part. (See Figs. 10 and 16.) The head and stem of the clip 13 enters the said slot. The head of the clip is secured at the center of the grip by two dogs 22 and 23, which form part of the grip. They are pivoted on each side of the center of the channel and move in a horizontal plane. (See Fig. 16.) The dog 22 at the end of the channel at which the clip enters is controlled by a spring 22^A, which is secured to the adjacent pendant, and the clip in entering engages and pushes it back until it passes it. The opposite dog 23 is normally locked in the path of the clip by a vertical slide 24, which slides up and down a short distance on a central vertical bar 25, which is attached to the cross channel-piece 20 and to a cross-bar 25^A, connected with the pendants 17. At the lower end of this upright bar a sheave 25^B is pivoted, that bears on the under side of the lower track and holds the bucket from swinging out as it rounds the

end of the terminal. In the opposite sides of this slide 24 I form two slots 26 and 27, into which projects from each dog 22 and 23, respectively, a pin formed on the ends of the dogs. The object of these slots is to positively lock the said dogs in the channel on each side of the head of the clip and to release first one dog and then the other, so that the clips can enter and leave the channel-piece 20 of the buckets at the proper times and places. Of these two slots 26 receives the pin of the spring-controlled dog 22. This slot is enough wider at its lower end to allow the pin of this dog 22 and the dog itself full freedom to move back out of the clip-grip's channel when the head of a clip enters the channel and comes in contact with it, as seen in Fig. 16, in which the slide is represented as raised to its fullest height, in which position the dog 22 is unlocked. The slide is raised automatically, as will be explained hereinafter. Now when the head of a clip enters the clip-grip's channel it collides or strikes the dog 22, and as the slide is at the top of its movement the pin of this dog is in the wide portion of the slot 26, and it can move back, and it is pushed back by the head of the clip as it strikes it and passes it, compressing the spring of the dog as it moves the dog, when it immediately springs into the channel again into its normal position, as shown in Fig. 16. The slot 26, however, is narrow at its top, and when the slide is down the narrow part of the slot registers over the pin of the dog 22 and the dog is locked against backward movement out of the channel. The slot 27 on the other side of the slide, which is seen in Fig. 10 through the slot 26, is a narrow slot and is just wide enough throughout its length for the pin of the dog 23 to move freely in. This slot is straight from its top to just below the center of the length of the movement of the slide, from which point it deflects away from the dog 23. Now when the slide is down in its normal position this dog 23 is locked and cannot be moved out of the channel, but when the slide is raised the pin follows the slot, which at its lower end is deflected away from the channel, and the pin and dog are moved back out of the channel and out of the path of the head of the clip—that is, the slide, through the medium of the slot 27, moves the dog 23 out of the channel and consequently out of the path of the head of the rope-clip; but the dog 22 is engaged by and is moved back out of the channel by the head of the rope-clip as it passes through the channel, and when the slide is down both dogs are locked by their respective slots against any backward movement whatsoever. Consequently when the head of a clip gets into the channel between these two dogs and the slide is down it is locked to the clip-grip and when the slide is up as far as it will go both dogs are released, and when it is only half-way up the dog 22 is released, but the dog 23 is locked.

This slide, the dogs, and the channel I term the "clip-grip" of the buckets.

My invention contemplates the automatic releasing of a clip from each bucket as the bucket moves along the side of the terminals as it comes into each terminal and the locking of each bucket to the next clip on the traction-rope as it comes along without stopping or diminishing the speed of the rope. I preferably carry out this feature of my invention in the following manner:

Along that side of each terminal the buckets come in on I arrange two rods 28 and 29, spacing them a short distance apart and far enough from the tracks to allow the buckets to pass between them and the rods. The ends of these rods are bent at right angles and extend to and are bolted to the curved trusses 30 and 31. Each truss consists of two plate members bolted together at one end, and their free ends are bolted to the opposite sides of the adjacent tie-beam. A pin 32 projects from the back of the vertical slide 24 and is arranged to move freely between the rods as the buckets enter the terminals. The end of the lower rod is separated from the end of the upper rod and is bent downward from the upper rod to form an upward-inclined plane at the end the pins of the buckets enter between them. The rods then are parallel with each other for a short distance, when they both deflect down a distance sufficient to move the slide down about one-half of its travel. They again extend horizontally a short distance parallel with one another, and then again deflect downward enough to move the slide down the rest of its downward travel. Consequently when the pin of the slide first enters between the rods and travels up the incline of the lower rod the slide is raised to its full height and both dogs are released, and the dog 23 is drawn back out of the path of the clip, allowing the clip to pass out of the grip and the bucket to slow up with the slide at its highest limit. Its pin is then on the level portion between the rods and with the dog 23 out of the channel of the grip and the spring-controlled dog 22 free to be moved back by the next clip coming along. At the point where the buckets come to rest there are two slides 33 and 34. These slides are both arranged to slide on the vertical member of the Z member of the clip-guide. Each of the said slides comprises a block-shaped member having a slot through it, which fits over the vertical portion of the top of the clip-guide 14^A. These slides extend down on the back side of the Z member, and a bar 32^A is secured to each and lies up under the edge of the horizontal portion of the Z member. The slide 33 has a projection 33^A on the rear end extending over the top of the clip-guide, to which are pivoted two levers 35 and 36, (shown plainly in Figs 8, 9, 10, 12, and 13,) one lever being pivoted over the other, the pivotal screw 36^A of the outer lever being threaded to the pivotal screw 37 of the inside

lever. The lever 36 extends beyond the end of the lever 35 and comprises a thin blade with a head portion 38, that extends laterally from the body of the lever over the edge of the clip-guide. The extreme end of this lever is beveled upward and is adapted to engage and slide up the inclined block 38^A, which is secured to the top member 14^A of the clip-guide. A square recess 39 is formed in the under side of the head of this lever, commencing from the point where the head joins the body. This recess is large enough to receive and fit loosely over the top of a projection 40, formed on the top of the grip members of the bucket. The lever 35 comprises a thin blade having at its end a laterally-extending blade 35^A, which projects over the edge of the clip-guide and which extends up backward from the end of the lever at an angle and forms a backward-sloping inclined plane. The projection 40 engages the under side of this inclined blade and raises it as the projection of the grip passes under it. After the projection 40 of the bucket has passed under the lever the lever drops down behind it. The projection is thus confined between the two heads of these two levers, and the bucket is held by them and must move as they move. The slide 34 lies in front of the slide 33, but close up to it. The slide 34 contains a recess, in which are pivoted by a pin 41 two clip-engaging dogs 42 and 43. These dogs are placed side by side and project through the open back of the clip-guide over the rope and clip and have at their free ends a thin depending portion 43^A, which has an open space at the central portion of each to allow a space between the opposite ends of the two dogs large enough for the rope-clips 13 to rest loosely in, which permits the depending end portions to drop down by each side of the clip, thus attaching the slide 34 to the clip. The depending portions of the dogs project parallel with their pivotal pin beyond the body of the dogs, and their lower edges are beveled upward to form inclined planes, which allows the clip as it comes along to raise the first dog and pass under it and allows the other to be raised by contact with the pin 44, secured to the member 14^A, at the end of the movement of the slide, as shown in Fig. 15, which releases the clip after it has been locked to a bucket, as will be explained hereinafter. Each of the two dogs 42 and 43 has an upward-extending projection 45, that abuts against the back of the slide 34, and thereby acts as a stop to define the downward movement of the dogs. A bifurcated spring 46 is secured to the slide, and its ends bear on the two dogs and hold them down in position to receive the clips, as shown in Figs. 4, 7, 8, 9, and 10. These two slides, with their levers and dogs, constitute the bucket-receiving and positive moving and operating mechanism while the clips are changing from one bucket to another and while the buckets are

being loaded and dumped. There is always one bucket standing at the dumping-station 47, and when a bucket comes in its clip is released at the clip-releasing station 47^A, and at the same time it becomes attached to the dogs of the clip-slide 34, and at the same time the levers 36 and 35 engage the projection 40 on the bucket, these three events taking place at substantially the same moment, and as the clip and rope move continuously the bucket slows up, and the clip moves on and carries the clip-slide along with it along the top edge of the clip-guide. As the clip-slide 34 moves it carries the lever 49 with it also, as this lever is pivoted by a pin 50 at one end to ears 51, formed on the edge of the clip next to the bucket-slide. (See Figs. 1 and 3.) This lever 49 extends to the opposite side of the terminal, where it is pivoted to a lever 52, which extends back to the clip-guide side of the terminal, where it is pivotally attached to supports 53 and 54 by a vertical cross-shaft 55, forming part of its end. The supports 53 and 54 are secured to the longitudinal ties 3.

About midway of the lever 52 there is a lateral extension 56, to which is pivoted a lever 57, which has at its end that pivots to the extension 56 a curved portion 58, that curves away from the extension 56. In this curved portion and up the lever a short distance there is a curved slot 59, through which the pin 60 loosely depends from the end of the extension 56, to which it is secured. At a short distance above this slot a lever 61 is pivotally attached to the lever 57 by a pin 62. This lever 61 extends to and is pivotally secured at its opposite end by a pin 63 to the lever 52 at a point opposite the extension. The opposite end of the lever 57 is pivotally secured by a pin 64 to the ears 65, which are formed on the bucket-slide 33 directly above the ears 51 on the clip-slide, the two pairs of ears being arranged on their respective slides to stand vertically over each other, as shown in Figs. 1 and 8. A rope 65^A is attached at one end to the lever 57 and passes over a sheave 65^B, which is pivotally secured in a bracket 65^C, attached to the guide-frame 15^C, and then passes over a sheave 65^D, which is pivotally secured to a bracket 65^E on a cross-bar of the terminal. A weight 65^F is secured to the opposite end of the rope. The movement of the clip-slide and lever 49 along the guide moves the levers 52 and 57 to the positions assumed by these levers in the dotted lines in Fig. 1, the clip-slide not stopping until it reaches the opposite end of the clip-guide and the bucket-slide and the incoming bucket not stopping until it reaches the standing or dumping position 47 of the buckets. The levers work as follows: The lever 49 draws the levers 52 and 57 after it. The lever 49 and its slide travel at the same speed as the clip that is held by its dogs; but the lengths, forms, and relations of these levers are such that while the clip is unlocked from

the incoming bucket and the bucket is caught by the levers of the bucket-clip without its being stopped or slowed down by the bucket-slide, which starts to move at substantially the same speed the incoming bucket is moving at and starts at the same instant the bucket enters between its levers, as it is moved instantly by the clip-slide, which is itself moved at the same instant the rope-clip leaves the incoming bucket. As the releasing of the rope-clip from the bucket, the catching or grasping of the incoming bucket, and the locking of the rope-clip to the clip-slide take place at substantially the same instant, and consequently both slides commence to move at the same instant; but the movement of the incoming bucket from the time the bucket-slide gets well under way is successively retarded until it is brought to a standstill at the dumping-station. The movement of the bucket-slide is much slower than that of the clip-slide, which moves along the guide at the same speed as the rope. The clip-slide, as it moves along the guide, engages the cam-lever of the accelerator, which starts the accelerating-arm and moves the standing bucket along, but so slow at first that the clip-slide overtakes it, and then the head of the rope-clip enters the clip-grip channel of the bucket by pushing aside the dog 22, which is still unlocked, as the slide 24 has moved down only one-half of its travel at the central deflection of the unlocking-rods 28 and 29. The dog 23 is, however, locked in the channel in the path of the clip, as the slide 24 has been moved down by its pin 32 moving from the first deflection in the rods 28 and 29, as the bucket now in the standing position was previously moved up to its standing position by a previous action of the clip and bucket slides. This downward movement of the slide 24 is about one-half of its full downward movement; but it is sufficient to move the stem of the positive moving dog 23 into the vertical portion of its slot 27, which moves it into the path of the clip and holds it there. At this time the bucket and rope clip and the clip-slide are traveling together and pass the ends of the deflecting-rods 28 and 29, the downward deflection of which at the end moves the pin 32 and the slide 24 of the bucket-clip-gripping device down to its lowest position, which brings the pin of the dog 22 in the narrow part of the slot 26 of the slide 24 and locks it against backward movement, which locks the head of the rope-clip securely to the bucket. A second or two later the clip-slide reaches the releasing-pin 44 and is detached from the rope-clip and is drawn back, together with the bucket-slide, to its starting-point by the weight 65^E.

The bucket-accelerating device comprises the actuating-lever 68, the bucket-carrying arm 69, the supporting-bucket 70, and the horizontal support 71. The bucket 70 extends across the terminal and is secured to

the outside longitudinal ties. On each end of the bracket vertical bearings 72 and 73 are formed. To the bearing 72 one end of the carrying-arm is bolted pivotally by a bolt 74, and one end of the lever 68 is bolted to the bearing 73 by a bolt 74^A. The carrying-arm rests on the horizontal bar 75, which is secured to supporting-bars 76 by the screws 76^A. The bars 76 extend downward and are bolted to the adjacent tie-beam. The segmental supporting-bar 71 is secured to the top of the bar 75 by screws 77, but is raised enough above it by collars 78 to allow the bucket-carrying arm to slide freely under it. The cam-actuating lever 68 rests and slides on this segmental support. Upon the bucket-carrying arm back of the lever 68 a vertical shoulder 79 is formed either by attaching an angled iron to the top of this arm or by forming the shoulder as an integral portion of it. A rope 80 is secured to the arm 69 and extends over a pulley 81, secured to a bracket 81^A, which is attached to the adjacent cross-tie. A weight 82 is fastened to the end of the rope 80. The cam portion of the lever 68 is formed with an outward-curved portion 80^A, that starts with an abrupt curve 80^B at its pivotal end and blends into a straight portion 80^C, that terminates near the end of the lever. This curved portion 80^A rests against the vertical shoulder 79. Adjacent to the free end of this lever a spring-buffer composed of the rod 83 projects loosely through lugs 84 and 84^A, which project vertically from the top of the support. A head 85 is formed on the end of the rod 83 that bears on the farthest side of the lug 84^A from the lever 68. The opposite end of the rod bears against the front edge of the lever. A spring 85^A surrounds the said rod 83 and bears at one end on the inside of the lug 85^A and is secured at the opposite end to the rod. The weight 82 draws the carrying-arm 69 and lever 68 toward the buffer-rod, and the vertical shoulder 79 bears against the curved portion of the actuating-lever 68, while the free end of the latter bears against the buffer-rod which receives the shock of the return movement of the accelerating device. The buffer also defines the stationary position of the bucket-carrying arm.

The bucket-carrying arm 69 has on its end a head 86, that is provided with a sleeve 86^A, which is fitted to slide a short distance back and forth on the arm. A slot 87 is made centrally in the head wide enough to receive loosely a depending lug 88, formed on the under side of the channel-piece 20 of the clip-grip of the bucket. The head extends laterally from each side of the slot in backwardly-curved portions, which allows the lug on the bucket to slide along them and push the head back until it drops into the slot. A lug 87^A depends from the under side of the sleeve portion of the head, and a similar lug 89 depends from the under side of the carrying-arm. A rod 90, having a head portion 91, extends loosely through the lug 87^A, with its head por-

tion normally bearing on the outside of said lug. This rod extends to and is secured to the lug 89. An expansion-spring 92 surrounds the rod between the two lugs and constantly presses the head of the carrying-arm against the head of the rod.

The pin 67 on the under side of the clip-slide when it engages the lever 68 moves the bucket-carrying gripping-arm 68 a short segment of a circle by forcing it against the shoulder 69 as it is pushed back by the pin. This starts the bucket along, gradually increasing its speed as the increased size of the curved portion of the lever 67 comes in contact with the shoulder as the lever is pushed back until the bucket is moving about as fast as the clip and rope, which enables the clip to take it from the accelerator without any shock on the rope. The clip-slide 34 travels on with the bucket until it reaches the pin 44 in the end of the clip-guide, when the inclined end of the dog 43 runs up on the pin and raises the dog above the clip, thus releasing the clip from the slide. Meanwhile the arm 49 has drawn the arm 57 along after it and caused the arm 57 to move the bucket-slide and its levers, which are locked to the incoming bucket, to move it to the standing, loading, or dumping position. When the accelerator leaves the outgoing bucket, the former swings back under the influence of the weight against the bumper to the center of the standing position, and the incoming bucket pushes back the head on the carrying-arm until the depending lug of the bucket registers with the slot in the head, which then springs forward and is attached to it. Just before this action takes place the lever 36 runs up the inclined plane 38^A and moves along its top, and the bucket is released from the bucket-slide and stops, but is now in the grasp of the accelerator. The movement of the bucket just before it reaches the standing, loading, or dumping position and just before the accelerator swings back in that position to receive and catch the incoming bucket is very slow, as the curved end and curved slot of the lever causes it to swing slowly on its pivot with but little forward movement. The outgoing bucket is released from the clip-slide at substantially the same time that the incoming bucket is brought to and released at the standing, loading, or unloading position.

The buckets are not connected to the slide 34; but they are connected to the slide 33 from the time they enter the terminal and run to the point where the levers 35 and 36 of the slide 33 engage the member 40 of the buckets. The slide 33, to which the buckets lock when they run into the terminal, is not attached or secured to or in any way connected to the moving rope 11. It is connected to the lever 57 and to no other lever and is moved solely by the lever 57 through the medium of the levers 49 and 52 and the lateral extension 56 of the lever 52. Consequently the running

rope has nothing to do with the bucket-slide 33. The clip-slide 34, however, is the slide that becomes attached to the running rope by means of its two dogs, one of which is raised up as the rope-clip passes under it and then drops down behind it, while the other dog lies in its path and the clip runs against it and moves the clip-slide with it without in the slightest degree slowing up the speed of the running rope, as the slide is very light in comparison with the load of buckets and material that moves the running rope. Consequently the clip-slide is picked up quick and starts off across its slideway and continues throughout the whole of its travel at the same speed as the running rope, and as it moves along its slideway it drags the lever 49 after it, and the lever 49 drags the end of the lever 52 that is pivoted to it after it, and lever 52, through its extension 56, pushes the lever 57, and consequently the bucket-slide which is attached to the lever 57, also along the slideway after the clip-slide which scooted off ahead of it when the clip picked it up; but the relation between the movements of these said levers is such that the lever 57 is moved in such a path that it starts the bucket-slide and the bucket it is locked to at about the same speed and at the same time that the bucket runs into the bucket-slide and is locked to it, and also starts it out with the momentum, so that the bucket when it runs into the bucket-slide does not stop, and the bucket-slide does not stop them. The buckets are filled with ore when they run in off the line, and their momentum carries them along after the rope-clip is disengaged from them. The arrangement of the bucket-slide is such, however, that they cannot pass it without locking to it; but as the bucket-slide is started along the guideway by the rope-clip at the same moment the bucket runs into it the incoming buckets are not stopped by the bucket-slide or slowed down until the bucket-slide has moved a little way, when its actuating-levers gradually retard its speed until it is brought to a stop, and this is the function of these two slides and the system of levers. The instant the rope-clip is released from a bucket it moves away from it as the bucket commences to slow up, and at the same instant it is released from the bucket it becomes attached to the rope-clip and moves away from the bucket and takes the clip-slide with it, and the instant the clip-slide moves the levers lengthen or straighten out and move the bucket-slide, and the levers move in such paths that the movement of the bucket and the bucket-slide to which it is attached is continuously retarded or slowed up, and by the time the clip-slide has arrived at its releasing-pin 44 the bucket-slide has arrived at the dumping-station and with the bucket, but slowed up to a dead-stop by gradual and constant retarding movement, which is produced by the running rope, the rope-clip, and the clip-slide through the medium of

these levers and the bucket-slide. The instant the clip-slide strikes its releasing-pin the weight and rope-pulley on the lever 49 pulls it and the clip-slide back on the slide-way, and the levers simply fold up again and both slides move back in the same relative order they moved forward in. There is always a bucket at the dumping-station; but the clip-slide instead of avoiding it engages the bucket-accelerating cam-lever and moves the accelerating-arm. The accelerating-arm attaches to and holds every bucket at the standing station before the clip-slide is started on a forward movement by a rope-clip by means of the depending pin 67 on the clip-slide, which strikes against the cam-lever. The cam-lever moves the accelerating-arm, which, having hold of the bucket, starts and carries it along and accelerates its movement until it is moving at nearly the same speed as the rope-clip, the running rope, and the clip-slide, during which time the clip is locked to it. Consequently the empty buckets standing at the dumping-station are not engaged by the clip-slide, but are carried along by the bucket-accelerator, which is moved through the radius of its sweep by the pin 67 on the clip-side, and the minute the clip-slide is released from the rope-clip by the pin 44 the accelerating-arm swings back and catches the loaded bucket that has just been brought to rest at the dumping-station by the bucket-slide.

The clip-slide 34 is fast to the rope through the medium of its dogs 42 and 43 locking the rope-clips between them as they enter the terminus; but this clip-slide does not move any bucket or pick up any bucket. When a rope-clip picks up this clip-side 34, the clip-slide starts along the guide all alone and just before it reaches the bucket standing at the dumping-station the pin 67, that depends from this clip-slide, strikes the lever 68. (See Fig. 14.) It must be remembered that the accelerating-arm has the standing bucket locked in its recess 87, and when the pin 67 strikes the lever 68 its cam portion bearing against the accelerating-arm starts the standing bucket along very slow at first, but increasing in speed until it is going at about the same speed as the rope. Meanwhile the clip-slide gains on it and catches up with it, and the head of the rope-clip enters the clip-grip of the bucket and the inclined rods 28 and 29 push down the vertical slide of the bucket and lock it to the rope-clip. All of this is accomplished before the clip-slide reaches the releasing-pin 44. Consequently the clip-slide does not touch the bucket at the dumping-station or anywhere else, but actuates the cam-lever 68, which moves the accelerating-arm, and this arm starts and accelerates the standing bucket, and the other buckets or the running-rope are not in the least affected.

The buckets are successively retarded after the bucket-slide gets control of them by the peculiar unfolding movement of the levers 49,

57, 52, and 61, which are normally folded together. These levers are so positioned and connected to one another and so arranged in relation to the running rope that they uniformly retard and slow up the forward movement of the free end of the lever 57, its bucket-slide, and the bucket it has control of. The lever 49 is connected to each rope-clip as it passes through the terminals by means of the clip-slide, to which it is pivotally secured at one end, and this end is carried along the clip-guideway with and by the clip-slide. The lever 49 pulls the lever 52 after it until when the lever 49 reaches the end of its stroke they are unfolded and stand approximately in nearly a straight line with each other. This movement of this lever 49 is made at exactly the same speed as the rope and its clip is traveling at throughout its entire stroke, because it is moved directly by and with the rope; but the lever 57, which is pushed along by the levers 49, 52, and 61, is so pivotally connected to these levers 52 and 61 and is so arranged at one end that its opposite free end, to which the bucket-slide is pivotally connected, is pushed along the clip-guideway after the clip-slide, but its opposite end, which is attached to these levers, makes a curved sweep toward the point from which its free end and bucket-slide started from, the extension of the lever 52, to which its outer end is pivoted, carrying it up close to the clip's guideway that the bucket and clip slides reciprocate on, or close to the line of movement of its free end and bucket-slide. This curved movement of the outer end of the lever 57, which connects to the levers 52 and 61 toward and to near the point from which its free end started and to a point a little way in front of the starting-point of its free end and of the bucket-slide, moves its free end and the bucket-slide along the guideway after the clip-slide; but at the same time that its free end and bucket-slide are being moved forward it is successively, evenly, and uniformly retarded and slowed up to a stop at the dumping-station, at which it arrives at the same time the lever 49, which moves the levers 52 and 57, arrives at the end of its stroke.

Figs. 1 and 2 represent the lower discharge-terminal. It differs from the upper or loading terminal only by its having a bucket-dumping mechanism. The upper terminal has a loading-hopper at one side of it, which is not, however, operated by any device connected to the bucket-operating mechanism of the tramway. The standing rope 10 extends up from the lower terminal and down from the upper terminal, as shown at the point where the standing rope enters the terminal in Fig. 2. The dumping mechanism comprises a system of levers and rods arranged along in front of the bucket-dumping station for turning the bucket upside down while it is standing at the said dumping-station, waiting for the next clip on the rope to come along and pick it up. 95 designates the

bucket guard-rail. The ends of this rail are curved away from the terminal in order that if a bucket is swinging as it enters the terminal the pin 96, which depends from the bottom of it, will strike the curved end and be guided between the rail and the terminal. This rail is integrally connected near its opposite ends to depending rods 97, which are pivoted by a rod 97^A about midway of their length to one of the ends of a pair of levers 98, the opposite ends of which are pivotally secured to a rod 99, that is supported in bearings 99^A, that are secured to a cross-tie 100, which rests on one of the sills of the terminal. The lower ends of the rods 97 are pivotally attached to a rod 101, which joins them together. Two levers 102 are pivoted at one of their ends to the rod 101 and at their opposite ends are pivoted to a rod 103, that is journaled to bracket-bearings 104, that are bolted to the underside of the adjacent lower tie-beam of the terminal. The levers 102 are bent downward from their pivoted ends at their central portion. One end of a rope 104^A is secured to the rod 101, and the rope extends up over a sheave 104^B, that is pivoted in an oblique plane to a bracket 105, which is secured to one of the cross-ties. The opposite end of the rope is secured to the end of an arm 106, that extends from a combined clutch and cam disk 107, that is loosely mounted on the top of the shaft 8^A of the grip-wheel 8. This cam and clutch contain a notched clutch in its lower peripheral edge that is adapted to register loosely in a similar clutch-surface formed in the top edge of a disk 108, secured just below it on the shaft. A horizontal cam-surface is formed on the disk 107 by a laterally-projecting portion 107^A, that is beveled downward from the lever portion 106 to about one-quarter of the diameter of the disk and is then straight for about another quarter of the diameter, forming a cam of the disk. A pin 110 is journaled reciprocally in bearings 111 at a height that will allow it to register with the top of the inclined portion of the cam, so that when the disk is rotated by the shaft the cam and disk will ride up on top of the pin, thereby raising the cam and disk and separating the opposing parts of the clutch. The opposite end of the pin 111 is pivoted to one end of a rock-arm 112, that is pivoted at its center by a bolt 113 to the frame of the terminal. The opposite end of the rock-arm is pivoted to one end of a lever 114, which extends toward the rear side of the terminal and is pivotally connected to a spring 115. This spring extends from the lever 114 into the path of the trolley-wheels and across the track of the buckets, so that they will engage it and move it back away from the track as they pass it. The spring is then bent inward from the track and wheels and is secured to a beam 116, that is secured to the top of the terminal.

The operation of the dumping is as fol-

lows: The grip-wheel, its shaft, and the part of the clutch that is secured to the clutch is continuously rotating when the tramway is running. The weight of the levers of the dumping device holds the rope taut and normally holds the arm of the cam and clutch disk parallel with the longitudinal ties and pointing toward the lay of the rope. Now as each bucket rounds the end of the terminal to go out on the line its forward trolley-wheel runs into the spring and moves it back in the direction of the arrow 116^A, which rocks the rock-arm 112 on its center and moves the pin 111 back in the direction of the arrow 117 from under the cam of the clutch, allowing the disk and cam to drop onto the disk below and the two clutch-surfaces to mesh together and swing the disk and its arm around with the grip-wheel in the direction of the arrow 118, its arm drawing the rope with it, raising the dumping-levers, and as they swing upon the rods 103 and 98 they turn the bucket upside down, as shown in dotted lines in Fig. 3, by the time the lever has made a half-revolution, and lowers it again after it passes the center noiselessly and without allowing it to drop. As soon as the trolley passes the spring 115 the said spring moves by its elastic tension out into its normal position and in doing so moves the pin back into the path of the cam, which engages the pin at the last quarter of the revolution of the arm and disk, and as the cam rides up on the pin the two clutch-surfaces are separated and the disk and its arm stop at the end of its revolution.

Some of the elements of the bucket-dumping mechanism and also some of the other parts, notably the rods for raising the slide of the bucket, the bucket, and the ropes and clip-guide, were patented to me September 19, 1893.

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

1. The combination with the clip-guide, the bucket and the rope-clip of a slide arranged to reciprocate along one side of said terminal, two levers pivoted to said slide and arranged side by side, having a space or recess between the ends thereof, a projecting lug on said bucket adapted to move under one lever into said recess as the bucket moves along the terminal, and means including levers operated by said rope-clip for moving said slide and bucket a predetermined distance along said terminal, substantially as described.

2. In a tramway-terminal the combination with the traction-rope, the clip and its guide-way, of a slide mounted to reciprocate along the side of said terminal parallel with said clip, two dogs pivoted side by side in said slide and extending into the path of said rope-clip and arranged so that when a clip enters said terminal it will raise one dog and pass under it, which will drop behind it and so that the two dogs will rest one on each

side of it, and a spring for normally holding said dogs in the path of said clips, substantially as described.

3. In a continuously-running wire-rope tramway terminal, the combination with the traction-rope, the rope-clip and the bucket, of means for positively grasping and moving the buckets while the bucket-holding rope-clips are changing from the incoming bucket to the loading or dumping outgoing bucket comprising a rope and clip-guide, a slide reciprocally mounted on a guideway parallel with said rope, levers secured thereto arranged and adapted to grasp the incoming bucket as the clip leaves it, a second slide reciprocally mounted on said slide-guideway, spring-controlled dogs pivotally attached to said slide and projecting into the path of said clip, one of which is adapted to be raised by said clip as it passes by it and to drop down behind it, and the other is adapted to be pressed against it by said dog and said slide moved along by it on said guideway, a pin in the path of said dog at the end of its travel arranged to be engaged by and to raise said dog and to release said slide from said clip, a lever pivotally attached to said slide at one end and at its opposite end to one end of a second lever, the opposite end of which is pivotally secured to a bearing secured to the terminal, a third lever pivotally attached to said last-named lever at one end and at its other end to said bucket-slide and means connected with said lever whereby when said clip moves said clip-slide and its lever the bucket-slide moves the incoming bucket at a retarded rate of speed to the loading or dumping station, and means including a rope and weight for returning said slides to their normal positions, substantially as described.

4. In a wire-rope tramway having a bucket normally standing at the loading and dumping station and a continuously-running traction-rope, the combination with the terminal frame, the traction-rope, the rope-clips and the buckets, of means for moving the incoming bucket after the clip leaves it to the loading or dumping station, comprising a clip-receiving channel on said bucket adapted to receive said clip, dogs pivoted in said channel on each side of said clip and adapted to confine said clip in said channel, means including a slide for manipulating said dogs to release said clip from said channel, a pin projecting from said slide, guide-rods arranged to engage said pin and to raise and lower said slide to admit and release said clip to and from said channel and to lock it therein, a guideway for said clip and traction-rope, a clip-slide mounted to reciprocate on said slideway, spring-controlled dogs pivotally secured to said clip-slide and arranged to project normally into the path of said clips and arranged to receive the clip between them and to loosely attach said clip to said clip-slide as the clip enters the terminal, a bucket-operating slide mounted on the said clip and rope

guideway, levers arranged thereon to be engaged by and to grasp each bucket loosely as it enters each terminal, and means including a bucket-accelerating device and a series of levers pivotally attached to said clip and bucket slides and to each other for starting and gradually accelerating the standing, loading or dumping bucket on its trip from one terminal to the other and for locking the rope-clip to it and for positively retarding the movement of the incoming bucket until the outgoing bucket is out of the loading or dumping station and for moving the incoming buckets to the loading-station and for attaching the accelerator to it, substantially as described.

5. The combination with the terminals, of the traction and stationary ropes, buckets adapted to run on said stationary rope, means for automatically attaching and detaching said buckets to said traction-rope comprising clips on said rope, a channel member on said bucket adapted to receive said clips, dogs arranged to confine said clips in said recess, a vertically-movable slide arranged to lock and to release said dogs to and from said clips by a predetermined movement of said slide, means for automatically moving said vertical slide to lock and to release said dogs as the bucket moves around a terminal, comprising rods arranged to first move at a predetermined point on the terminal, said vertical slide to unlock said dogs and thereby release said clip from said bucket, and at another point to move said vertical slide to lock one dog and to leave the other released so that said clip can enter said recess, and at another point to lock both dogs after said clip has entered said recess, a guideway for said clip and rope, a slideway arranged parallel with said traction-rope a bucket-slide, slidably mounted on said slideway, means including a projection on the buckets for detachably securing the buckets to the bucket-slide at the point on the terminal where the clips are released from them, a second slide on said clip-slideway, means including spring-controlled dogs for detachably securing said slide to each clip at the time it is released from each incoming bucket and a system of levers pivoted to said bucket and clip slides and terminal so arranged and adapted that as each continuously-moving clip engages and is attached to the clip-slide it will be carried along said slideway and its lever will draw the other levers connected to it after it, thereby causing the lever pivoted to said bucket-holding slide to move said slide and bucket toward and to the loading or dumping station but at a much slower movement than said traction-rope is moving at, thus retarding its movement while the clip picks up and starts the bucket at the loading or dumping station out on the line, substantially as described.

6. In wire-rope-tramway terminals the combination with the bucket and clip, of the pendant pivoted thereto, the clip-locking

mechanism and the guideway adapted to operate said slide to lock and unlock said clip from the buckets, with the bucket-slide, the bucket-gripping levers, and means connected
5 with said clip for moving said bucket and slide to the standing position and means for releasing said levers and slide from said bucket, substantially as described.

7. In wire-rope-tramway terminals having
10 a bucket loading or dumping station at each terminal, the combination of the frame, tracks around said frame, one above the other, a stationary and a continuously-running traction-rope cooperating with said frame and
15 tracks, a grip-wheel carrying said traction-rope operatively mounted in each terminal, clips attached to said traction-rope, buckets adapted to run on said stationary rope and said tracks, means including a moving slide
20 and cooperating dogs and a guideway arranged to move said slide reciprocally to lock and release said buckets to said clips at predetermined points in said terminal, with means including a clip gripping and releasing device, and a cooperating bucket gripping
25 and releasing device, and a bucket-accelerating device operatively mounted on said terminal for positively starting the stationary loading or dumping bucket out of the terminals
30 onto the ropeway and for positively moving the incoming loaded or empty bucket into the loading or dumping position, substantially as described.

8. In wire-rope tramways the combination
35 with the terminals, the stationary and traction rope, of a clip secured to said traction-rope, buckets adapted to run on said stationary rope, means for attaching said buckets to said traction-rope, means for releasing
40 each incoming bucket from said traction-rope at a suitable point in each terminal and for attaching a stationary loaded or empty bucket to said traction-rope at another suitable point of each terminal, and means including suitable slides and gripping devices for positively
45 gripping and moving the incoming buckets in relative operative unison to the movement of the outgoing buckets, substantially as described.

9. In tramway-terminals the combination
50 of the traction-rope and the bucket-holding clip, the clip and rope guideway, with the clip-slide reciprocally mounted on said guideway, the spring-controlled dogs adapted
55 to secure said slide to said clip and the pin for releasing said slide from said clip substantially as described.

10. In tramway-terminals having a loading
60 and dumping station and an incoming bucket-clip-releasing station, the combination of the frame, the tracks and the traction-rope and clip, with a trolley engaging said tracks, a pendant suspended from said trolley, a bucket pivoted to said pendant, a clip gripping and
65 locking device secured to said pendant, projections on said pendant, means for releasing said clips from said buckets as they enter said

terminal, a mechanism for gripping said buckets at the time said clips are released from them, a device for gripping said clips as they
70 are released from said buckets and mechanism connected with said clip-gripping device and said bucket-gripping device whereby said clip moves said incoming buckets with a positive bucket-controlling movement from
75 the clip-releasing station to the loading or dumping station in relative unison with the movement of the outgoing bucket, substantially as described.

11. In wire-rope-tramway terminals having
80 a bucket and clip releasing station and a loading and dumping station, the combination with the traction-rope, the clips and the buckets, of a guideway for said rope and clip; a slideway on said guideway, a slide mounted
85 on said slideway at the clip-releasing station and provided with levers arranged to operatively grasp an incoming bucket, and means including incline planes for releasing said levers at the loading or dumping station, a second
90 slide mounted on said slideway also at said clip-releasing station and provided with dogs arranged to grasp said clip, means for releasing said clip-slide at the end of said guideway, a lever pivoted to said clip-slide at one
95 end and pivoted at its opposite end to one end of a second lever having its opposite end pivoted to a bearing attached to the terminal frame; a third lever pivoted at one end to said bucket-grasping slide and having its opposite
100 end curved, a curved slot in said curved end, a lateral extension on said second-named lever toward the first-named lever, a pin loosely extending through said curved slot of the curved end of said third lever and secured to
105 the end of the extension of said second lever a fourth lever pivotally attached at one end to said third lever just above its curved end and pivotally attached to said second lever opposite said extension, and means including
110 a weight for returning said levers and slides to the clip-releasing stations whereby said clip and clip-slide as they move through and along said guideway, carry the first-named lever with them and this first lever moves the
115 second and third and fourth levers to impart a positive but a slower and a retarding movement to the said bucket-slide and the buckets from said clip-releasing station to said loading or dumping station, substantially as described.
120

12. The combination in tramway-terminals having a bucket standing loading or dumping station, of the frame, the traction-rope, the clips and the buckets, of a bucket-gripping
125 and positive bucket-accelerating device comprising an arm pivoted at one end to a suitable bearing attached to said frame opposite said station, and having its opposite end free to swing in a segment of a circle and extending
130 to the bucket at said station, a support for the free end of said arms, a head portion on the free end of said arm adapted to slide axially on it and provided with a slot therein,

means including a spring for holding said head at the outward end of its movement on said arm, a projection on said bucket adapted to fit loosely in said slot, backwardly-curved, laterally-extending slides on said head and means including a cam-shaped lever for imparting a gradually-accelerating speed to said arm throughout its segmental movement, substantially as described.

13. In wire-rope tramways the combination of terminals comprising a frame structure, an upper and a lower track a stationary and a traction rope, a grip-wheel supporting said traction-rope, with a bucket and pendant arranged to operatively engage said tracks and stationary rope, means including a slide-locking device attached to the pendant portion of said bucket and a clip attached to said traction-rope for detachably securing said buckets to said rope, means including a differential guideway operatively arranged to engage said locking device for releasing and locking said buckets to said clips at predetermined points on said terminals, an accelerating device comprising a pivotal arm arranged to swing in a segment of a circle, a head on the free end of said arm arranged and adapted to loosely engage and hold said buckets and to move them with said arm throughout said arm's segmentary movement, a cam-lever arranged and adapted to move said arm and to gradually start and accelerate its movement throughout the radius of its segmental movement, means including said traction-rope and clip for operating said cam-lever to operate said arm in the operative direction of its movement, means including a gravity device for returning said arm to its normal position and a buffer device adapted and arranged to receive and cushion the return movement of said arm, substantially as described.

14. In tramway-terminals the combination with the traction-rope and clip, of the accelerating device comprising a segmentally-swinging arm having a resiliently-movable bucket-engaging head, a cam member operatively arranged to start and gradually accelerate said arm, the supports for said arm and cam-lever, the buffer, and means connected with said clip whereby said accelerating device is caused to start and to gradually accelerate the movement of each bucket until it has attained substantially the speed of said traction-rope while said clip is being attached to said buckets and before it takes it from the accelerator, and means for returning said accelerating device to its normal position, substantially as described.

15. The combination in tramway-terminals, of the traction-rope, the clip and slide arranged to engage said clip, the traction-rope, the clip-guideway, and the slide mounted to reciprocate on said guideway, with the accelerating device comprising the bucket-carrying arm, the cam-lever arranged to start and accelerate said device, the buffer, the weight for returning said arm to its normal position

and the pin in said slide arranged to engage said cam-lever, substantially as described.

16. The combination in wire-rope-tramway terminals having a clip-releasing station and a loading and dumping station at each terminal, of the traction-rope, the clips and the buckets operatively arranged and adapted to automatically and intermittently engage and separate from said clips at said clip-releasing station and to engage said buckets at said loading or dumping station at predetermined points on said terminals, with means including an automatic gripping and releasing device and an automatic bucket gripping, holding and releasing device and intermediate mechanism between said clip-gripping and said bucket-gripping device whereby said clip-gripping device operates said bucket-gripping device to move said incoming bucket from the clip-releasing station to said bucket loading or dumping station, and a bucket starting and accelerating device coöperatively arranged and adapted to be operated by said clip and clip-gripping device, and comprising a swinging arm arranged to engage and hold said bucket at the loading or dumping station, a cam member arranged to engage said swinging arm and to start and gradually accelerate its movement and the movement of the buckets throughout the radius of its movement until said bucket is moving substantially as fast as said traction-rope, and while said clip is being locked to said bucket substantially as described.

17. In tramway-terminals the combination with the traction-rope and buckets having a depending pin, of the dumping device comprising a rod arranged to be engaged by said pin at said dumping-station, levers pivoted to said rod and arranged to move said rod to turn said buckets to discharge their contents, a rope secured at one end to said dumping-levers, a shaft arranged vertically in said frame, a grip-wheel operatively supporting said traction-rope and mounted on said shaft, a disk loosely mounted on the top of said shaft, an arm extending from said disk and secured to the opposite end of said rope a notched clutch-surface on the lower periphery of said disk, a second disk having a notched clutch-surface registering opposite said notched clutch-surface of said first-named disk and secured to said shaft, a cam formed on said disk, mechanism adapted to normally hold said disk and cam out of engagement with said clutch-disk and arranged to be intermittently engaged by the passing buckets to cause engagement of said clutch-surface and a revolution of said disk and cam to dump said buckets substantially as described.

18. The combination in tramway-terminals of the frame, the upper and lower tracks, the stationary and traction ropes, the grip-wheel and its shaft, the clip, the buckets and the clip and the bucket engaging, locking, releasing and moving mechanism, with the

bucket-dumping mechanism comprising the bucket-tilting rods and levers, the combined clutch and cam disk and actuating-arm loosely mounted on said shaft, the clutch-disk secured to said shaft in operative relation to said clutch and cam disk, the pin reciprocally arranged to engage said cam, a lever member arranged to extend normally over the said tracks and into the path of said buckets, intermediate mechanism between said lever member and said pin and a flexible connection between said arm of said combined disk and cam and said bucket-tilting members, substantially as described.

19. In tramway-terminals having a dumping-station the combination with the frame and the traction-rope, the clip the tracks and the buckets, of the grip-wheel and its shaft operatively supporting said traction-rope, a clutch-disk loosely mounted on said shaft, an opposing clutch member secured to said shaft and revoluble with it and arranged in operative relation to said clutch-disk, an arm extending from said clutch-disk, a series of levers and rods arranged on the base of said frame, a suitable connection between said series of rods and levers and the arm of said clutch-disk whereby when said arm moves said system of levers are moved to tilt said buckets at said dumping-station, an inclined cam on a portion of the diameter of said clutch-disk, a pin arranged to engage said cam portion and to normally hold said clutch-disk out of engagement with said clutch member, a reciprocating lever arranged to project normally into the path of the outgoing buckets and intermediate mechanism between said pin and reciprocating lever, substantially as described.

20. In tramway-terminals the combination with the tracks, the buckets, the traction-rope, the clip, the grip-wheel and its supporting-rope, of the disk-clutch secured to said shaft, the combined clutch and cam disk loosely mounted on said shaft in operative relation to said disk-clutch, the pin engaging said cam, the rock-arm pivoted at one end to said pin, the lever pivoted to the opposite end of said rock-arm and the spring-lever secured at one end to said lever and at its opposite end to said terminal and arranged to extend over said tracks into the path of the passing buckets and be engaged by said buckets and moved to withdraw said pin from said clutch-cam and allow it to engage said disk-clutch whereby said clutch-disk and its arm are rotated by said disk-clutch and grip-wheel a partial revolution and said clutch-disk is disengaged from said disk-clutch by said cam and pin at the end of its revolution, substantially as described.

21. The combination of a traction-rope, the clips and the buckets, with the bucket-gripping device, the clip-gripping device and the levers pivotally connected together and to said clip and bucket gripping device and ar-

anged and adapted to actuate said clip and bucket gripping devices, substantially as described.

22. The combination of a wire-rope-tramway-terminal frame having a clip-releasing and a bucket loading and dumping station, with a traction-rope, clips attached to said traction-rope, a bucket engaging and gripping device adapted to engage and grip loosely the buckets at the clip-releasing station, and means detachably secured to said clip for actuating said bucket-gripping device to move said buckets from the said clip-releasing to the loading or dumping station, substantially as described.

23. The combination in a wire-rope-tramway-terminal frame having a clip-releasing and a bucket loading or dumping station, of the traction-rope, the clips and the buckets, with a reciprocating, bucket-gripping device arranged to engage and grip loosely the buckets at the clip-releasing station, a reciprocating clip-engaging device arranged and adapted to engage each clip at the clip-releasing station and intermediate mechanism between said clip-engaging device and said bucket-engaging device whereby said buckets are moved from said clip-releasing station to said loading or dumping station by said clip-engaging device, substantially as described.

24. In wire-rope-tramway terminals having a clip-releasing station, a bucket loading and unloading station and a bucket gripping and accelerating device, the combination with the terminal frame, the traction-rope, the clips, the buckets and the bucket and clip locking and unlocking mechanism, of a bucket gripping and releasing device arranged and adapted to reciprocate along said terminal, and a clip gripping and releasing device arranged and adapted to reciprocate along said terminal, means connected with said clips and bucket-gripping devices whereby said clips and traction-rope move said buckets from said clip-releasing station to said loading or dumping station, and an accelerating device adapted to grip and hold to a bucket at said dumping-station, and means connected with said clip for actuating said accelerating device to start said buckets and accelerate their speed to substantially that of said traction-rope, substantially as described.

25. The combination with the frame, the traction-rope, the clips, and the buckets, of the bucket gripping, moving and releasing mechanism and the accelerator comprising the swinging arm, the cam-lever, and the buffer, and means connected with said clip and bucket gripping, moving and releasing mechanism for actuating said bucket-accelerator, substantially as described.

26. The combination with the traction-rope and the clip, of a device for accelerating the buckets, comprising means including a bucket-gripping device for holding the buckets, a cam-lever for moving said bucket-grip-

ping device and means connected with said clip for actuating said cam-lever, substantially as described.

27. In wire-rope-tramway terminals having
5 a clip-releasing and a bucket loading and
dumping station, the combination with the
terminal frame, the tracks, the traction-rope,
the clips, the buckets and the bucket and clip
locking and unlocking mechanism, of a
10 bucket-gripping device for gripping a bucket
at the clip-releasing station, a clip-gripping
device for gripping the clips at the clip-re-
leasing station, means for operating said
bucket-gripping device to move said buckets
15 from said clip-releasing station to said load-

ing or dumping station, an accelerating de-
vice comprising a reciprocating arm adapted
to engage and grip said buckets at the load-
ing or dumping station, means including a
cam for starting and accelerating said recip- 20
rocating arm throughout its operative move-
ment, and means connected with said clips
for actuating said cam, substantially as de-
scribed.

In testimony whereof I affix my signature 25
in presence of two witnesses.

CHRISTOPHER T. FINLAYSON.

Witnesses:

BESSIE THOMPSON,

CLAUDE A. DUNN.