No. 793,312. PATENTED JUNE 27, 1905.

A. W. MORGAN.

AUTOMATIC TROLLEY POLE.

APPLICATION FILED JAN. 30, 1905.

3 SHEETS—SHEET 1.

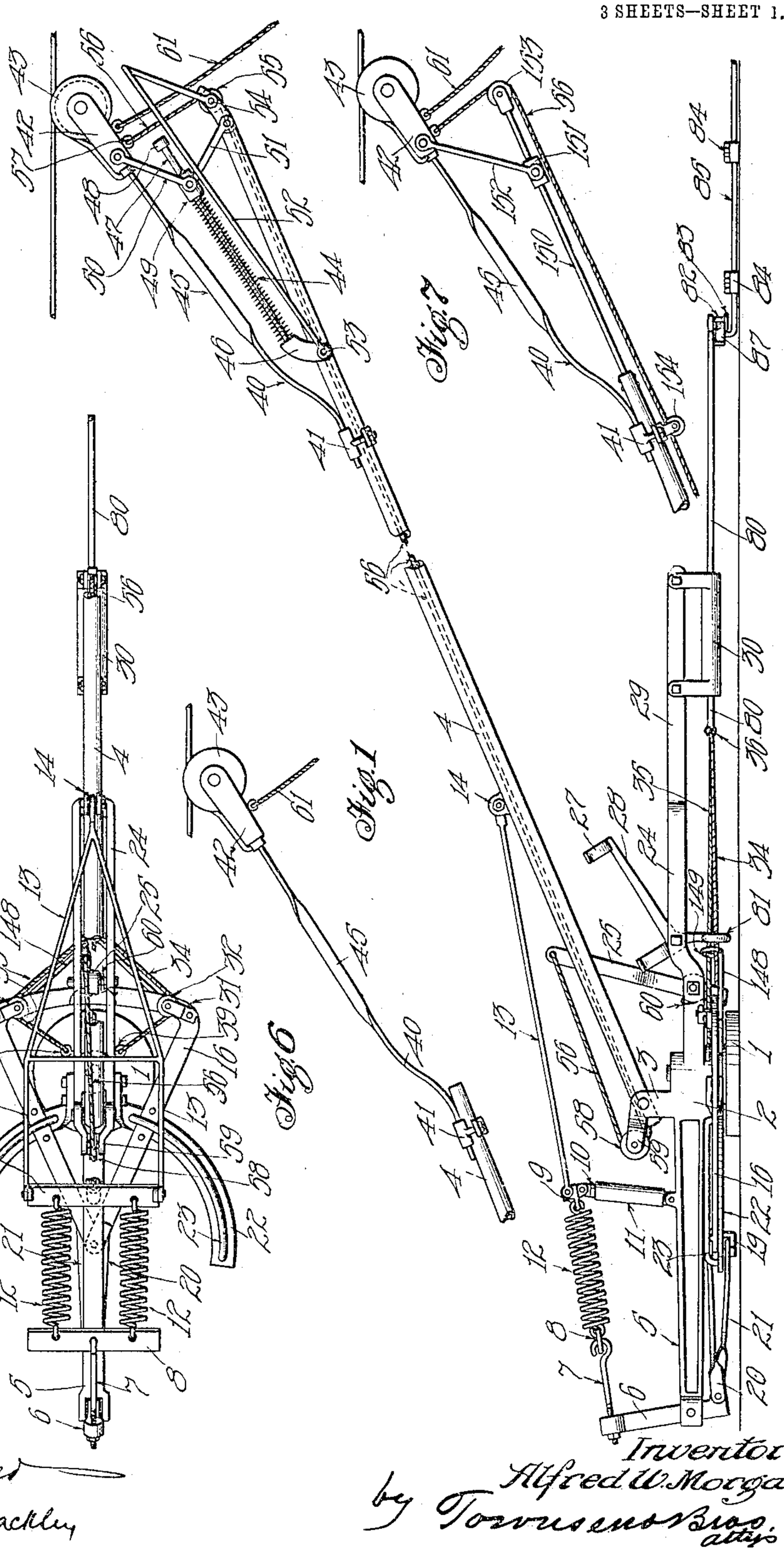

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

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3 SHEETS—SHEET 2.

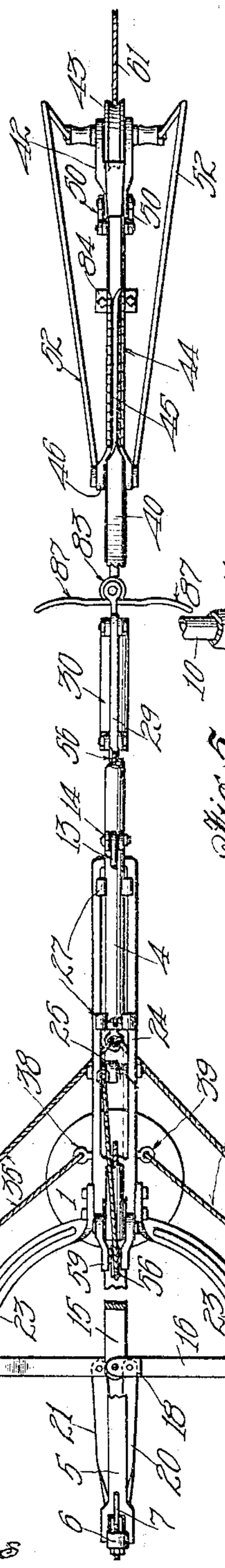

Fig. 4.

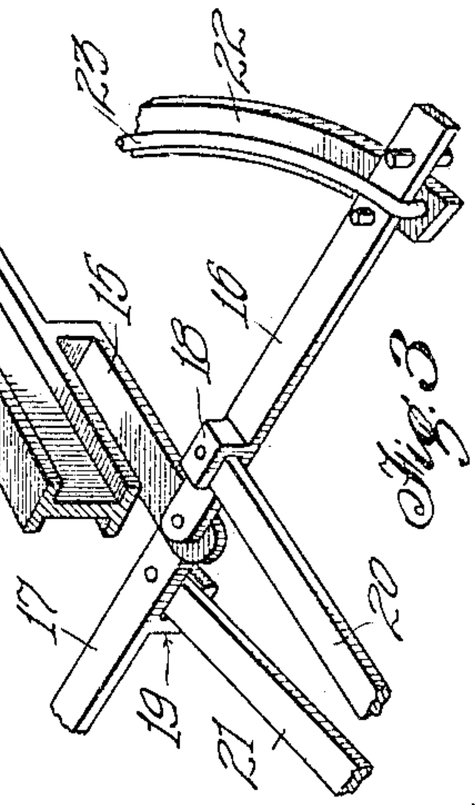

Fig. 5.

Fig. 3.

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3 SHEETS—SHEET 3.

Fig. 10

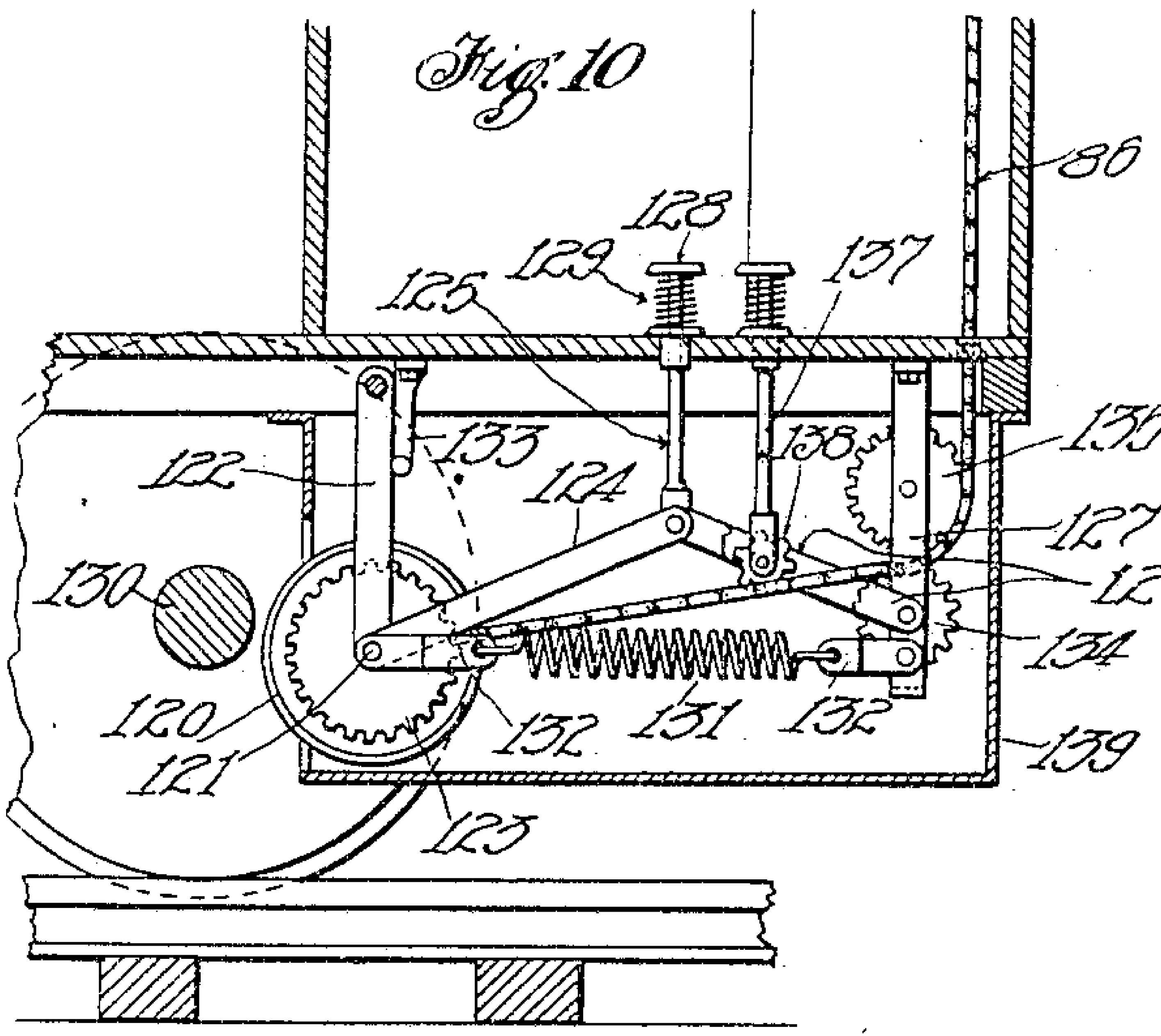


Fig. 8

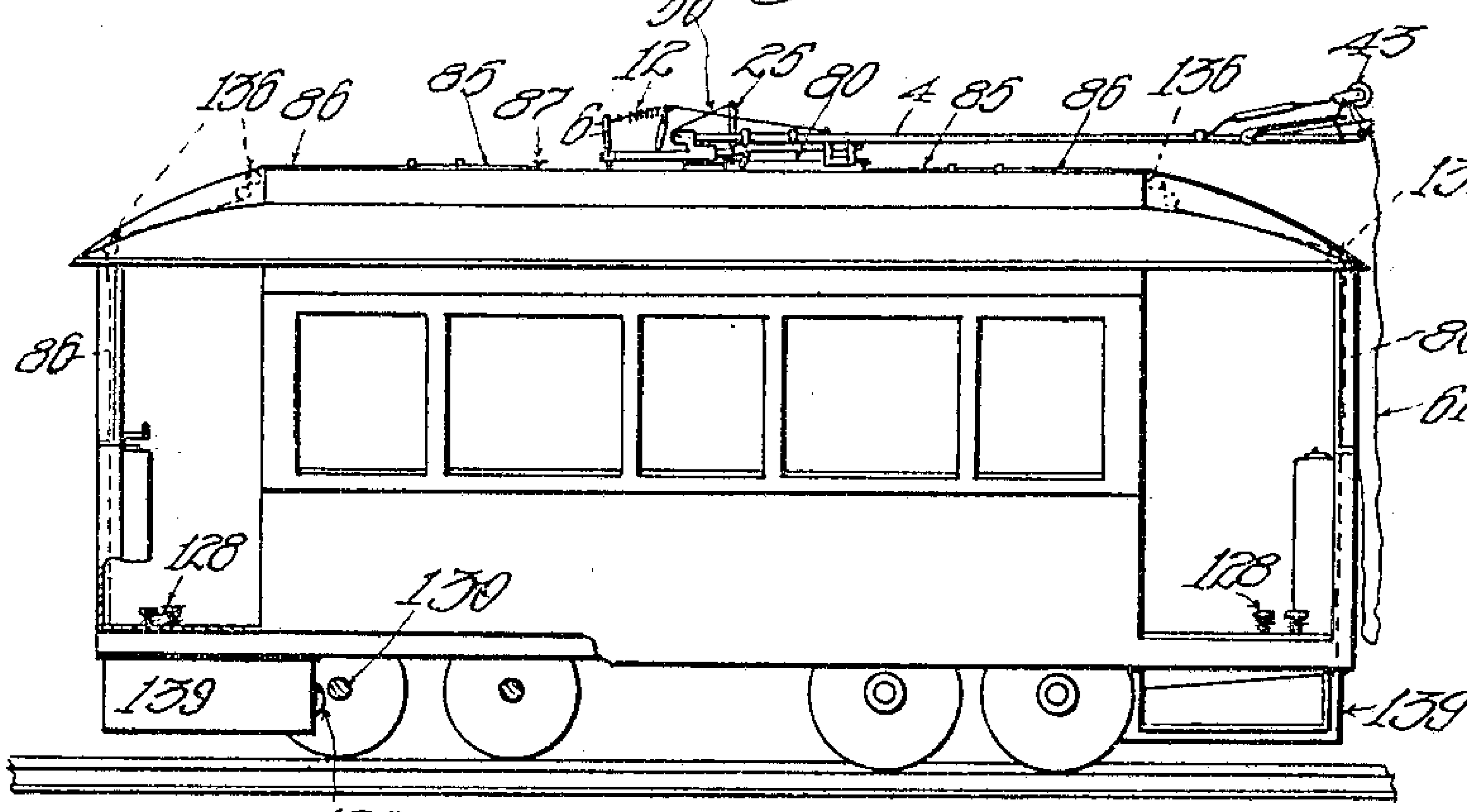
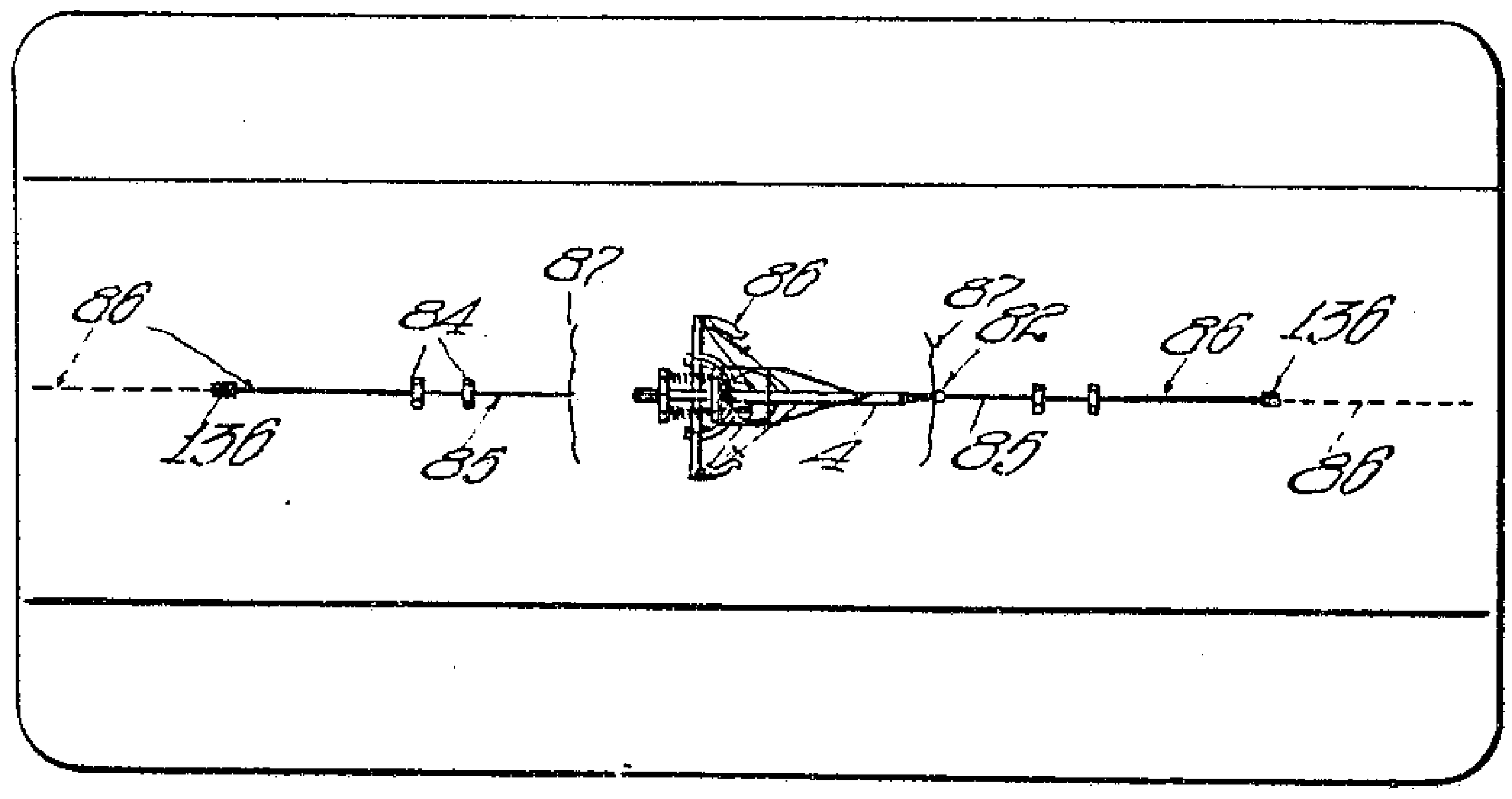


Fig. 9



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No. 793,312. Patented June 27, 1905.

UNITED STATES PATENT OFFICE.

ALFRED W. MORGAN, OF LONGBEACH, CALIFORNIA.

AUTOMATIC TROLLEY-POLE.

SPECIFICATION forming part of Letters Patent No. 793,312, dated June 27, 1905.

Application filed January 30, 1905. Serial No. 243,201.

To all whom it may concern:

Be it known that I, ALFRED W. MORGAN, a citizen of the United States, residing at Longbeach, in the county of Los Angeles and State of California, have invented a new and useful Automatic Trolley-Pole, of which the following is a specification.

This invention relates to that class of trolley-poles which when the trolley jumps from the wire are dropped below the wire to prevent the pole from hitting on guy-wires or other overhead structure. Heretofore trolley-poles having this function have usually been thrown down by compressed air or springs; but in the present invention the pole drops by gravity, and the difficulties of using compressed air for this purpose are avoided, the main object of the invention being to provide a trolley-pole which when the trolley flies off from the wire will automatically drop.

Another object is to provide a novel mechanism at the top of the pole for resiliently supporting the trolley with respect thereto, so that the trolley will have a quick and active movement and accommodate itself to irregularities in the wire and to sudden changes in the elevation of or lateral deviation of the trolley-wire without the main trolley-pole moving up or down or sidewise, thereby securing an excellent contact between the trolley and wire and greatly reducing the tendency of the trolley to leave the wire. Where the trolley is carried directly on the top of the pole, any slight irregularity in the wire tends to displace the pole, and the inertia of the pole prevents a quick recovery, so that the trolley frequently flies from the wire, which disadvantage is eliminated in the present invention.

Another object of the invention is to provide a unique power device for restoring the pole, so that the trolley rests against the wire.

The accompanying drawings illustrate the invention, and, referring thereto, Figure 1 is a side elevation of the invention, showing the trolley resting against the wire and all the parts in normal position. Fig. 2 is a plan view of the operating mechanism and lower part of the pole, all parts being in the position shown in Fig. 1. Fig. 3 is a side elevation of the invention, showing the pole as having dropped to a horizontal position. Fig. 4 is a plan view of the invention, the pole being in the position shown in Fig. 3, with the balancing-springs and other connections removed. Fig. 5 is a perspective view showing the pivoted ends of the catch-levers and their support. Fig. 6 is a side elevation showing the spring-carrier. Fig. 7 is a side elevation showing a modified form of spring-carrier. Fig. 8 is a side elevation of a trolley-car, showing the pole and pole-operating mechanism in position. Fig. 9 is a plan view of the car with part of the trolley-pole broken away to show the controlling-ropes entering through the roof. Fig. 10 is an enlarged sectional view of the power mechanism for raising the pole. Figs. 11 and 12 are broken, enlarged detail views of portions of the pole raising and locking mechanism.

The invention comprises means for resiliently supporting the trolley upon the pole and suitable catch mechanism for normally preventing the pole from dropping and a connection from the resilient trolley-supporting means to said catch mechanism for releasing the latter when the trolley takes a quick movement relatively to the pole.

The invention also embraces a power mechanism for raising the pole.

The invention also includes a novel means for supporting the trolley resiliently with respect to the pole.

In the preferred embodiment of the invention, 1 designates a base, which may be mounted upon the roof of the car, and swiveled to the base is a standard 2, having upwardly-extending wings 3, to which is pivoted a trolley-pole 4. Extending forwardly from the standard 2 is a rigid arm 5, having a forked arm, in which is pivoted a rock-arm 6, and to the upper end of the rock-arm 6 a hook 7 is attached, to which is connected a cross-bar 8. Another cross-bar 9 is pivotally mounted on the upper end of a plunger 10, which telescopes within a tube 11, the tube 11 at its lower end being pivoted to the arm 5, as shown in Fig. 1. A pair of extension-springs

12 connects the two cross-bars 8 and 9. The opposite ends of the cross-bar 9 are pivotally attached to a yoke-frame 13, (see Fig. 2,) the rear end of the frame 13 being pivoted to a lug 14 on the trolley-pole 4.

Projecting forwardly from the under side of the arm 5 is a tongue or bracket 15, and pivoted to the upper side of the bracket 15 is a catch-lever 16, a similar catch-lever 17 being pivoted concentrically with the arm 16, but below the tongue 15. The catch-arm 16 is provided on its top with an L-shaped lug 18, the catch-arm 17 being provided on its bottom with an L-shaped lug 19. A link 20 at one end is pivotally connected to the lug 18, its other end being twisted at right angles to the shank and pivoted to one side of the rock-arm 6, (see Figs. 1 and 2,) and a similar link 21 connects the lug 19 with said arm. Bolted to the standard 2 are a pair of segmental guides 22, which support the catch-arms 16 and 17. Each guide 22 is provided with a guard 23, which holds the catch-arms from moving upward from the guides. Extending rearwardly from the frame 2 is a yoke 24, to which is pivoted a locking-lever 25. Formed on each end of the levers 16 and 17 are detents 26.

When the pole is raised and rests against the wire, as shown in Figs. 1 and 2, the detents 26 engage opposite sides of the lower end of the locking-lever 25, (see especially Figs. 2 and 12,) thereby preventing outward movement of the catch-arms and holding the pole in elevated position.

A pole-restorer comprises rests 27, which are formed on a bell-crank lever 28, pivoted to the yoke 24. The lower end of the lever is provided with a triangular-shaped eye 81, through which the restoring-rope is adapted to be moved back and forth as the pole is raised or lowered. Extending rearwardly from the yoke is a beam 29, which supports a guide-block 30, in which is slidably mounted a rod 80. The rear end of the rod 80 carries a roller 82, having a bottom flange 83. At the angle of each catch-arm formed by the junction of the detents 26 are brackets 31, sheaves 32 and 33 being journaled therein. Restoring-ropes 34 and 35 are connected to the forward end of the rod 80 and pass through the eye 81, there being a knot 36, which when the eye 81 is in the slanting position shown in Fig. 3 will engage with the upper small notch of the eye 81, so that when the ropes 34 and 35 are pulled rearwardly the eye 81 will be pulled back by the knot 36, thus tilting the bell-crank lever, which will cause the eye 81 to slant in the opposite direction and allow the knot 36 to slip through the lower part of the eye; but when the rope and knot move in the opposite direction the knot, which is preferably pointed or cone-shaped forwardly, slips through the eye without moving the lever 28. The rope 35 passes over the sheave 33 and is fastened to an eye 38, which projects out from one side of the yoke 24, while the rope 34 passes over the sheave 32 and is fastened to an eye 39, projecting out from the other side.

In order to prevent the ropes 34 and 35 from sagging and from catching in the mechanism, rope-guides 148 are pivoted to the catch-arms 16 and 17 concentric with the sheaves 32 and 33, each rope-guide having an eye 149, through which the rope passes. These guides can freely swing to follow the line of the rope as it changes according to the position of the catch-arms.

Mounted upon the roof of the car at each end are guide-blocks 84, in which are slidably mounted rods 85, to the outer ends of which are attached chains 86. The inner end of each rod carries a pair of spreader-arms 87.

A resilient trolley-carrier 40 is fastened to the upper end of the pole by a clip 41. The free end of the trolley-carrier is provided with a harp 42, in which is mounted the trolley 43. The intermediate portion of the shank of the trolley-carrier 40 is twisted sidewise, as at 45, to provide for lateral swinging of the trolley, the other portions of the trolley-carrier 40 being at right angle to the flat part 45, provided for the vertical swinging of the trolley. A yoke 46 is pivoted to the trolley-pole beneath the trolley-carrier 40 and has a stem 47 with a head 48, and slidably mounted on the stem 47 is a block 49, which is connected by a pair of toggle-links 50 with the harp 42 and by another pair of toggle-links 51 with the upper end of the main trolley-pole, as shown in Figs. 1 and 3. The joints of the toggles with the harp and pole and with each other are made with sufficient play to permit of the lateral movement of the harp and wheel without interfering with the efficiency of the links in their vertical movements. A pair of guards is provided on the upper end of the trolley-pole, each guard comprising a wire 52, the forward end of which is fastened to a bolt 53, which bolt also acts as a pivot for the yoke 46. The rear end of each rod 52 is angularly bent and fastened at the extreme upper end of the main trolley-pole to the bolt 54.

The guard 52 is inclined upwardly and outwardly, as shown in Figs. 1, 3, and 4. The extreme upper end of the main trolley-pole is forked, and a sheave 55 is mounted therein upon the bolt 54, while a lock-controlling cord 56 is attached to an eye 57 on the harp 42, passes over the sheave 55, and through the interior of the trolley-pole 4 over a sheave 58 at the lower end thereof, the sheave 58 being mounted in brackets 59, projecting from the wings 3, the cord 56 being attached to the upper end of the locking-lever 25. A spring 60 encircles the pivot-bolt of the arm 25 between the arm and one side of the yoke 24 and by engaging with the yoke with one end and the arm with the other serves to normally hold the locking-arm 25 in position shown in Fig. 1. A trolley-rope 61 is fastened to the harp

42 and extends down over the edge of the roof of the car. The power mechanism for raising the pole is shown in Figs. 8, 9, and 10, and comprises a friction-wheel 120, carried by a shaft 121, journaled in swinging arms 122. A sprocket-wheel 123 is mounted concentric with the friction-wheel 120 and is rotatable therewith. The ends of a pair of toggle-links 124 are pivoted to the shaft 121, and their other ends are pivoted to the lower end of a pedal-rod 125, which extends down through the floor of the car, as shown. A pair of toggle-links 126 are pivoted at one end to the pedal-rod 125 and at the other end to a depending stationary bracket 127.

The upper end of the pedal-rod 125 has a pedal 128 and is held normally raised by a coil-spring 129, thus holding the toggle-links 124 and 126 flexed and the friction-wheel 120 free from the car-axle. As a further means for yieldingly holding the parts in this position, a strong coil-spring 131 is stretched between lugs 132, pivoted, respectively, to the lower ends of the bracket 127 and the arms 122. A bracket 133 forms a stop against which the arms 122 rest when in normal position.

Idler-sprockets 134 and 135 are mounted on the bracket 127, and the chain, before described, is attached to the sprocket 120, passes over the idler-sprocket 134 and under the idler-sprocket 135, thence up through the deck and over guiding-sprocket 136, then up through the roof of the car, as shown in Figs. 8 and 9. Pivoted to the toggle-links 126 is a pedal-rod 137, similar to the pedal-rod 125, which carries on its lower end a small idle sprocket 138. While for convenience of illustration the two pedal-rods 125 and 127 have been shown as arranged fore and aft of the car and of the same height, it may be desirable to construct them of unequal heights and to arrange them side by side in order that they may the more readily be distinguished one from the other by the operator and the more conveniently operated by the foot. This power raising apparatus is preferably inclosed by a casing 139, as it is arranged under the car and exposed to flying dust, small stones, &c., caused by the rapid movement of the car. Each end of the car is equipped with one of these power raising mechanisms, and the chain 86 of each passes up through the adjacent end of the car and connects with its respective slide-rod 85.

When the trolley is on the wire, the parts normally stand in the position shown in Fig. 1, the trolley-pole 4 being held up by the yoke 13, springs 12, hook 7, arm 6, links 20 and 21, and catch-levers 16 and 17, the latter being prevented from moving outwardly by the locking-lever 25, the springs 12 giving resiliency to the pole. As the car moves along the trolley-pole 4 plays up and down as the height of the wire varies, the springs 12 providing for the relatively slow and gradual up-and-down movement of the trolley-pole, and the trolley-carrier 40 is bent down toward the pole, the toggle-links 50 and 51 being flexed so that the spring 44 is under compression, and the spring 40 is flexed under a tension. If the pole rises slowly or to a considerable degree, the springs 12 take up the slack between the yoke 13 and hook 7, and the plunger 10 moves out from the tube 11, as the tendency of the hook 7 and yoke 13 is to take a straight line. Any abrupt change of the height of the wire causes a movement of the trolley-carrier from the springs 40 and 44, so that the trolley is maintained in close contact with the wire even though the main pole is too sluggish in action to respond to the change in elevation of the wire. When the trolley flies from the wire, however, the spring 40 moves up and the spring 44 expands its maximum degree, thereby straightening out the toggle-links 50 and 51, and as the harp is thus moved up it pulls on the rope 56, which throws the locking-arm 25 over to the left and into the position shown in Fig. 3, thereby releasing the detents 26, whereupon the arm 6 is free to tilt, and the trolley-pole 4, with the trolley and adjacent mechanism, drops and in dropping pulls the arm 6 to the right through the medium of the yoke 13, springs 12, and hook 7, the catch-arms 16 and 17 sweeping outwardly as the arm 6 rocks forward. The pole is arrested by the stops 27 and takes the position shown in Fig. 3, and when in that position the plunger 10 can move down no farther in the tube 11, and the movement of the arm 6 is arrested by the catch-arms 16 and 17 striking the ends of the guards 22 and 23. Thus the springs 12 would be put under tension at the time the yoke 13 swung below the straight line formed by the hook 7 and springs 12, as determined by the minimum height of the plunger 10. Thus the latter part of the drop of the pole is cushioned by the flexing of the springs 12, which softens the strike of the pole against the stops 27 and prevents undue strain on the mechanism.

When it is desired to raise the pole, the operator places his foot on the treadle 128 and forces it and the rod 125 downward, which tends to straighten the links 124 and 126, which will move the friction-wheel 120 into engagement with the axle 130. This of course will cause the sprocket-wheel 123 to revolve and wind the chain 86 around it, which in turn will pull the rod 85 through its bearings, and thereby draw upon the restoring-ropes 34 and 35 until they have drawn the arms 16 and 17 in, so that the locking-lever 25 can engage with the detents 26 and hold the arms against return movement until they are released, as by the trolley-wheel jumping the wire, as above described. As the outer ends of the arms 16 and 17 are thus moved to the rear they draw upon the links 20 and 21, and thereby draw the lower end of the lever 6 to the rear, which in turn forces the upper or longer

end of the lever forward, and with it the springs 12 and their connections, until the trolley-wheel is again placed in contact with the wire. If the operator desires to give the pole a preliminary start before placing the wheel 120 in engagement with the axle, he can place his foot upon the pedal of rod 137 and force it down, which will cause the sprocket-wheel 138 to flex the chain 86 sufficiently to draw the knot 36 into engagement with the eye 81 and tilt the lever 28 until it has partly raised the pole, after which he can force down the pedal-rod 125, and thereby move the wheel 120 into engagement with the axle 130 and complete the operation of raising the pole, as above described.

Fig. 7 shows a spring-shank 40, similar to the one in Fig. 1. The end of the trolley-pole carries a spring-rod 150, upon which is slidably mounted a block 151. A link 152 connects the block 151 with the harp 42. A sheave 153 is carried on the end of the spring-rod 150, while the rope 56, which is attached to the harp 42, passes over the sheaves 153 and 154. The spring-rod 150 can spring up and down or sidewise and reinforces the action of the spring-shank 40 in both its lateral and vertical action, the block 151 sliding over the rod 150 to permit the necessary relative movement between the two spring elements when in action.

What I claim is—

1. The combination with a pivoted pole, of a locking-lever and intermediate mechanism for holding the pole elevated and for allowing the pole to drop into a substantially horizontal position when said mechanism is released, and means for automatically restoring the pole to its elevated position.

2. The combination with a pivoted pole, of a locking-lever and intermediate mechanism for holding the pole elevated and for allowing the pole to drop into a substantially horizontal position when said mechanism is released, a trolley-carrier on the trolley-pole connected with the locking-lever for controlling the same, and means for automatically restoring the pole to its elevated position.

3. In combination, a standard, a pole pivoted thereto, catch-arms pivoted on the standard to swing laterally, a rock-arm pivoted to the standard and resiliently connected with the trolley-pole, and links connecting the catch-arms with the rock-arm.

4. In combination, a standard, a pole pivoted thereto, catch-arms pivoted on the standard to swing laterally, a rock-arm pivoted to the standard and resiliently connected with the trolley-pole, links connecting the catch-arms with the rock-arm, and a locking-lever pivoted to the standard and normally engaging the catch-arms.

5. In combination, a standard, a pole pivoted thereto, a pair of catch-arms pivoted to the standard to swing apart laterally of the standard, a rock-arm pivoted to the standard, and resiliently connected to the pole and links connecting the rock-arm and the catch-arms.

6. In combination, a standard, a pole pivoted thereto, a pair of catch-arms pivoted to the standard to swing apart laterally of the standard, a rock-arm pivoted to the standard, and resiliently connected to the pole, links connecting the rock-arm and the catch-arm, and a locking-lever pivoted to the standard and normally engaging both catch-arms.

7. In combination, a standard, a pole pivoted thereto, catch-arms pivoted on the standard to swing laterally, a rock-arm pivoted to the standard and resiliently connected with the trolley-pole, links connecting the catch-arms with the rock-arm, and means for normally holding the catch-arms in set position.

8. In combination, a standard, a pole pivoted thereto, catch-arms pivoted on the standard to swing laterally, a rock-arm pivoted to the standard and resiliently connected with the trolley-pole, links connecting the catch-arms with the rock-arm, a locking-lever pivoted to the standard and normally engaging the catch-arms, and means for tilting the locking-lever when the trolley flies from the wire thereby unlocking the catch-arms and allowing the pole to drop.

9. In combination, a standard, a pole pivoted thereto, catch-arms pivoted on the standard to swing laterally, a rock-arm pivoted to the standard and resiliently connected with the trolley-pole, links connecting the catch-arms with the rock-arm, a locking-lever pivoted to the standard and normally engaging the catch-arms, a trolley-carrier carried by the trolley-pole, and a connection from the trolley-pole, and a locking-lever for operating the same when the trolley-carrier moves away from the pole.

10. In combination, a standard, a pole pivoted thereto, a pair of catch-arms pivoted to the standard to swing apart laterally of the standard, a rock-arm pivoted to the standard, and resiliently connected to the pole, links connecting the rock-arm and the catch-arms, and means for normally holding the catch-arms in set position.

11. In combination, a standard, a pole pivoted thereto, a pair of catch-arms pivoted to the standard to swing apart laterally of the standard, a rock-arm pivoted to the standard, and resiliently connected to the pole, links connecting the rock-arm and the catch-arms, means for normally holding the catch-arms in set position, and means for releasing the catch-arms when the pole flies from the wire, thereby allowing the pole to drop.

12. In combination, a standard, a pole pivoted thereto, a pair of catch-arms pivoted to the standard to swing apart laterally of the standard, a rock-arm pivoted to the standard, and resiliently connected to the pole, links connecting the rock-arm and the catch-arms, a

locking-lever pivoted to the standard and normally engaging both catch-arms, and means for normally holding the locking-lever in engagement with the catch-arms and for disengaging the locking-lever therefrom when the pole flies from the wire, thereby releasing the catch-arms and allowing them to swing outwardly and permit the pole to drop.

13. In combination, a standard, a pole pivoted thereto, a pair of catch-arms pivoted to the standard to swing apart laterally of the standard, a rock-arm pivoted to the standard, and resiliently connected to the pole, links connecting the rock-arm and the catch-arms, means for normally holding the catch-arms in set position, a trolley-carrier on the trolley-pole, and means connecting the trolley-carrier with the catch-arms for releasing the latter by movement of the trolley-carrier.

14. In combination, a standard, a pole pivoted thereto, a pair of catch-arms pivoted to the standard to swing apart laterally of the standard, a rock-arm pivoted to the standard, and resiliently connected to the pole, links connecting the rock-arm and the catch-arms, a locking-lever pivoted to the standard and normally engaging both catch-arms, and means on the trolley-pole for normally holding the locking-lever in engagement with the catch-arms and for disengaging it from the catch-arms when the pole flies from the wire, thereby releasing both catch-arms and allowing the pole to drop.

15. In combination, a standard, a pole pivoted thereto, a pair of catch-arms pivoted to the standard, to swing apart laterally of the standard, a rock-arm pivoted to the standard, and resiliently connected to the pole, links connecting the rock-arm and the catch-arm, a locking-lever pivoted to the standard and normally engaging both the catch-arms, a trolley-carrier on the trolley-pole, and a connection from the trolley-carrier to the locking-lever for operating the same by movement of the trolley-carrier.

16. In combination, a standard, a pole pivoted thereto, catch-arms pivoted to the standard, to swing laterally, a rock-arm pivoted to the standard and connected with the pole, links connecting the rock-arm and catch-arms, and a flexible connection attached to the standard and playing over the catch-arms for raising the pole and restoring the catch-arms when pulled upon.

17. In combination, a standard, a pole pivoted thereto, catch-arms pivoted to the standard to swing oppositely laterally of the standard, a rock-arm pivoted to the standard and connected with the pole, links connecting the rock-arm and catch-arms, sheaves on the catch-arms, and a bifurcated flexible connection attached to the standard and running over the sheaves for raising the pole and restoring the catch-arm when pulled upon.

18. In combination, a standard, a pole pivoted thereto, catch-arms pivoted to the standard, a rock-arm pivoted to the standard and connected with the pole, links connecting the rock-arm and catch-arms, a pole-restorer pivoted to the standard, and a single means for operating the catch-arms and pole-restorer.

19. In combination, a standard, a pole pivoted thereto, catch-arms pivoted to the standard, a rock-arm pivoted to the standard, links connecting the rock-arm and catch-arms, a pole-restorer pivoted to the standard, and a bifurcated flexible connection attached to the catch-arms and having an operative connection with the pole-restorer.

20. In combination, a standard, a pole pivoted thereto, catch-arms pivoted to the standard and connected with the pole, links connecting the rock-arm and catch-arms, a rod slidably mounted on the standard, and a flexible connection attached to the slidable rod and to the standard and playing over the catch-arms.

21. In combination, a pivoted standard, a pole pivoted thereto, catch-arms pivoted to the standard, a rock-arm pivoted to the standard, links connecting the rock-arm and catch-arms, a rod slidably mounted on the standard, and a bifurcated flexible connection attached to the rod and to the catch-arms.

22. In combination, a pivoted standard, a pole pivoted thereto, catch-arms pivoted to the standard, a rock-arm pivoted to the standard, links connecting the rock-arm and catch-arms, a rod slidably mounted on the standard, and a bifurcated flexible connection attached to the rod and to the catch-arms, a roller on the end of the rod, roof-rods slidably mounted above the car-roof, spreader-arms on the roof-rods, either spreader-arm adapted to engage the roller.

23. In combination, a pivoted standard, a pole pivoted thereto, catch-arms pivoted to the standard, a rock-arm pivoted to the standard, links connecting the rock-arm and catch-arms, a rod slidably mounted on the standard, a bifurcated flexible connection attached to the rod and to the catch-arms, a roller on the ends of the rod, roof-rods slidably mounted above the car-roof, curved spreader-arms on the roof-rods, either spreader-arm adapted to engage the roller.

24. In combination with a car-axle, a trolley-pole carried by the car, and means operated by the car-axle for raising the pole.

25. In combination with a car-axle, a trolley-pole carried by the car, means for lowering the pole, and means operated by the car-axle for raising the pole.

26. In combination with a car-axle, a trolley-pole carried by the car, means for automatically lowering the pole when the trolley jumps from the wire, and means operated by the car-axle for raising the pole.

27. In combination with a rotating element

on the car, a trolley-pole carried by the car, and means operated by the rotating element for raising the pole.

28. In combination with a trolley-pole, means for automatically lowering the trolley-pole when the trolley jumps from the wire, a rotating element on the car, and means operated by the rotating element for raising the pole.

29. In combination with a pivoted trolley-pole, of means for raising the pole comprising a rotary element on the car, a friction-wheel, means for moving the friction-wheel into or out of contact with the rotary element, a flexible connection operated by the friction-wheel, and mechanism intermediate the flexible connection and trolley-pole for raising it.

30. In combination with a pivoted trolley-pole, the car-axle, a friction-wheel, means for moving the friction-wheel into or out of contact with the axle, and means operated by the friction-wheel for raising the pole.

31. In combination with a pivoted trolley-pole, the car-axle, a friction-wheel, a toggle device for moving the friction-wheel into contact with the axle, means operated by the friction-wheel for raising the pole, and pedal-operating means connected with the toggle device and projecting up through the floor of the car.

32. In combination with a pivoted trolley-pole, the car-axle, a friction-wheel, a toggle device for moving the friction-wheel into contact with the axle, a sprocket operated by the friction-wheel, an idler-sprocket, a chain connected with the first sprocket and passing over the idler-sprocket, suitable mechanism operated by the chain for raising the pole, pedal-operating means connected with the toggle device and extending up through the floor of the car, a spring for retracting the friction-wheel, another idler-sprocket for flexing the chain, and pedal-operating means carrying the latter idler-sprocket extending through the floor of the car.

33. In combination, a pivoted trolley-pole, mechanism for supporting the pole embracing a pair of pivoted catch-arms, sheaves on the catch-arms, ropes passing over the sheaves for operating the catch-arms, and rope-guides pivoted to the catch-arms concentric with the sheaves and having eyes through which the ropes pass.

34. A pivoted trolley-pole, mechanism for supporting the pole comprising a standard, a rock-arm pivoted to the standard, a cross-bar connected with the rock-arm, a yoke-frame connected to the trolley-pole, a cross-bar connected to the yoke-frame, springs connecting the cross-bars, a tube pivoted to the standards, a plunger in the tube connected to the second-named cross-bar, the length of the plunger being sufficient to maintain its attached cross-bar at a height above the first cross-bar and the point of attachment of the yoke-frame with the trolley-pole when the latter is lowered.

35. A trolley-carrier comprising a spring-shank twisted to form portions having planes at right angles to each other, a harp carried at the upper end of the spring-shank, a trolley in the harp, a spring extension on the trolley-pole, a block on the spring extension and a link connecting the block and harp.

In testimony whereof I have hereunto set my hand, at Los Angeles, California, this 11th day of January, 1905.

ALFRED W. MORGAN.

In presence of—

GEORGE T. HACKLEY,

W. S. BOYD.