No. 786,489. PATENTED APR. 4, 1905.

M. O. DOLSON.

AUTOMATIC TROLLEY POLE CONTROLLER.

APPLICATION FILED JULY 28, 1904.

2 SHEETS—SHEET 1.

Fig. 4

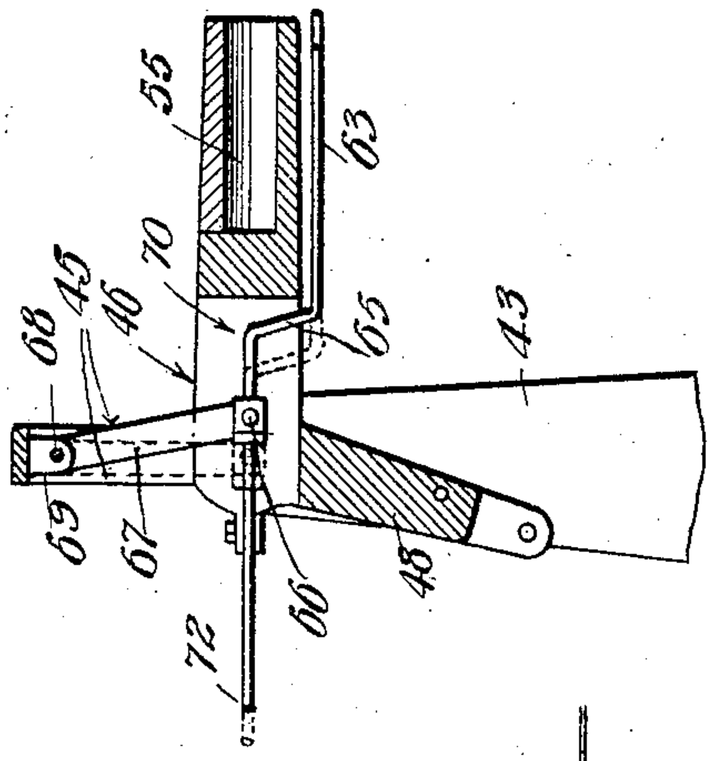


Fig. 3

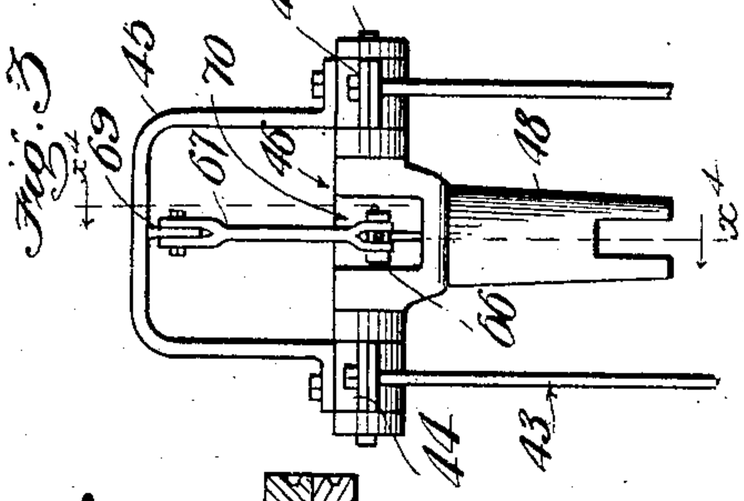
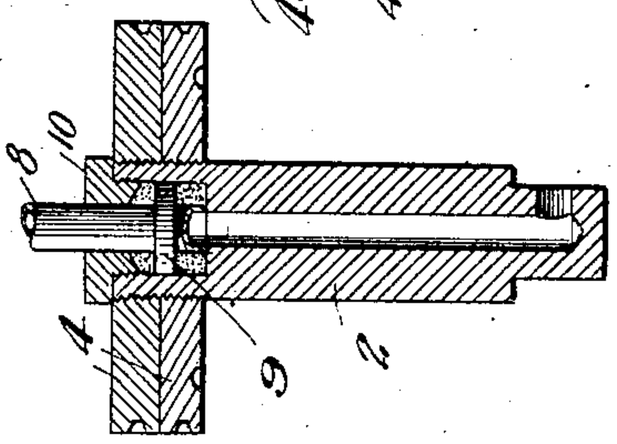


Fig. 12



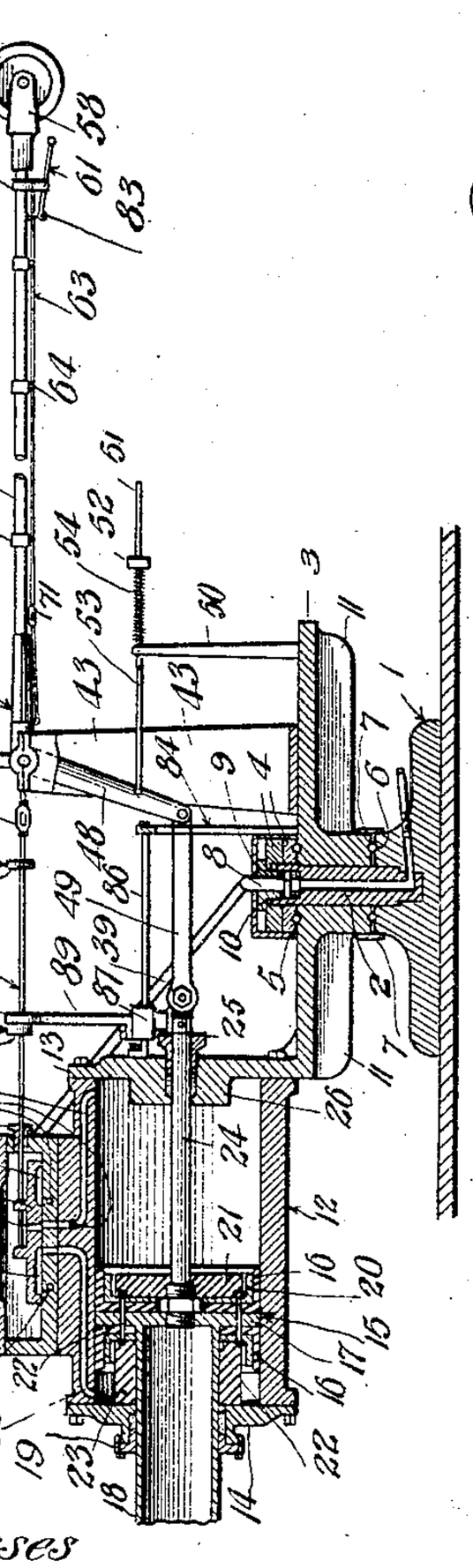
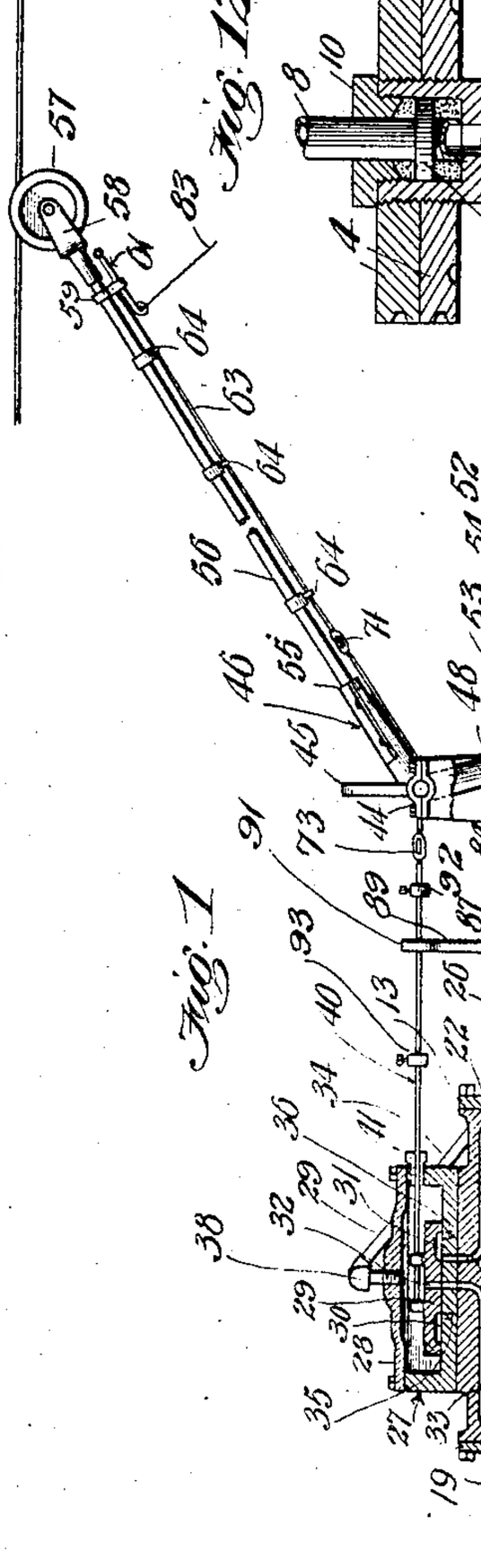


Fig. 2

Fig. 1



Witnesses
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AUTOMATIC TROLLEY POLE CONTROLLER.

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2 SHEETS—SHEET 2.

Fig. 6

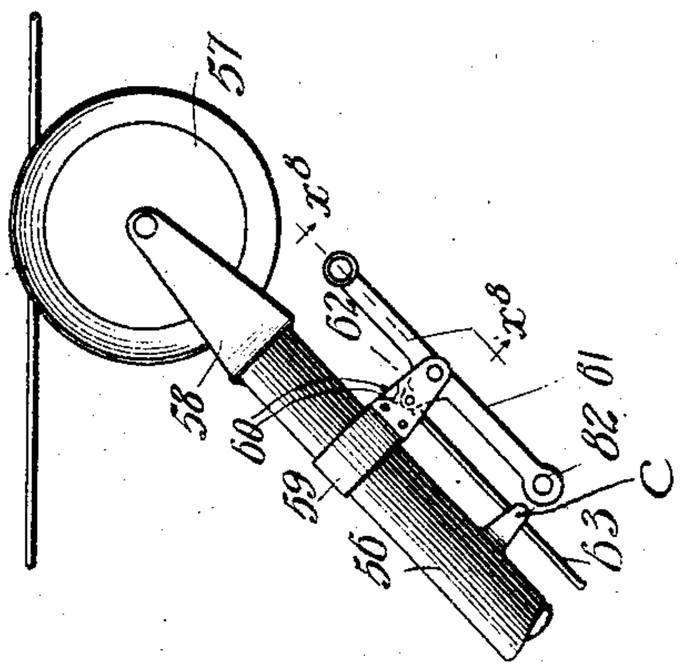


Fig. 8

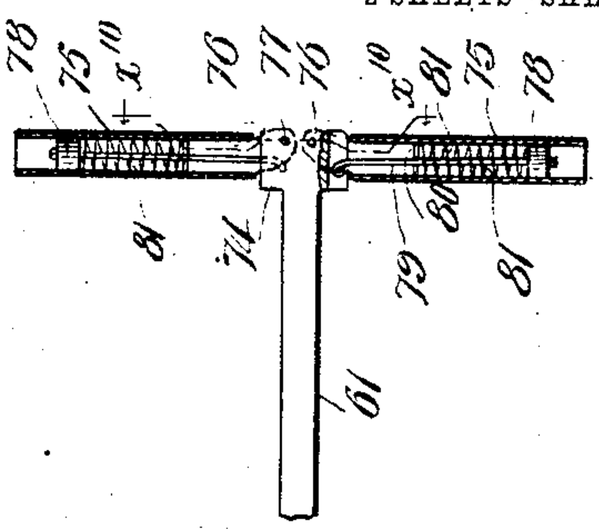


Fig. 9

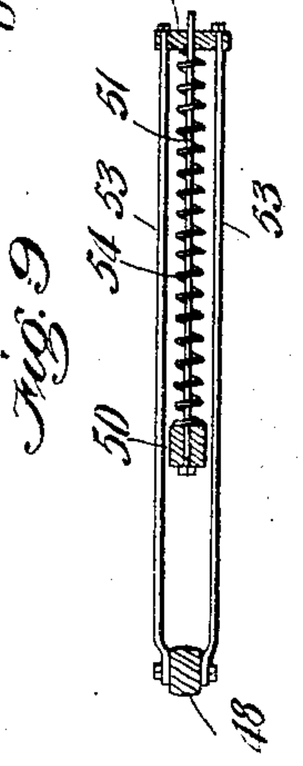


Fig. 10

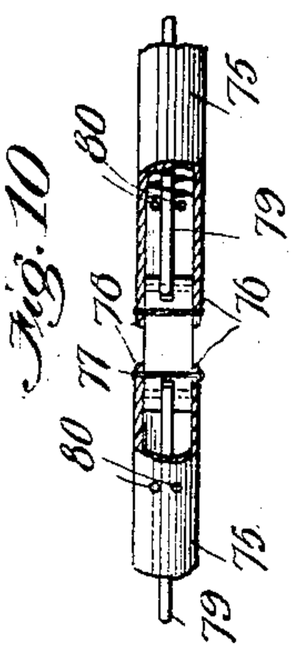


Fig. 5

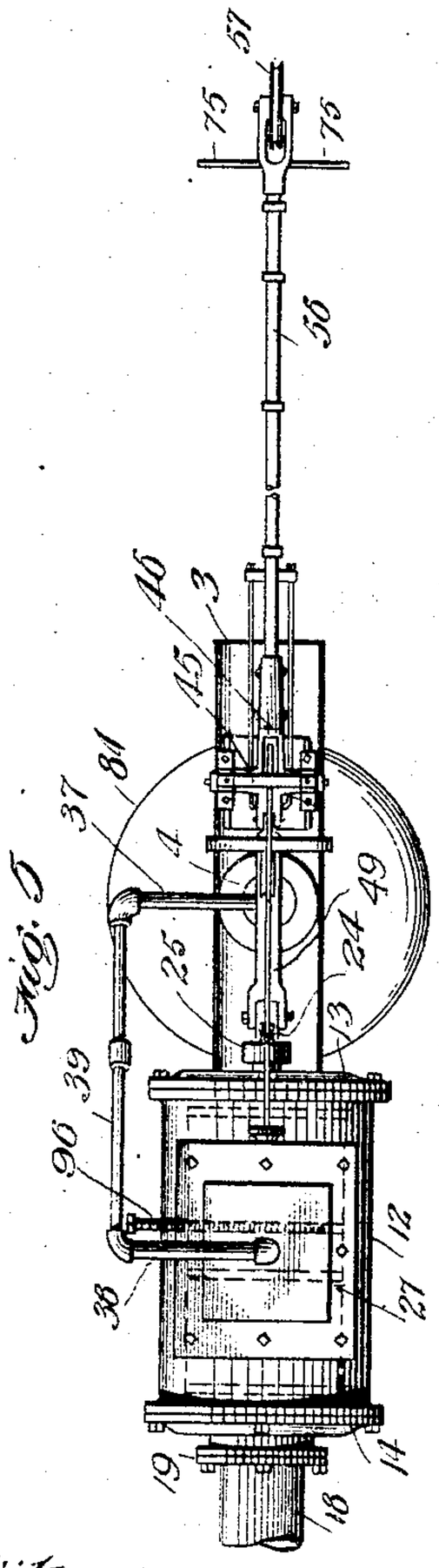
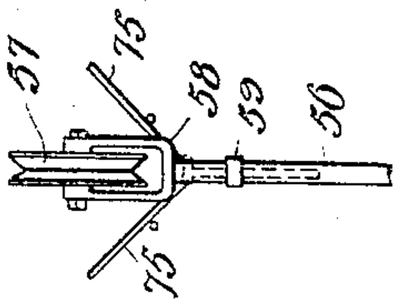
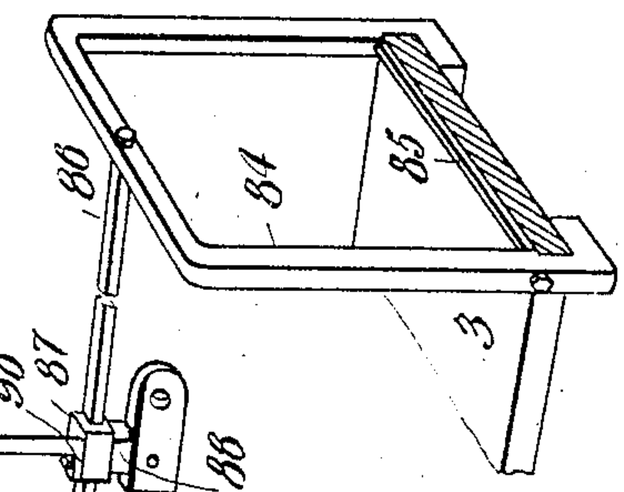


Fig. 7

Fig. 11





Witnesses
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G. T. Stackley

Inventor
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by Townsend Bros. atty

No. 786,489. Patented April 4, 1905.

UNITED STATES PATENT OFFICE.

MARTIN O. DOLSON, OF LOS ANGELES, CALIFORNIA.

AUTOMATIC TROLLEY-POLE CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 786,489, dated April 4, 1905.

Application filed July 28, 1904. Serial No. 218,544.

To all whom it may concern:

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

This invention relates to that class of controllers which are operated by fluid-pressure.

In a former application of mine for a trolley-pole controller, filed December 23, 1903, Serial No. 186,371, I have shown and described certain generic elements which are embodied in the present case, and the present application relates to improvements over the mechanism of the former application referred to.

The main object of the present invention is to provide means auxiliary to the mechanical means for controlling the pneumatic raising and lowering device which will positively insure the lowering of the pole in the event of the failure of the mechanical controlling means to operate. The mechanical controlling means depends for its operation upon certain devices coming in contact with the trolley-wire as the pole flies upwardly, and it is obvious that under some conditions these devices might not hit the wire—for instance, in case of a sudden breakage of the wire or if the trolley-pole should be given a sudden side jerk as it flies toward the wire, which would swing the pole so much to one side of the wire that the device referred to would miss the wire as the pole flew up after the side jerk.

Another object is to provide an improved form of tripping device.

Another object is to soften the drop of the pole near its bottom limit by relieving the fluid-pressure which throws down the pole and introducing a reverse pressure of sufficient strength and amount to absorb the inertia of the pole.

The accompanying drawings illustrate the invention, and referring thereto—

Figure 1 is a vertical longitudinal sectional view through the device, the trolley-pole being shown in its elevated position with the trolley resting against the wire. Fig. 2 is a view similar to Fig. 1, showing the trolley-pole depressed. Fig. 3 is a detail view, enlarged, looking at the rear face of the supporting-yoke for the trolley-pole and adjacent parts, the hinged elbow of the pole being sectioned. Fig. 4 is a section on line x^4 x^4, Fig. 3. Fig. 5 is a plan view of what is shown in Fig. 2. Fig. 6 is a side elevation of the upper part of the trolley-pole including the trolley and tripping device. Fig. 7 is a perspective view of the valve-stem, part of the piston-rod, cross-head, guide, valve-operating arm, and supporting-yoke for the guide. Fig. 8 is a section on line x^8 x^8, Fig. 6, enlarged. Fig. 9 is a plan view of the auxiliary suspension-spring with adjacent parts. Fig. 10 is a partial section on line x^{10} x^{10}, Fig. 8. Fig. 11 is a plan view of the upper end of the trolley-pole including the trolley and trip-lever and illustrates the action of the trip-lever members when caught between the two trolley-wires approaching a switch. Fig. 12 is an enlarged sectional view of the hollow swivel-pin and adjacent parts.

1 designates a base which is mounted on top of the car. (Not shown.) Forced into the base 1 is a hollow pin 2, and swiveled on the pin 2 is a table 3, there being nuts 4 screwed to the upper end of the pin to prevent the table from rising and two sets of ball-bearings 5 and 6 provided for the upper and lower faces of the table, respectively, the nuts 4 affording means for adjusting both bearings.

A sleeve 7 covers the crack between the table 3 and the case 1 and excludes dust from the lower bearings 6, while a dust-cap lies over the nuts 4 and protects the upper bearing. The upper end of the pin 2 terminates a short distance above the table 3, and a pipe 8 lies in the space within the adjusting-nuts 4, being provided with a flange 9, which practically fills the hole in the lower nut. A gland 10 is provided for the pipe 8 where it passes through the upper nut, suitable packing being provided both above and below the flange 9. The table 3 may thus be freely revolved upon the base 1, and as it turns the pipe 8 turns with it; but the pin 2 is stationary, being rigidly fastened to the base 1, and as an air-tight joint is formed between the pin 2 and the pipe 8 air under pressure may be con-

veyed therethrough to operate the pneumatic devices.

The table 3 is provided with ribs 11, which strengthen and stiffen it, and a cylinder 12 is attached to the front end of the table. One of the cylinder ends may preferably be formed of a plate 13, cast integral with the table 3, as shown, and the cylinder may be fastened thereto by cap-screws, as shown. The other end, 14, of the cylinder may be likewise fastened to the cylinder by cap-screws.

The cylinder 12 contains a piston 15, comprising a pair of cupped leathers 16, between which is a metal disk 17, and fastened to the front face of the disk 17 is a tube 18, which extends out through the head 14, the head 14 being provided with a gland 19 around the tube 18. Nested within each cupped leather 16 is a cupped metallic disk 20, and within the rear disk 20 is a buffer 21, formed, preferably, of rubber. The parts forming the piston are fastened together by bolts 22. Nested within the front cupped disk 20 is an annular rubber buffer 23, which encircles the tube 18. A piston-rod 24 is attached to the disk 17 and passes through the rear cylinder end 13 and through a suitable gland 25.

Projecting from the inside face of the head 13 and preferably cast integral therewith is a boss 26. The buffer 21 is adapted to strike against the boss 26 at one extreme of the throw of the piston, while the buffer 23 is adapted to strike against the head 14 at the other extreme of the stroke of the piston. Thus any jar which might occur at the extreme ends of the piston-stroke is obviated by the buffers.

On the cylinder-wall is a valve-chest 27, having a removable cover 28, and within the valve-chest 27 is a slide-valve 29, having two cavities 30 and 31 and a central passage 32. The cylinder-wall is provided with two passages 33 and 34 for the respective ends of the cylinder, the valve-chest ports of which lie close together, as illustrated. The valve-chest is provided with two outlet-passages 35 and 36.

A horizontal pipe 37 is attached by an elbow to the upper end of the pipe 8, while a horizontal pipe 38 communicates with the valve-chest 27, a pipe 39 connecting the pipes 37 and 38.

Air under pressure is delivered from the hollow pin 2 through the pipe connections just described to the valve-chest 27 irrespective of the position of the table 3 upon the base 1.

A valve-stem 40 is attached to the valve 29 and extends out through a suitable gland 41. Mounted on the rear end of the table 3 is a U-shaped standard 43, the two members of which are provided with split bearings at the top with removable caps 44. A bridge 45 is fastened to the caps 44.

An elbow 46 is provided with trunnions 47, which are pivoted in the bearings 44, and the lower arm 48 of the elbow is forked and connected with the piston-rod 24 by a link 49. A standard 50 is mounted on the table 3, (see Fig. 1,) and projecting rearwardly from the upper end of the standard 50 is a rod 51. Slidably mounted on the rod 51 is a cross-bar 52, which is connected by a pair of links 53 with the arm 48 at an intermediate point, there being a compression-spring 54 interposed between the standard 50 and the cross-bar 52. The upper member of the elbow 46 is provided with a socket 55, in which is mounted the trolley-pole 56. The upper end of the trolley-pole carries the trolley 57, mounted in the usual manner in the harp 58.

Attached to the trolley-pole 56 a short distance below the harp 58 is a clamp 59, having two ears 60, between which is pivoted a trip-lever 61, having a short arm 62, which projects toward the trolley-pole 56 and lies between the ears 60. A rod 63 is attached to the end of the short arm 62 and passes down along the trolley-pole through suitable guide-eyes 64 and at its lower end is offset, as at 65, and connected by a pivot 66 to the lower end of a rock-arm 67, the upper end of which is pivoted at 68 to a bracket 69 on the bridge 45.

The elbow 46 is provided with a slot 70 to give room for the lower end of the arm 67 and offset 65 of the rod 63. The rod 63 is provided with a turnbuckle 71 for adjusting its length. A rod 72 connects the arm 67 with the valve-stem 40, there being a turnbuckle 73 affording means for adjustment. The arm 67 is adapted to swing on its pivot 68, and the arc described by its moving pivot 66 intersects the axis of the trunnions 47, so that when the arm 67 hangs vertical, as illustrated by dotted lines in Fig. 4, which is its natural position when the trolley rests against the wire, the pivot 66 is concentric with the trunnions 47.

The end of the trip-lever 61 is formed in a T 74, and pivoted to the branches of the T are tubular arms 75. The ends of the arms are split and formed with ears 76, which lap over the T 74 and are pivoted at 77. Within each tubular arm 75 is a plunger 78, having a rod 79, which is pivoted to the adjacent member of the T 74. A pin 80 extends across the tube, and a compression-spring 81 is interposed between the cross-pin 80 and the plunger 78. It will be noted that the pivots 77 lie close to the outer edge of the T, so that the arms 75 may swing backward, as illustrated in Fig. 11, and that the arms are prevented from swinging forward by the edges of the tubes abutting against the ends of the T, as illustrated in Fig. 8. The springs 81 normally hold the arms 75 extended, as shown in Fig. 8. The lower end of the trip-lever 61 is provided with an eye 82, to which is attached the trolley-rope 83. A lug *c* projects from the under side of the pole 56 near the trip-lever, as shown in Fig. 6. This lug is perforated, the

wire 63 passing therethrough and serves to guide the wire and as a stop prevents the eye 82 of the trip-lever from interfering with the wire 63.

A U-shaped standard 84 is mounted on the table 3, (see Fig. 7,) the lower ends of the legs being notched and drawn against the edges of the table 3 by a tie-rod 85. The outer end of a guide-rod 86 is supported by the standard 84. The inner end of the guide-rod is attached to the end 13 of the cylinder.

Slidable on the guide-rod 86 is a cross-head 87, having an extension 88, which is fastened to the end of the piston-rod 24. An arm 89 is attached to the cross-head 87, being provided with a step 90, affording stability to the arm 89 and providing for attachment by a cap-screw. The upper end of the arm 89 has a fork 91. Collars 92 and 93 are adjustably mounted on the valve-stem 40 by means of set-screws 95.

In operation air is supplied through the hollow pin 2 and connecting-pipes with the valve-chest 27, and when the valve 29 stands at the left, as shown in Fig. 1, the compressed air enters through the passages 32 and 33 into the cylinder at the left of the piston, which holds the piston to the right, thus through the medium of the piston-rod, link 49, and elbow 46 holding the trolley-pole elevated, with the trolley resting against the wire, the space within the cylinder at the right of the piston being open to the atmosphere through passages 34 36 and valve-cavity 31. When the valve is in this position, the pivot 66 of the rock-arm 67 is concentric with the pivotal point of the trolley-pole and the trip-lever 61 lies substantially parallel with the trolley-pole. The pressure of the trolley against the wire produced by the fluid-pressure referred to is supplemented by the pressure produced by the spring 54. Thus as the car moves along and the trolley-pole is naturally worked up and down, owing to the variation in the height of the wire or rocking of the car, the position of the valve 29 is undisturbed, owing to the concentricity between the pivots 66 and trunnions 47. When, however, the trolley jumps from the wire, the pole flies up, owing to the pressure of the air behind the piston and to the pressure derived from the spring 54, and ordinarily when this occurs one or the other of the arms 75 will strike the trolley-wire, which results in tilting the trip-lever 61 and drawing up the rod 63, which rocks the arm 67 and through the medium of the valve-rod 40 pulls the valve 29 to the right, as shown in Fig. 2, which places the space at the left of the piston into communication with the outlet 35 and admits compressed air to the right of the piston through the passages 32 and 34, whereupon the piston is moved to the left of the cylinder and the trolley-pole is thrown down into substantially a horizontal position through the medium of the connections before described. Thus the trolley-pole is instantaneously depressed when it jumps from the wire. In case the trolley-wire should break or if the trolley should fly off and swing sidewise, so that neither of the arms 75 struck the wire, the pressure of the air at the left of the piston would elevate the pole somewhat, and as the piston-rod 24 moves to the right during this movement the arm 89 will be brought in contact with the collar 92, and a further slight movement of the piston shifts the valve to the right into the position shown in Fig. 2, thereby reversing the pressure within the cylinder, moving the piston to the left, and depressing the trolley-pole. As the trolley-pole comes down the arm 89 moves toward the collar 93 and strikes the collar just before the pole reaches a horizonal position, and this further slight downward movement of the pole shifts the valve to the left and almost closes the passage 34, which, while maintaining undiminished air-pressure against the right of the piston, reduces the rate of inflow of compressed air to the right of the piston, thereby forcing the piston to the left more slowly, and the pole comes easily to rest by reason of the diminished air-flow and the counteracting effect of the spring 54. Thus there is no shock when the pole is dropped. When the pole is to be elevated again to the wire, the trolley-rope is pulled upon, which tilts the trip-lever from the position shown in Fig. 2 into the position shown in Fig. 1, thereby shifting the valve to the left and admitting air to the left of the piston, thus raising the pole so that the trolley may be guided onto the wire by manipulating the rope in a manner similar to the operation of the ordinary spring-sustained trolley-pole.

The trolley may be withdrawn from the wire and the pole depressed by simply pulling on the trolley-rope and then easing up on the rope and guiding the trolley to one side of the wire, so that one of the arms 75 will hit the wire and tilt the trip-lever, which will of course depress the pole pneumatically.

In finding the wire the rope should be held taut, which will keep the trip-lever tilted, so that even though one of the arms 75 should hit the wire the valve will not be shifted, but power will be maintained to push the pole upwardly.

The rubber buffers on the piston cushion the stroke of the piston at its termination, and violent shocks are thereby avoided. The trip-lever 61 is frictionally held between the wings 60, being squeezed therebetween, and the trip-lever is thus prevented from accidentally jarring or creeping out of position, and it moves only when the rope is pulled upon or when one of the arms 75 strikes the wire.

In order to vary the size of the opening through the passage 34 to regulate the flow

of air in entering the forward end of the cylinder when the trolley is coming down, a throttling-screw 96 is provided. (See Figs. 1, 2, and 5.) In Fig. 5 the screw is shown as leaving only a small opening in the port 34.

What I claim is—

1. A trolley-pole, fluid-pressure means for operating the pole, a valve for controlling the fluid-pressure means, and means for automatically operating the valve when the pole swings to a certain lower limit.

2. A trolley-pole, fluid-pressure means for operating the pole, a valve for controlling the fluid-pressure means, and means for automatically operating the valve when the pole swings to certain upper and lower limits.

3. A trolley-pole, fluid-pressure means for operating the pole, a valve for controlling the fluid-pressure means, a device carried by the pole for operating the valve when said device hits the trolley-wire, and auxiliary means for automatically operating the valve when the pole swings to a certain upper limit.

4. A trolley-pole, fluid-pressure means for operating the pole, a valve for controlling the fluid-pressure means, a device carried by the pole for operating the valve when said device hits the trolley-wire, and means for automatically operating the valve when the pole swings to a certain lower limit.

5. A trolley-pole, fluid-pressure means for depressing the pole, and means for gradually applying the pressure of said means when the pole reaches a certain low limit.

6. A trolley-pole, fluid-pressure means for operating the pole, a valve for controlling the fluid-pressure means, means for automatically shifting the valve a definite degree when the pole reaches a certain high limit, and means for automatically shifting the valve reversely a less degree when the pole reaches a certain low limit.

7. A trolley-pole, fluid-pressure means for operating the pole, a device on the pole for controlling the fluid-pressure means when the device hits the trolley-wire, and means for decreasing the fluid-pressure when the pole reaches a certain low limit.

8. A trolley-pole, fluid-pressure means for operating the pole, a valve for controlling the fluid-pressure means, means for automatically shifting the valve a definite degree when the pole reaches a certain high limit, means for automatically shifting the valve reversely a less degree when the pole reaches a certain low limit, and further means for controlling the fluid-pressure means comprising a device on the trolley-pole operated by striking the wire.

9. Supporting means, a trolley-pole pivotally mounted thereon, a cylinder thereon, a piston in the cylinder connected with the pole, and a tube extending from the piston through one end of the cylinder for reducing pressure against one side of the piston.

10. Supporting means, a trolley-pole mounted thereon, a cylinder thereon, a piston in the cylinder connected with the pole and rubber buffers carried on both sides of the piston.

11. Supporting means, a trolley-pole mounted thereon, a cylinder thereon, a piston in the cylinder connected with the pole, the said piston comprising a central disk, a pair of oppositely-disposed cupped leathers thereon, and disks outside the cupped leathers with bolts passing through the disks and leathers.

12. A base, a table revolubly mounted thereon, a trolley-pole pivoted to the table, a cylinder on the table, a piston for the cylinder, a piston-rod connected with the trolley-pole, a standard on the table, a guide-rod extending from the standard to the cylinder, a cross-head mounted on the guide and connected with the piston-rod, a valve for the cylinder, a valve-stem, an arm mounted on the cross-head and lying adjacent the valve-stem, and a device on the valve-stem in the path of movement of the said arm.

13. A base, a table revolubly mounted thereon, a trolley-pole mounted on the table, a cylinder on the table, a piston and piston-rod therefor, a head screwed to the end of the piston-rod, a link connecting the head and the trolley-pole, a cross-head on said piston-head, a guide for the cross-head, a valve for the cylinder, a valve-stem, an arm on the cross-head, and devices on the valve-stem in the path of movement of said arm.

14. A base, a table revolubly mounted thereon, a trolley-pole mounted on the table, a cylinder on the table, a piston and piston-rod therefor, a head screwed to the end of the piston-rod, a link connecting the head and the trolley-pole, a cross-head on said piston-head, a guide for the cross-head, a valve for the cylinder, a valve-stem, an arm on the cross-head, devices on the valve-stem in the path of movement of said arm, a pair of links pivoted to the trolley-pole, a cross-bar carried by the links, and a compression-spring bearing against the cross-bar for sustaining the trolley-pole.

15. A base, a hollow swivel-pin mounted therein, a table, journals on said pin, suitable ball-bearings between the table and base, nuts screwed to the pin above the table, suitable ball-bearings between the nuts and table, in combination with a trolley-pole pivoted to the table, and fluid-pressure means carried by the table for operating the trolley-pole.

16. A base, a hollow swivel-pin mounted therein, a table, journals on said pin, suitable ball-bearings between the table and base, nuts screwed to the pin above the table, suitable ball-bearings between the nuts and table, a dust-cap over the nuts, and a suitable dust-band around the lower ball-bearing, in combination with a trolley-pole pivoted to the table, and fluid-pressure means carried by the table for operating the trolley-pole.

17. A base, a hollow pin therein, a table swiveled on the hollow pin, the upper end of the pin having a recess, a pipe having a flange lying within the recess, suitable packing within the recess on both sides of the flange, a nut surrounding the pipe and inclosing the packing, suitable annular nuts screwed to the pin above the table, in combination with a trolley-pole mounted on the table, fluid-pressure means on the table for operating the trolley-pole, and suitable pipe connecting the said pipe with the fluid-pressure means.

18. A pivoted trolley-pole, fluid-pressure means for operating the pole, a valve for controlling the fluid-pressure means, a valve-stem therefor, a pair of collars adjustably fastened on the valve-stem, and a device operated by the fluid-pressure means for contacting with said collars when the trolley-pole is near the limits of its swing.

19. A trip-lever having its end formed in a T, tubular arms having slitted ends forming ears which are pivoted to the T near the outer edge thereof, plungers within the tubular arms, and rods connecting the spring-pressed plungers with the T.

20. A table, a trolley-pole mounted thereon, a cylinder thereon, a valve for the cylinder, a U-shaped standard the legs of which are notched and lying over the edges of the table, a tie-bar clamping the legs against the edges of the table, a guide-rod fastened to the standard and to the cylinder, a piston and piston-rod for the cylinder, a cross-head on the guide and connected with the piston-rod, a valve-stem, an arm on the cross-head, and devices on the valve-stem lying in the path of movement of the arm.

In testimony whereof I have hereunto set my hand, at Los Angeles, California, this 19th day of July, 1904.

MARTIN O. DOLSON.

In presence of—
GEORGE T. HACKLEY,
JULIA TOWNSEND.