No. 808,198. PATENTED DEC. 26, 1905.

M. O. DOLSON.

VALVE GOVERNOR FOR TROLLEY POLE CONTROLLERS.

APPLICATION FILED FEB. 20, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

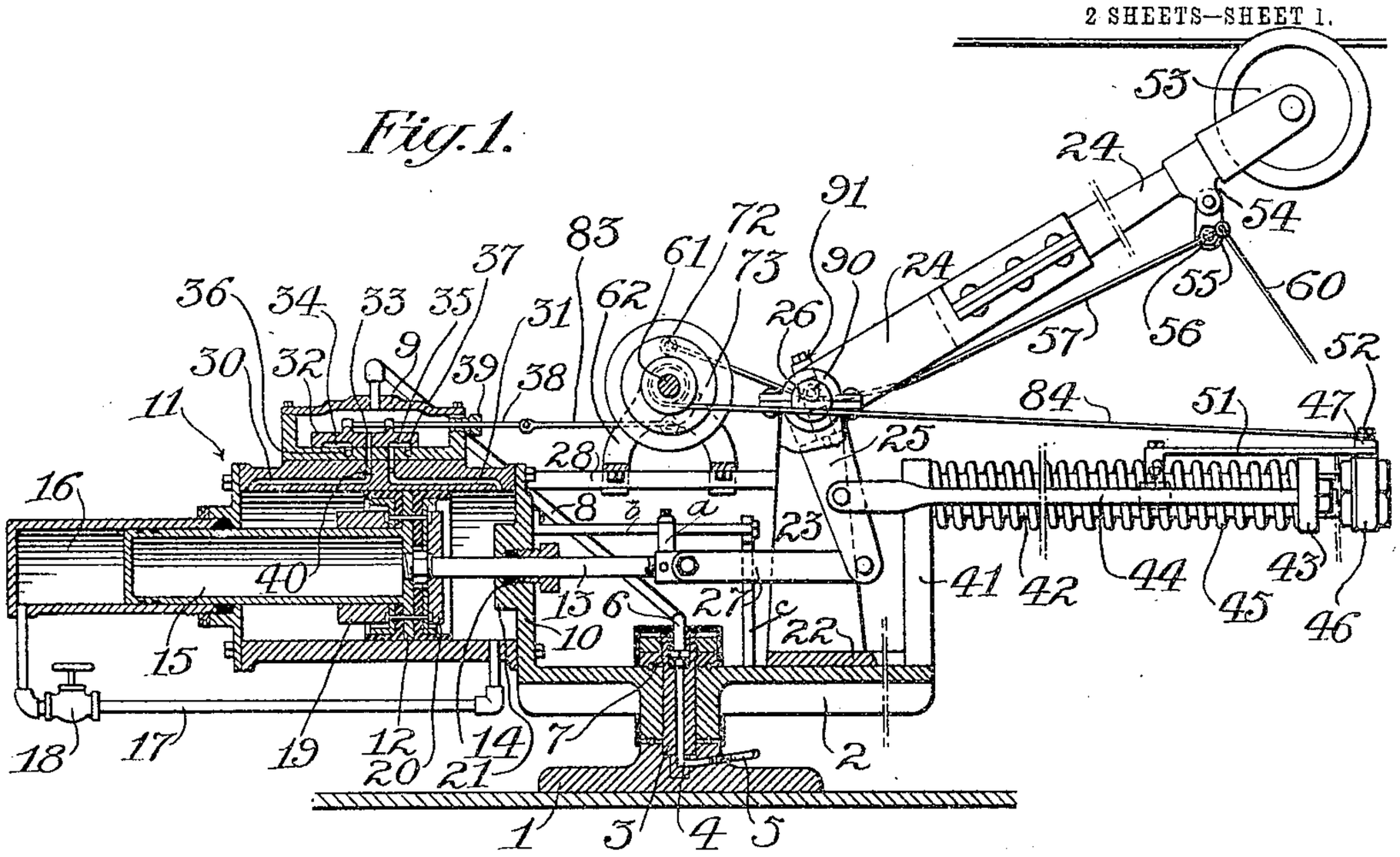
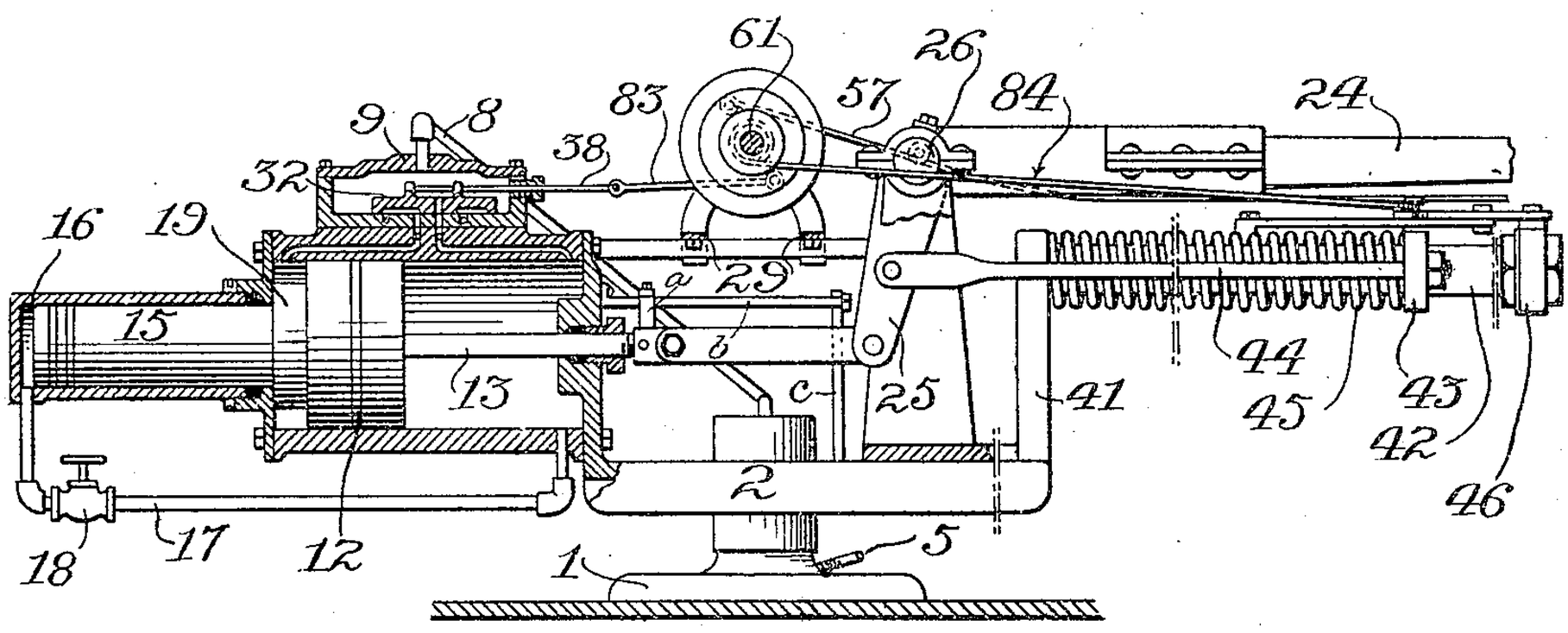


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

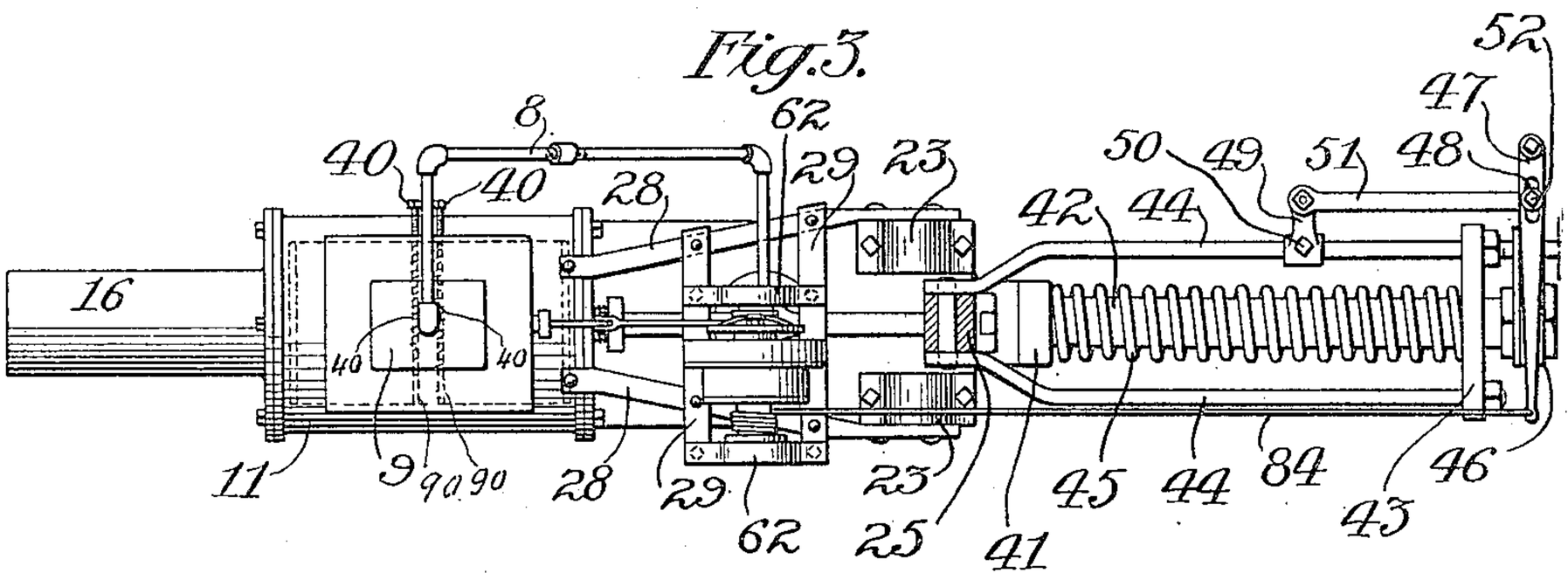


Fig. 4.

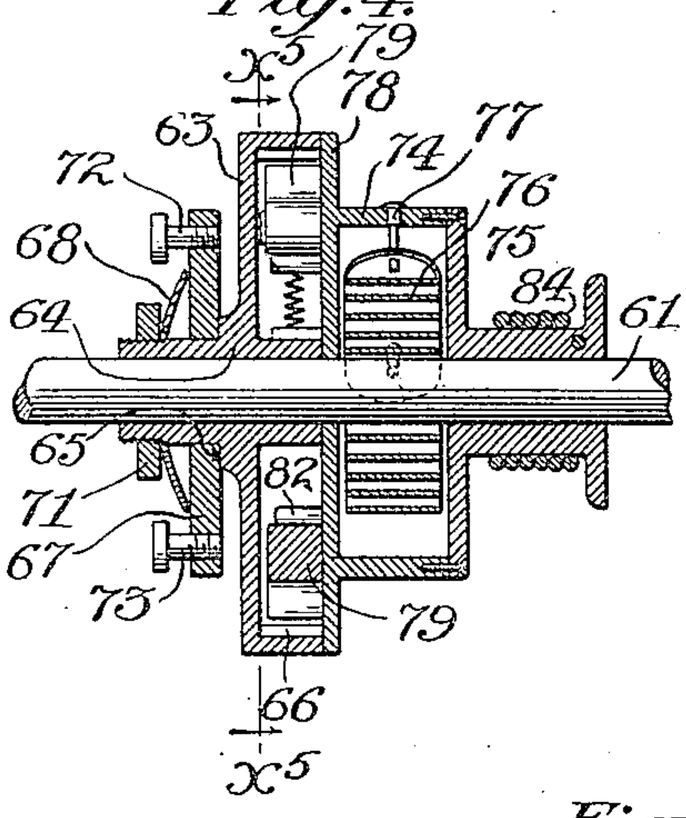


Fig 5.

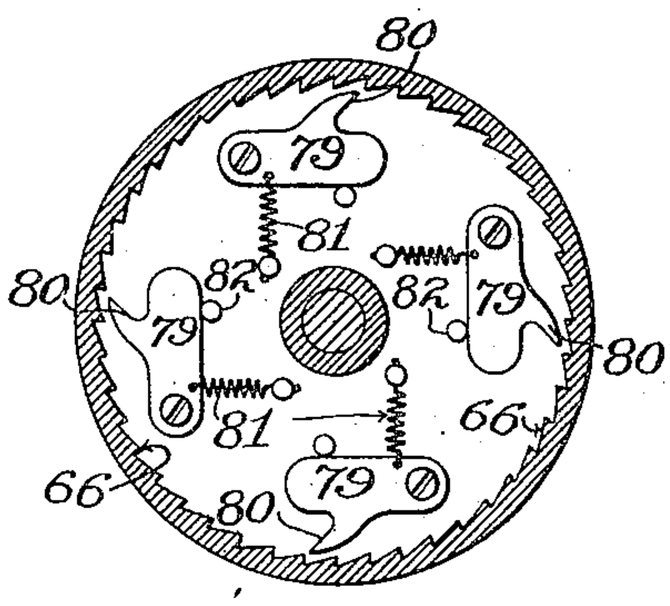


Fig. 6.

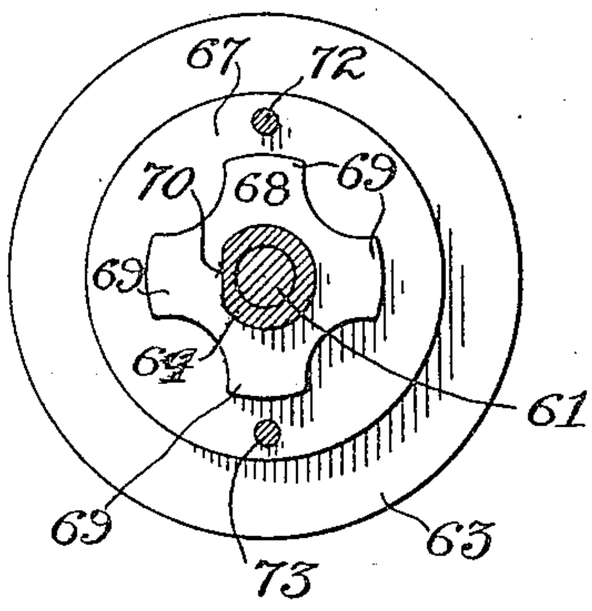
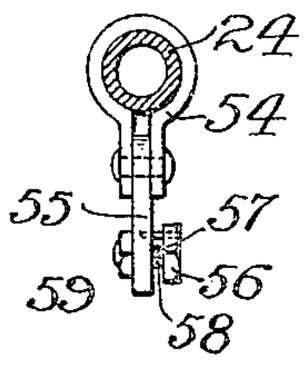


Fig. 7.



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UNITED STATES PATENT OFFICE.

MARTIN O. DOLSON, OF LOS ANGELES, CALIFORNIA.

VALVE-GOVERNOR FOR TROLLEY-POLE CONTROLLERS.

No. 808,198. Specification of Letters Patent. Patented Dec. 26, 1905.

Application filed February 20, 1905. Serial No. 246,499.

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 Valve-Governor for Trolley-Pole Controllers, of which the following is a specification.

This invention relates to trolley-pole controllers of the pneumatic type; and the main object of the invention is to provide a novel device actuating when the trolley-pole makes a sudden movement upwardly to throw the valve and cause the trolley-pole to be automatically lowered.

Heretofore the valves of trolley-pole controllers of the pneumatic type have been operated, controlled, or governed by devices located bodily on the trolley-pole, usually near the upper end thereof. In a former application of mine, filed July 28, 1904, Serial No. 218,544, is shown a device for controlling such valves, which is operated by its striking against the trolley-wire when the pole flies up; but the disadvantage of locating devices for controlling the valves on the pole is that if the trolley-pole becomes bent the coöperation between the device and the valves becomes deranged, and the efficiency of the trolley-pole controller is thus either greatly impaired or rendered *nil;* but the present invention, which consists of a device carried not on the pole, but on the standard, and controlled by inertia for controlling the valve, overcomes this difficulty, as even though the trolley-pole becomes bent the operation of the valve is properly governed and even if the pole should by accident break the device will cause the valve to act so as to result in depressing the pole or that part of it which remains.

The invention also includes a novel means for cushioning the downward drop of the trolley-pole.

Other objects and advantages of the invention will appear from the following description.

The accompanying drawings illustrate the invention, and, referring thereto, Figure 1 is a side elevation of the invention, showing the cylinder and adjacent mechanism with part of the standard in vertical section and with the trolley-pole raised, the trolley resting against the wire. Fig. 2 is a view similar to Fig. 1, illustrating the position of the parts with the trolley-pole down. Fig. 3 is a plan view of the invention with the trolley-pole removed, so as not to obscure the underlying features. Fig. 4 is an enlarged sectional view through the governing device. Fig. 5 is a sectional view through the ratchet-drum and illustrates the pawls. The section is on line x^5 x^5, Fig. 4. Fig. 6 is a face view of the friction-plate and spring. Fig. 7 is an end elevation of the governor-rope clamp.

Referring particularly to Figs. 1, 2, and 3, mounted upon the roof of the car is a base 1, above which is mounted a standard 2, the latter being swiveled upon a pin 3, which is rigidly mounted in the base 1, the pin 3 having a central air-passage 4, which communicates with a pipe 5, leading to the compressed-air supply on the car. (Not shown.) A pipe 6 is connected by a suitable swivel-coupling 7 with the swivel-pin 3, the pipe 6 being connected by a pipe 8 with a valve-chest 9. As the construction of the parts adjacent the swivel-pin 3 is fully described and claimed in the former application of mine referred to, it need not be described in detail herein.

The rear end of the standard has a vertical plate 10, to which is bolted an air-cylinder 11, the plate 10 forming the front end of the cylinder. Mounted within the cylinder 11 is a piston 12, the detail construction of which is also fully described and claimed in the former application referred to.

The piston 12 carries a piston-rod 13, which extends through the plate 10, there being a suitable stuffing-box 14 in the plate 10, through which the piston-rod extends. The end of the piston-rod 13 is supported by a cross-head or block *a*, which is slidably mounted on a guide *b*, one end of which is attached to the plate 10, the other end being supported by a standard C. Extending rearwardly from the piston is a trunk-piston 15, which fits closely within a cushioning-chamber 16, attached to the rear end of the cylinder 11, there being a suitable stuffing-box for preventing the passage of air from the cylinder 11 to the cushioning-chamber 16.

The rear end of the cushioning-chamber 16 is connected by a pipe 17 with the front end of the cylinder 11, there being a suitable valve 18 for regulating the flow of air through the pipe 17. The piston 12 is provided with a rubber buffer 19, which is adapted to strike against the rear end of the cylinder 11, while the front face of the piston 12 has a rubber buffer 20, adapted to strike against a boss 21, formed on the inside of the forward end of

the cylinder. Bolted to the standard 2 is a standard 22, having legs 23, to the upper ends of which is pivoted a trolley-pole 24, having an offset arm 25, which extends radially of the pivot-pin 26, supporting the trolley-pole. The arm 25 is connected by a link 27 with the piston-rod 13.

Extending between the legs 23 and the cylinder 11 are braces 28, (see also Fig. 3,) and bolted to the braces 28 are cross-braces 29.

The upper wall of the cylinder 11 is provided with a rear air-passage 30 and a forward air-passage 31, and slidably mounted within the valve-chest 9 is a slide-valve 32, having a central air-passage 33 and recesses 34 and 35 formed in its bottom face. The bottom wall of the valve-chest 9 is also provided with outlet-passages 36 and 37, which both communicate with the atmosphere. Attached to the valve 32 is a valve-stem 38, which extends through the front wall of the valve-chest 9 and through a suitable stuffing-box 39.

When the valve stands in the position shown in Fig. 1, air is admitted from the valve-chest 9, through the passages 33 and 30, into the front end of the cylinder 11, while air in the rear end of the cylinder is allowed to exhaust through the passages 31 and 37, these two passages being both in communication with the recess 35.

As a means to vary the size of the openings through the passages 36 and 37 in order to regulate the flow of air therethrough, throttling-screws 40 are provided. (See Figs. 1, 2, and 3.) In Fig. 3 the screws are shown as leaving only small openings in the respective passage-ways 30 and 31.

The forward end of the standard 2 is provided with a plate 41, from which rearwardly projects a spring-bar 42, upon which is slidably mounted a cross-bar 43, which is connected by links 44 with the arm 25, there being a heavy coil compression-spring 45 encircling the bar 42 and interposed between the cross-bar 43 and the plate 41. Rigidly mounted on the end of the bar 42 is a lever-supporting arm 46, to the end of which is pivoted an operating-lever 47, having a slot 48.

A bracket 49 is adjustably mounted, by means of a set-screw 50, on one of the links 44, and pivoted to the bracket 49 is a link 51, which is flexibly connected with the operating-lever 47, there being a bolt 52, which passes through the slot 48, adjustably clamped to the operating-lever 47, the end of the link 51 being pivoted to the bolt 52.

Carried on the upper end of the trolley-pole 24 is a trolley-wheel 53 of the usual construction, while pivoted to a clip 54 on the trolley-pole is a governor-rope clamp, (see Fig. 7,) which comprises a plate 55, with a bolt 56, having a hole 58, through which a governor rope or cable 57 passes, the rope 57 being squeezed against the plate 55 by screwing up the nut 59 to draw in the bolt which pulls the hole toward the plate. By loosening the nut 59 the governor-cable 57 may be adjusted through the bolt 56. This adjustment is not only useful in assembling the parts, but is also useful in readjusting the governor-cable if the trolley-pole 24 becomes bent. Fastened to the end of the governor-cable 57 is a trolley-rope 60.

Mounted upon the cross-bars 29 is an inertially-controlled device for controlling the pneumatic means. In the present embodiment the inertially-controlled device comprises a stationary shaft 61, which is rigidly mounted upon supports 62. Loosely mounted on the shaft 61 is a ratchet-drum 63, having a hub 64 and a bearing-face 65. The ratchet-drum 63 is provided with internal ratchet-teeth 66. (See Figs. 4 and 5.)

Loosely mounted on the hub 64 is a friction-plate 67, which bears against the friction-face 65, being frictionally held against the face 65 by a concavo-convex spring 68, (see Fig. 6,) the spring 68 having four fingers 69, as shown, and having its bore flattened at 70 to fit a correspondingly-flattened face of the hub 64, so that the spring 68 is prevented from turning relatively to the ratchet-drum, the outer end of the hub 64 being threaded and there being screwed thereon a nut 71 for adjusting the pressure of the spring 68 against the friction-plate 67. The friction-plate 67 has a top stud 72 and a bottom stud 73.

Loosely mounted on the shaft 61 is a spring-drum 74, to which is screwed a winding-drum 75. The outer end of a spiral spring 76 is hooked to a hook 77, the inner end of the spiral spring 76 being hooked to the stationary shaft 61. The spring-drum 74 has a flange 78, which lies close to the adjacent edge of the ratchet-drum 63, thereby forming an inclosed space within the ratchet-drum 63. Within the inclosed space thus formed and pivoted to the spring-drum 74 are pawls 79, having detents 80, which are adapted to engage with the teeth 66 of the ratchet-drum when the pawls are moved outwardly, the pawls 79 being normally held out of engagement with the teeth 66 by coil-springs 81, which resiliently hold the pawls 79 against stop-pins 82.

The stud 73 of the friction-plate 67 is connected by a link 83 with the valve-stem 38, while the stud 72 of the friction-plate 67 is connected to the governor-cable 57. (See Fig. 1.) From the stud 72 the governor-cable passes under a small sheave 90, mounted in a bracket 91, which is fastened to the trolley-pole and so arranged that the lower groove of the sheave intersects the pivotal axis of the trolley-pole. Thus there is no interference with the governor-cable as the pole rocks up and down. A rope 84, wound on the winding-drum 75, is connected to the end of the lever 47. (See Fig. 3.)

In operation air is admitted through the pipe 5 and its connections to the valve-chest 9, and thus to the rear end of the cylinder 11, thereby holding the piston 12 near the front of the cylinder and holding the trolley-pole raised so that the trolley rests against the wire, which action of the piston is also assisted by the spring 45 tending to force the cross-bar 43 outwardly and acting upon the trolley-pole through the arm 25 and links 44. As the car moves along and the trolley-pole 24 plays up and down, owing to variations in the height of the wire the piston 12 will be moved slowly back and forth in the cylinder, thus when the pole is moved down by the wire slightly compressing the air in the rear end of the cylinder and also slightly compressing the spring 45, the pole being moved up again as the wire rises by the expansion of the spring 45 and by the compressed air back of the piston. As the pole thus moves up and down under these normal conditions owing to the varying height of the wire the links 44 are reciprocated slowly, and the operating-lever 47 is thus rocked back and forth through the medium of the link 51, and as it is pushed back by the upward movement of the pole it pulls upon the rope 84 and rotates the winding-drum 75 and spring-drum 74, the ratchet-drum 63, however, remaining stationary, as the pawls 79 are held by the springs 81 out of engagement with the teeth 66 of the ratchet-drum, there not being sufficient centrifugal force to overcome the tension of the spring 81. As the pole is moved slowly downward and the operating-lever 47 is thus rocked in the opposite direction the spring 76 expands and rotates the winding-drum 75 in the opposite direction, thus taking up the slack in the rope 84. When the trolley flies from the wire, the air-pressure back of the piston 12, together with the spring 45, produces a quick upward movement of the trolley-pole 24, and as the links 44 move backward the operating-lever 47 is pushed quickly backward, which, through the rope 84, imparts a quick rotation or a rotative jerk to the spring-drum 74, the centrifugal force arising therefrom causing the pawls to fly outwardly into engagement with the teeth 66 and to thereby impart rotation to the ratchet-drum 63, which, being in frictional engagement with the friction-plate 67, rotates the latter, and the latter through its stud 72, link 83, and valve-stem 38 quickly pulls the valve 32 into its opposite position, thus allowing air to exhaust from the front end of the cylinder through the passages 30 and 36 and admitting air to the rear end of the cylinder through the passage 31, which moves the piston 12 toward the front end of the cylinder and, overcoming the pressure of the spring 45, quickly pulls down the trolley-pole into the position shown in Fig. 2. But a slight upward movement of the trolley is required after it jumps from the wire to affect the governing device and shift the valve. When compressed air is admitted to the rear of the piston, part of it flows through the pipe 17 into the cushioning-chamber 16, so that as the piston 12 moves toward the front of the cylinder and the trunk-piston 15 moves against the compressed air within the cushioning-chamber 16 the forward movement of the piston is cushioned, and this prevents undue strain on the mechanism by softening the latter part of the downward movement of the trolley-pole, so that the pole is dropped easily into its horizontal position. The pressures within the cushioning-chamber 16 and the rear end of the cylinder are thus equalized, and the rate of flow of air through the pipe 17 may be regulated by adjusting the valve 18. As the friction-plate 67 is rocked, as before described, the governor-cable 57 is also pulled slightly, the clamp 55 swinging freely to allow of this action. As but a slight amount of movement of the friction-plate is required to shift the valve 32 and as the outward movement of the operating-lever 47 may cause a greater amount of rotation of the ratchet-drum 63 than is necessary, this excess of movement is provided for by allowing the ratchet-drum to slip relatively to the friction-plate 67, so that after the valve 32 has been shifted to its limit further movement of the friction-plate 67 is prevented, and if there is an excess of movement the ratchet-drum 63 continues rotation, its friction-face 65 slipping over the friction-plate 67.

To further cushion the downward movement of the pole, the throttling-screw 40 is regulated so as to restrict the outward flow of air through the passage 30 in exhausting, so that the air back of the piston being retarded in its escape acts as a cushion during the drop of the pole.

When it is desired to elevate the pole to the wire, the trolley-rope 60 may be pulled, which will rock the clamp 55 rearwardly and through the medium of the governor-cable 57 will rotate the friction-plate 67, moving its bottom stud 73 toward the valve-chest 9, and through the medium of the link 83 and valve-stem 38 will shift the valve 32 to its original normal position, so that air is admitted through the passages, as before described, to the front end of the cylinder, forcing the piston 12 to the rear end of the cylinder, and thus elevating the pole, which may be guided onto the wire by proper manipulation of the rope 60.

The valve 32 is retained in position after the rope 60 has been released by reason of the friction of the parts, and it will not again be shifted until the trolley-pole is allowed to take a quick upward movement sufficient to cause the pawls 79 to fly out into engagement with the teeth 66, and this movement may be secured, if desired, by means of the rope 60 and is accomplished by pulling down the pole 24 and then suddenly releasing the rope 60,

so that the pole will take a quick upward jump, which will give the necessary jerk to the spring-drum 74, which will then cause the pole to drop, as before described. This enables the trolley-pole to be easily lowered to its horizontal position whenever desired without undue effort.

When the pole takes an upward jump, the movement of the piston 12 toward the rear end of the cylinder is also cushioned by reason of the air within the rear end of the cylinder being restrained from too rapid an escape through the passage 31 by the other throttling-screw 40.

What I claim is—

1. Supporting means, a trolley-pole mounted thereon, means on the supporting means for moving the trolley-pole, and an inertially-controlled device on the supporting means operatively connected with the trolley-pole and operated by a quick movement thereof for governing the moving means.

2. Supporting means, a trolley-pole mounted thereon, means on the supporting means for moving the trolley-pole, and an inertially-controlled device on the supporting means operatively connected with the trolley-pole for governing the moving means, and means for operating said device independently of the trolley-pole to cause the moving means to operate.

3. Supporting means, a trolley-pole mounted thereon, means on the supporting means for moving the trolley-pole, and an inertially-controlled device on the supporting means for governing the moving means and operatively connected with the trolley-pole whereby a quick movement of the trolley-pole causes the inertially-controlled device to operate.

4. Supporting means, a trolley-pole mounted thereon, pneumatic means for moving the trolley-pole, and an inertially-controlled device on the supporting means for governing the pneumatic means and having an operative connection with the trolley-pole whereby a quick movement of the trolley-pole causes the governing device to operate.

5. Supporting means, a trolley-pole mounted thereon, pneumatic means for moving the trolley-pole, and an inertially-controlled device on the supporting means for controlling the pneumatic means.

6. Supporting means, a trolley-pole mounted thereon, pneumatic means for holding the trolley-pole suspended and for depressing the pole, and an inertially-controlled device on the supporting means for governing the pneumatic means and operated by a quick movement of the trolley-pole.

7. Supporting means, a trolley-pole mounted thereon, pneumatic means for raising and lowering the pole, and a device on the supporting means for governing the pneumatic means and operative by a quick movement of the pole to render active the pneumatic lowering means, and being operative independently of the pole to render active the pneumatic raising means.

8. Supporting means, a trolley-pole mounted thereon, means on the supporting means for moving the trolley-pole, a device on the supporting means operatively connected with the trolley-pole and operated by a quick movement thereof for governing the moving means, a governor connection for operating the governing device independently of the trolley-pole, and means hinged to the trolley-pole and adjustably clamping the governor connection for supporting the same.

9. Supporting means, a trolley-pole mounted thereon, pneumatic means for moving the pole, a valve carried by the pneumatic means for controlling the same, and an inertially-controlled device carried on the supporting means for actuating the valve and operatively connected with the trolley-pole whereby a quick movement of the latter causes the inertia device to operate and control the valve.

10. In combination with supporting means a trolley-pole mounted thereon, pneumatic means for operating the pole, a valve carried by the supporting means for controlling the pneumatic means, and a device carried by the supporting means for governing the valve comprising a ratchet with an operative connection with the valve, a pawl operating by inertia to engage the ratchet, supporting means for the pawl, and an operative connection from the trolley-pole to the pawl-supporting means for moving the same.

11. In combination with supporting means a trolley-pole mounted thereon, pneumatic means for operating the pole, a valve carried by the supporting means for controlling the pneumatic means, a device carried by the supporting means for governing the valve comprising a ratchet with an operative connection with the valve, a pawl operating by inertia to engage the ratchet, supporting means for the pawl, an operative connection from the trolley-pole to the pawl-supporting means for moving the same in one direction, and means for moving the pawl-supporting means in the other direction.

12. In combination with a trolley-pole, pneumatic means for operating the pole, a valve for controlling the pneumatic means, and a device for governing the valve comprising a ratchet-drum, a friction-plate bearing against the ratchet-drum, a connection from the friction-plate to the valve, a pawl operating by inertia to engage the ratchet-drum, supporting means for the pawl, and an operative connection from the trolley-pole to the pawl-supporting means for moving the same.

13. In combination with a trolley-pole, pneumatic means for operating the pole, a valve for controlling the pneumatic means, and a device for governing the valve comprising a ratchet-drum having an operative con-

nection with the valve, a winding-drum, a pawl carried thereby and adapted to engage the ratchet-drum, a governor-rope on the winding-drum, and means operated by the trolley-pole for pulling the governor-rope and rotating the winding-drum.

14. In combination with a trolley-pole, pneumatic means for operating the pole, a valve for controlling the pneumatic means, and a device for governing the valve comprising a ratchet-drum having an operative connection with the valve, a winding-drum, a pawl carried thereby and adapted to engage the ratchet-drum, a governor-rope on the winding-drum, a pivoted lever connected to the governor-rope and means operated by the trolley-pole for actuating the pivoted lever.

15. In combination, a standard, a trolley-pole pivoted thereto, a spring-bar on the standard, a cross-bar slidable on the spring-bar, links connecting the cross-bar with the trolley-pole, a supporting-bar on the cross-bar, a lever pivoted to the supporting-bar, a link connecting the lever with one of the aforesaid links, pneumatic means for operating the trolley-pole, a device operating by inertia for controlling the pneumatic means, and means operated by the pivoted lever for actuating the inertia means.

16. In combination with a trolley-pole, pneumatic means for operating the pole, a valve for controlling the pneumatic means, and a device for governing the valve comprising a ratchet-drum, a winding-drum with operative connections to the trolley-pole, pawls on the winding-drum for engaging the ratchet-drum, a friction-plate bearing against the ratchet-drum, a connection from one side of the friction-plate to said valve, and a governor-rope connected to the other side of the friction-plate and supported by the trolley-pole.

17. In combination with a trolley-pole, pneumatic means for operating the pole, a valve for controlling the pneumatic means, a device for governing the valve comprising a ratchet-drum, a winding-drum with operative connections to the trolley-pole, pawls on the winding-drum for engaging the ratchet-drum, a friction-plate bearing against the ratchet-drum, a connection from one side of the friction-plate to said valve, a governor-rope connected to the other side of the friction-plate and supported by the trolley-pole, and means for regulating the friction between the friction-plate and ratchet-drum.

18. In combination with a trolley-pole, pneumatic means for operating the pole, a valve for controlling the pneumatic means, and a device for governing the valve comprising a stationary shaft, a ratchet-drum revoluble on the shaft, a winding-drum revoluble on the shaft, spring-pressed pawls on the winding-drum normally held out of engagement with the ratchet-drum, a friction-plate revoluble on the shaft, a connection from the friction-plate to the valve, and means operated by the trolley-pole for rotating the winding-drum.

19. In combination with a trolley-pole, pneumatic means for operating the pole, a valve for controlling the pneumatic means, a device for governing the valve comprising a stationary shaft, a ratchet-drum revoluble on the shaft, a winding-drum revoluble on the shaft, spring-pressed pawls on the winding-drum normally held out of engagement with the ratchet-drum, a friction-plate revoluble on the shaft, a connection from the friction-plate to the valve, means operated by the trolley-pole for rotating the winding-drum in one direction, and a helical spring inside the winding-drum, and having one end attached to the shaft and its other end attached to the winding-drum for rotating the latter in the opposite direction.

20. In combination with a trolley-pole, pneumatic means for operating the pole, a valve for controlling the pneumatic means, a device for governing the valve comprising a stationary shaft, a ratchet-drum revoluble on the shaft, a winding-drum revoluble on the shaft, spring-pressed pawls on the winding-drum normally held out of engagement with the ratchet-drum, a friction-plate revoluble on the shaft, a connection from the friction-plate to the valve, means operated by the trolley-pole for rotating the winding-drum, and a spring stationary on the shaft and bearing against the friction-plate.

21. In combination with a trolley-pole, pneumatic means for operating the pole, a valve for controlling the pneumatic means, a device for governing the valve comprising a stationary shaft, a ratchet-drum revoluble on the shaft, a winding-drum revoluble on the shaft, spring-pressed pawls on the winding-drum normally held out of engagement with the ratchet-drum, a friction-plate revoluble on the shaft, a connection from the friction-plate to the valve, means operated by the trolley-pole for rotating the winding-drum, a spring stationary on the shaft and bearing against the friction-plate, and a nut on the shaft for regulating the pressure between the spring and friction-plate and between the latter and the ratchet-drum.

22. In combination, a trolley-pole, pneumatic means for operating the pole comprising a cylinder and a piston therein connected with the pole, a cushioning-chamber adjacent the cylinder, a trunk-piston attached to the first piston and playing in the cushioning-chamber, and a pipe connecting the rear end of the cushioning-chamber with the front end of the cylinder.

23. In combination, a trolley-pole, pneumatic means for operating the pole comprising a cylinder and a piston therein connected with the pole, a cushioning-chamber adjacent

the cylinder, a trunk-piston attached to the first piston and playing in the cushioning-chamber, a pipe connecting the rear end of the cushioning-chamber with the front end of the cylinder, and means for regulating the cushioning effect of the air within the cushioning-chamber comprising a valve in said pipe whereby the flow of air therethrough is controlled.

24. A cylinder, a piston therein, a valve-chest on the cylinder with passages from the valve-chest to the cylinder, a valve in the valve-chest and adjustable means for regulating the flow of fluid through the passages.

25. A cylinder, a piston therein, a valve-chest on the cylinder with passages from the valve-chest to the cylinder, a valve in the valve-chest, and a screw extending through the wall of the cylinder and entering a passage for regulating the flow of fluid therethrough.

26. A cylinder, a piston therein, a valve-chest on the cylinder with passages from the valve-chest to the cylinder, a valve in the valve-chest, and screws extending through the wall of the cylinder and entering the passages for regulating the flow of fluid therethrough.

In testimony whereof I have hereunto set my hand at Los Angeles, California, this 14th day of February, 1905.

MARTIN O. DOLSON.

In presence of—
GEORGE T. HACKLEY,
TILLIE E. ADAM.