No. 871,616. PATENTED NOV. 19, 1907.

C. NORLAND.

TROLLEY POLE CONTROLLER.

APPLICATION FILED NOV. 19, 1906.

2 SHEETS—SHEET 1.

Fig. 7

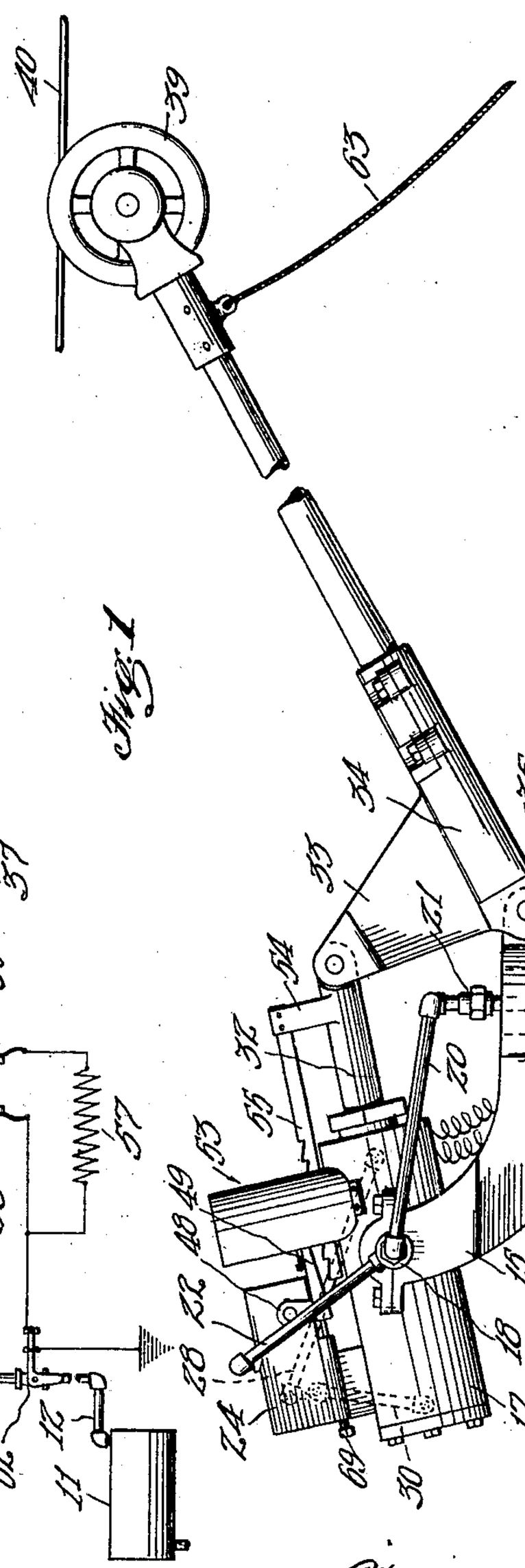
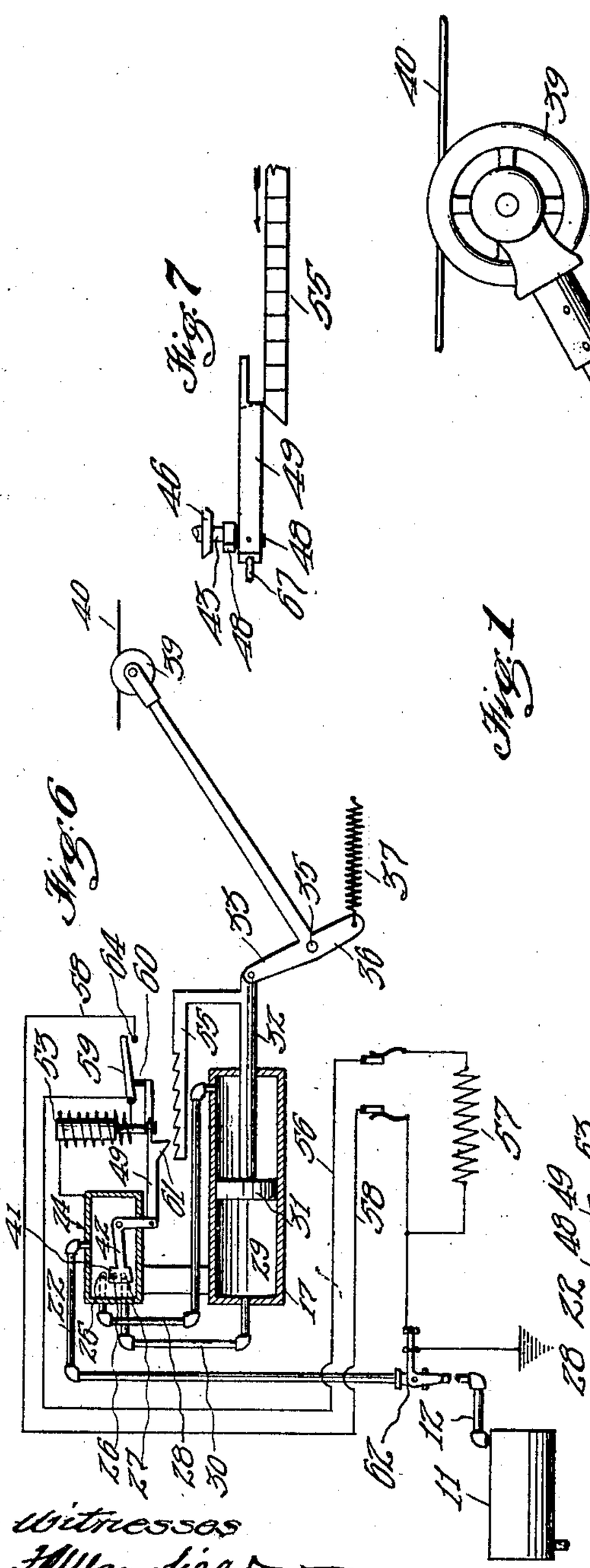


Fig. 1

Fig. 6



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2 SHEETS—SHEET 2.

Fig. 2

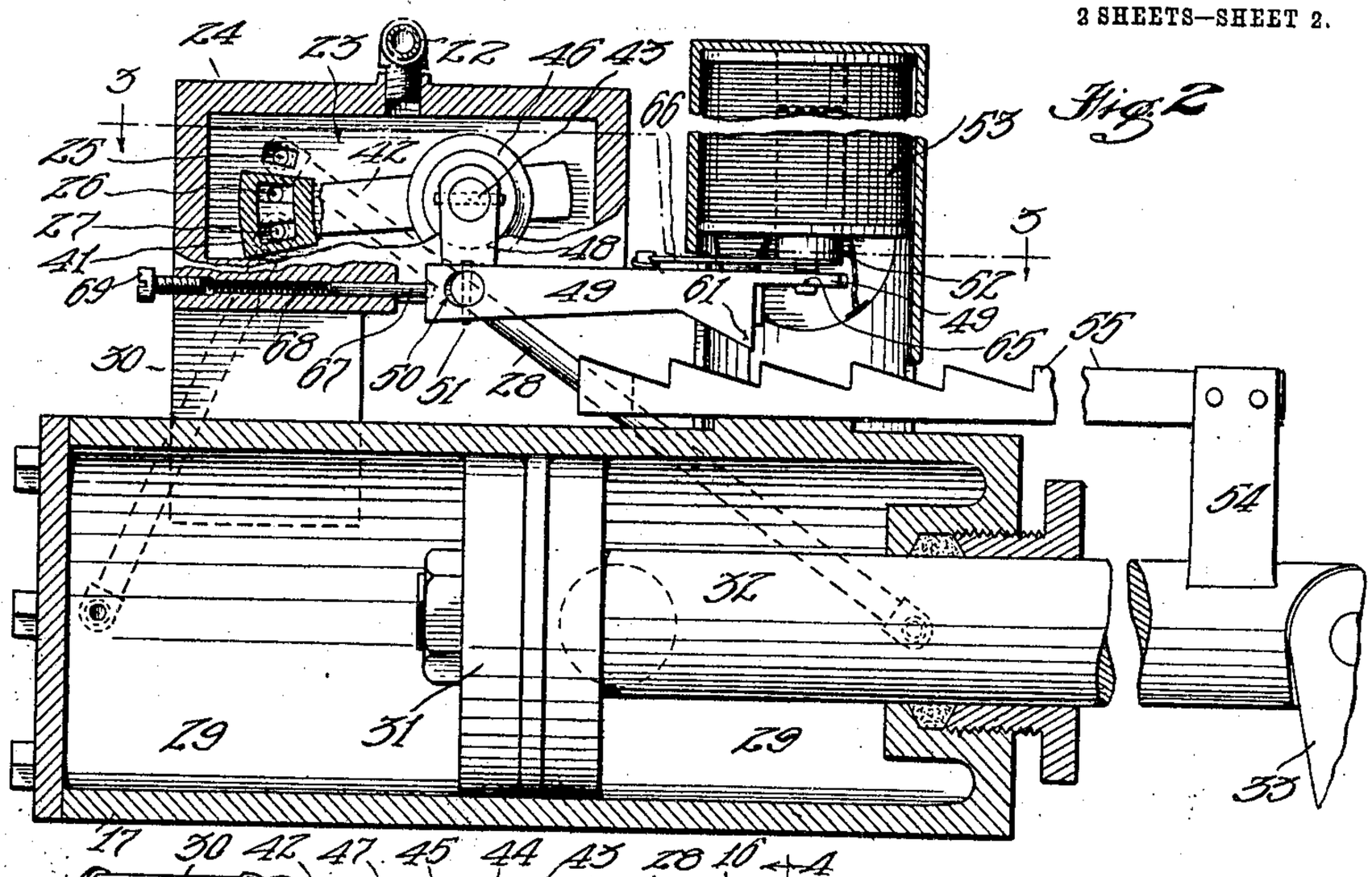

Fig. 3

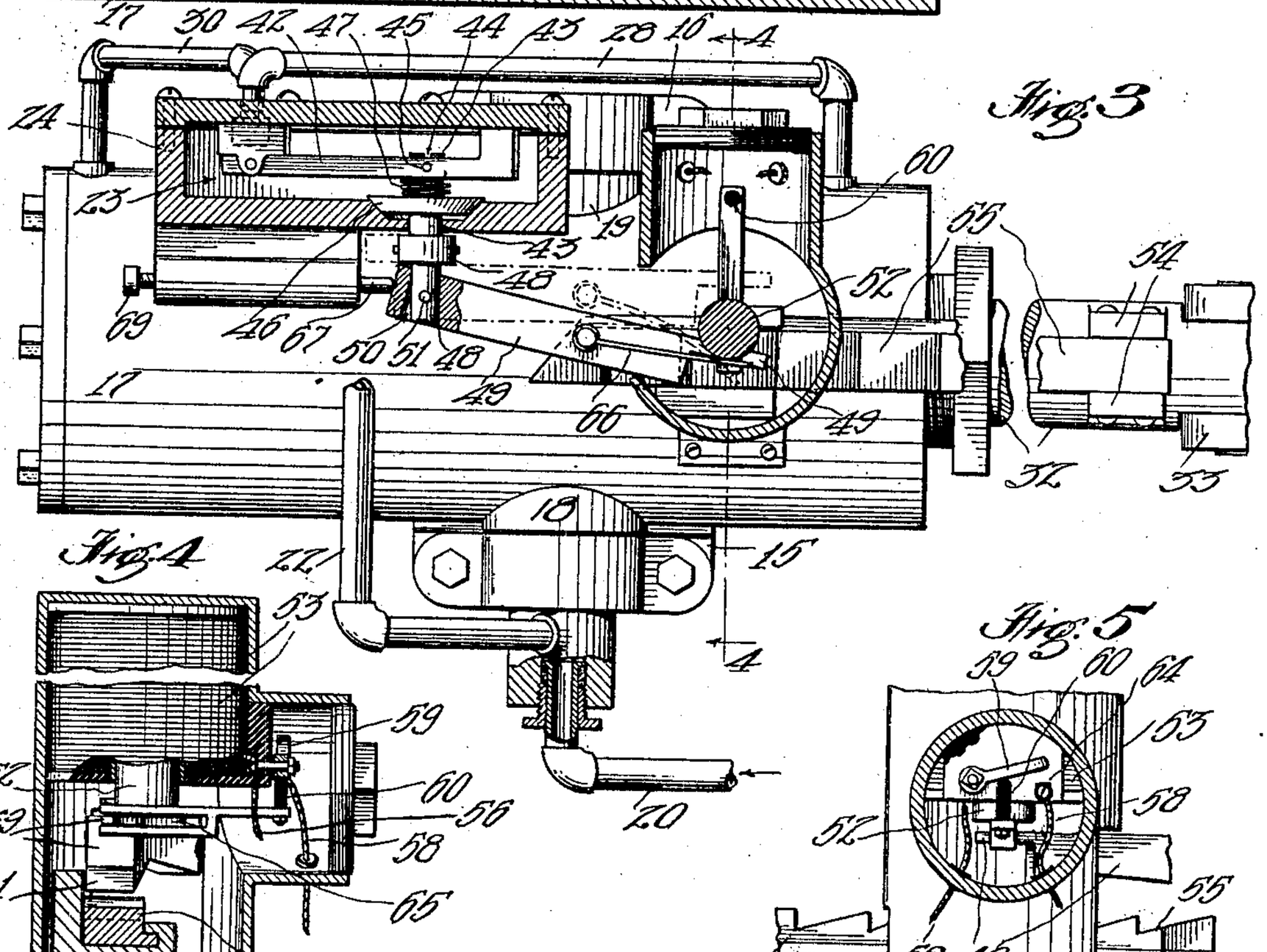

Fig. 4

Fig. 5

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UNITED STATES PATENT OFFICE.

CLARENCE NORLAND, OF LOS ANGELES, CALIFORNIA.

TROLLEY-POLE CONTROLLER.

No. 871,616. Specification of Letters Patent. Patented Nov. 19, 1907.

Application filed November 19, 1906. Serial No. 344,084.

To all whom it may concern:

Be it known that I, CLARENCE NORLAND, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Trolley-Pole Controllers, of which the following is a specification.

My invention relates to electrically operated cars having an overhead feed system and to pneumatic means for controlling the movement of the trolley pole; and the object thereof is to provide mechanism, whereby the pneumatic pressure will operate to hold the trolley wheel to the feed wire and such pressure will be automatically shifted to bring the trolley wheel below the feed wire in the case the same accidentally leaves such wire; and the object thereof is to provide efficient means to accomplish these results.

I accomplish these objects by the mechanism described herein and illustrated in the accompanying drawings in which:—

Figure 1—is a side elevation partly in section of my improved controller. Fig. 2—is a longitudinal vertical section of the piston chamber, valve chamber and the magnet. Fig. 3—is a plan of the piston chamber and a horizontal section of the valve chamber taken on line 3—3 of Fig. 2. Figs. 4 and 5—are details of a portion of the electrical mechanism controlling the air shifting mechanism. Fig. 6—is a diagrammatic view. Fig. 7—is a detail of a portion of the valve shifting mechanism.

In the drawings 10 represents the top of a car. The fluid pressure reservoir 11 is secured to the car in the usual manner. Pipe 12 connects this reservoir through the swivel pin 13 which is secured to the roof of the car with pipe 20. The swivel base 14 is connected in the usual manner to the swivel pin and rotates thereon. The swivel base is provided with arms 15 and 16 in which is pivotally mounted the air cylinder 17 by trunnions 18 and 19 which pass through holes in the ends of arms 15 and 16. The outer end of one of said trunnions, 18, is hollow and is connected by pipe 20 through the swivel pin with pipe 12. A revoluble joint 21 is provided so that pipe 20 may rotate while pipe 12 is stationary. Leading from trunnion 18 is pipe 22 which is connected to and opens into the slide valve chamber 23 through the casing 24 thereof. In the side of the casing of the slide valve chamber are ports 25 and 26 and 27. Port 25 is connected by pipe 28 with the front end of piston chamber 29. Port 26 is an exhaust port and leads to the open air. Port 27 is connected by pipe 30 with the rear end of piston chamber 29. Within chamber 29 is a piston 31 having a stem 32 which is pivotally connected to an arm 33 secured to the trolley pole base 34 on the upper side thereof. The trolley pole base is pivotally secured to the swivel base at 35 and is provided with a depending arm 36 to which is secured spring 37. The other end of spring 37 is secured to a yoke 38, which yoke is adjustably secured to the swivel base. The purpose of spring 37 is to hold the trolley wheel 39 in engagement with the feed wire 40 in case of accident to the pneumatic mechanism.

Within the slide valve chamber is the slide valve 41 which is adapted to connect ports 26 and 27 or ports 25 and 26, depending upon the position of the valve. This valve is provided with an arm 42 which is mounted on shaft 43, the end of which is provided with a slot 44 through which and through arm 42 pin 45 passes, whereby when shaft 43 turns arm 42 is caused to turn with it. On shaft 43 within the piston valve chamber is a packing disk 46 and between this disk and arm 42 is a spring 47 which bears against the two members and keeps the slide valve firmly on its seat and the disk in air tight engagement with the casing of the chamber. Exterior the casing of the slide valve chamber shaft 43 is provided with a crank arm 48 to which is pivotally secured a dog 49. The hole 50 through the end of the dog through which the lower end of the crank arm passes is enlarged at the outer end thereof as best shown in Fig. 3 so that the dog may rock on the crank arm as hereafter explained. A pin 51 holds the dog secured to the crank arm. The other end of the dog is secured to the plunger 52 of the solenoid magnet 53 so as to move with said plunger as the same is moved. Stem 32 is provided with an upwardly projecting arm 54 to which is secured a rearwardly extending rack 55, which rack is adapted to be engaged by dog 49 whenever magnet 53 becomes inert, which occurs whenever the trolley wheel accidentally leaves the feed wire or passes a breaker. Magnet 53 is provided with a main circuit 56 provided with resistance 57 and with a shunt circuit 58 which is provided with a switch 59, which switch is normally held open by insulating block 60

which is carried on the end of dog 49 best shown in Fig. 6. The purpose of these circuits will be explained later.

In the operation of my device when the trolley wheel is on the feed wire the slide valve will be in the position shown in Fig. 2, connecting the rear end of piston chamber 29 to exhaust and throwing the forward end thereof to pressure, whereby the wheel is held in contact with the feed wire by pneumatic pressure. In this position the magnet is energized through the main circuit which receives current from the feed wire. Now should the trolley wheel accidentally leave the feed wire the circuit which energizes the magnet is broken and the magnet becomes inert and the plunger falls carrying with it the free end of dog 49, whereupon tooth 61 on the under side of the dog engages with whichever of the teeth of the rack that happen to be below this end when it falls and the dog is carried backward with the rack as the trolley wheel rises. The backward movement of the dog through connecting mechanism before described shifts the slide valve to connect ports 25 and 26, thereby putting the front end of the piston chamber to exhaust, and opens port 27 to pressure thereby throwing the rear end of the piston chamber to pressure and causing the piston therein to move toward the front thereof thus bringing the trolley wheel below the feed wire. On pipe 12 in a position convenient to be reached by the motorman is a three-way or controller valve 62. When it is desired to return the trolley wheel to the feed wire the conductor will take the usual guide rope 63, and with the same guide the wheel to the wire. At the same time the motorman will turn the controller valve to cut off the supply of air to the piston chamber and to throw pipe 12 above the valve to exhaust, thereby permitting the air in the rear portion of the piston chamber to escape. Spring 37 will then return the wheel to the feed wire. It will be observed that when dog 49 falls so as to engage rack 55 that switch 59 closes the shunt circuit 58 by engaging contact 64, thereby giving the magnet great power and it instantly draws the dog up to its normal position when the wheel reaches the feed wire, thereby opening the shunt circuit but retaining its energy to hold the dog out of engagement with the rack through the main circuit. When the trolley wheel has been brought to its lowest position as before explained rack 55 will have passed beyond the end of dog 49 as shown in Fig. 7. The ends of these two members are reversely beveled as shown in Fig. 7 so that the rack on its rearward movement will push the dog to one side thereof so that it does not engage the rack when the trolley wheel is being returned to the wire. The dog is permitted to slide sidewise on its connection with the plunger of the solenoid by means of slot 65 and the enlarged hole 50 in the end thereof. When the dog has been drawn to the position shown in Fig. 2 spring 66 returns the dog to a position to engage the rack as soon as the magnet becomes deënergized. Should there be circuit breakers in the feed wire the magnet would become deënergized and the dog would fall and engage the rack and the shunt circuit would be closed so that when the trolley wheel passed the breaker the full power of the magnet would be utilized to draw the dog back out of engagement with the rack when the shunt circuit would again be broken. I provide this more powerful circuit in case there should be a considerable amount of friction between the dog and the rack when passing a breaker. The air pressure on disk 46 is sufficient to hold the slide valve in the position in which port 25 is connected to exhaust after the valve has been moved as before explained, but as soon as the air is exhausted through the controller valve, plunger 67 which bears against crank arm 48 and spring 68 which bears on the plunger will instantly shift the slide valve to throw port 25 to pressure and port 27 to exhaust so that after the wheel has been returned to the feed wire and the controller valve turned to throw pressure into the valve chamber, the pressure will be exerted in holding the trolley wheel to the feed wire. A screw 69 regulates the tension of spring 68.

Having described my invention what I claim is:—

1. In a trolley pole controller, the combination of a compressed air reservoir; an air cylinder having a piston operatively connected to the trolley pole; a valve chamber connected to said reservoir; connections from the opposite ends of said air cylinder to said valve chamber, said valve chamber having an exhaust port therein; a valve in said chamber adapted to connect either end of said air cylinder to exhaust; mechanism connected to said piston and mechanism connected to said valve and co-acting therewith for shifting said valve, whereby fluid pressure in the air cylinder is changed from one end to the other when the trolley wheel accidentally leaves the feed wire; and electrically operated means for holding said co-acting mechanism out of engagement when the trolley wheel is on the feed wire and current is flowing down the trolley pole.

2. A trolley pole controller for use with an overhead feed wire, comprising mechanism actuated by fluid pressure to move the trolley wheel into contact or out of contact with the feed wire; mechanism for shifting the fluid pressure from holding the trolley wheel in contact with the feed wire to cause the wheel to move below the feed wire when

the wheel rises above the feed wire; and electric mechanism for controlling said shifting mechanism when the wheel is in contact with the feed wire.

3. A trolley controller for use with an overhead feed wire, comprising a trolley controller actuated by fluid pressure exerted in one direction to maintain the trolley wheel in contact with the feed wire and when exerted in the other direction to lower the trolley wheel below the feed wire; mechanism for shifting the direction of said fluid pressure when the wheel rises above the feed wire; and electric mechanism for controlling said shifting mechanism when the wheel is in contact with the feed wire.

4. A trolley controller for use with an overhead feed wire, comprising a trolley controller actuated by fluid pressure exerted in one direction to maintain the trolley wheel in contact with the feed wire and when exerted in the other direction to lower the trolley wheel below the feed wire; a valve for shifting the direction of said fluid pressure; mechanism secured to said valve and mechanism connected to the trolley pole base which when co-acting causes said valve to shift said fluid pressure; and a solenoid magnet operatively connected to the mechanism secured to the valve whereby when said magnet is energized said mechanism secured to the valve and to the trolley pole base cannot co-act.

5. In a trolley controller for use with an overhead feed wire in which fluid pressure when exerted in one direction holds the trolley wheel in contact with the feed wire and when exerted in the other direction lowers the wheel below the feed wire; mechanism for shifting the direction of said fluid pressure comprising a valve; a dog operatively secured thereto; a rack operatively secured to the trolley pole base, said rack being adapted to be engaged by the dog and to shift the valve when the trolley wheel accidentally leaves the feed wire; and electric mechanism for holding said dog out of engagement with said rack when the electric mechanism is energized.

6. In a trolley controller for use with an overhead feed wire in which fluid pressure when exerted in one direction holds the trolley wheel in contact with the feed wire and when exerted in the other direction lowers the wheel below the feed wire; mechanism for shifting the direction of said fluid pressure comprising a valve; a dog operatively secured thereto; a rack operatively secured to the trolley pole base, said rack being adapted to be engaged by the dog and to shift the valve when the trolley wheel accidentally leaves the feed wire; and electric mechanism for holding said dog out of engagement with said rack when the electric mechanism is energized, comprising a solenoid magnet having the plunger thereof operatively connected to said dog, said magnet having a main circuit with resistance therein and a normally open shunt circuit without resistance, said shunt circuit having a switch therein which will automatically close the shunt circuit when the dog engages the rack.

In witness that I claim the foregoing I have hereunto subscribed my name this 12th day of November, 1906.

CLARENCE NORLAND.

Witnesses:

G. E. HARPHAM,

EDMUND A. STRAUSE.