R. F. LEVENS & A. H. WHATLEY.

TROLLEY RETRIEVER.

APPLICATION FILED DEC. 7, 1907.

981,865. Patented Jan. 17, 1911.

2 SHEETS—SHEET 1.

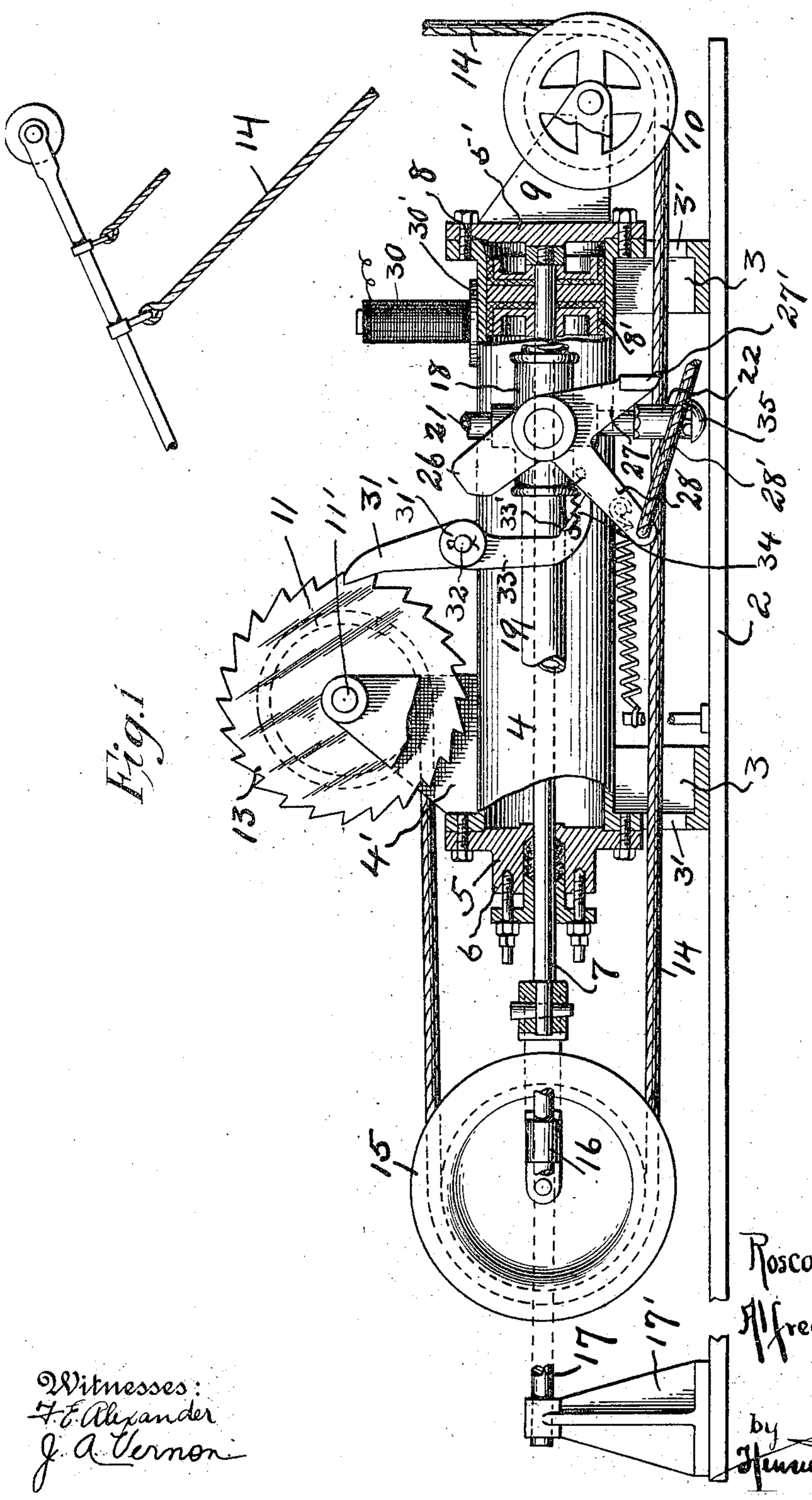

Fig. 1.

Witnesses:
F. E. Alexander
J. A. Vernon

Roscoe F. Levens
Alfred H. Whatley
Inventors
by Attorney's
Henry T. Tough

R. F. LEVENS & A. H. WHATLEY.

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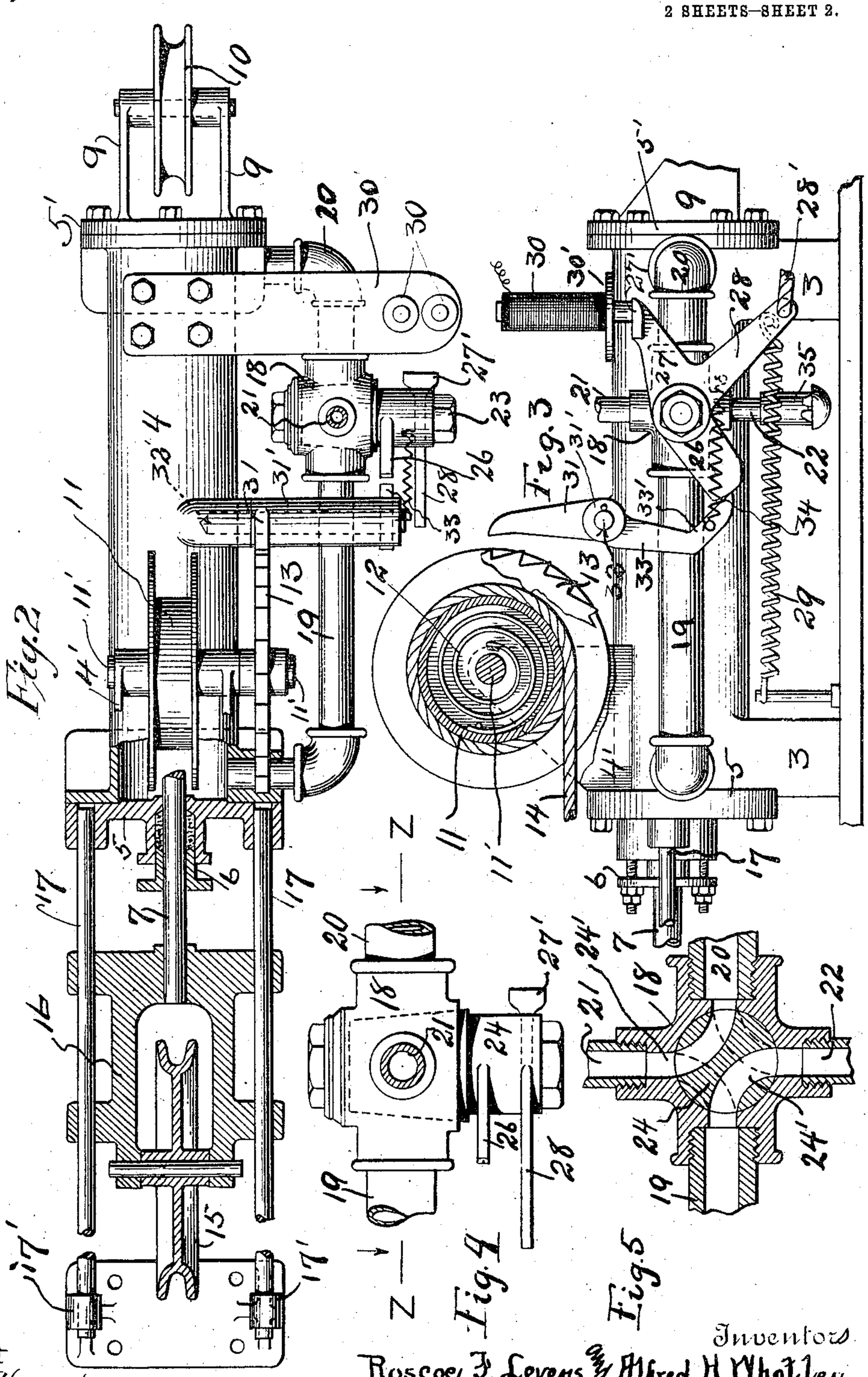

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Attest
F. E. Alexander
J. A. Vernon

Inventors
Roscoe F. Levens and Alfred H. Whatley
By Their Attorney
Henry T. Tough

UNITED STATES PATENT OFFICE

ROSCOE F. LEVENS AND ALFRED H. WHATLEY, OF PROVIDENCE, RHODE ISLAND, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE AMERICAN TROLLEY RETRIEVER COMPANY, OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

TROLLEY-RETRIEVER.

981,865. Specification of Letters Patent. **Patented Jan. 17, 1911.**

Application filed December 7, 1907. Serial No. 405,578.

To all whom it may concern:

Be it known that we, ROSCOE F. LEVENS and ALFRED H. WHATLEY, citizens of the United States, residing at Providence, county of Providence, State of Rhode Island, have invented certain new and useful Improvements in Trolley-Retrievers, of which the following is a specification.

Our invention relates to mechanism for pulling down or retrieving a trolley pole immediately upon the trolley wheel leaving the conducting wire, and its object is to provide a mechanism actuated by compressed air and started by the cessation of current through the rheostat, which shall automatically haul down on the said rope,—this mechanism, however, not interfering with the proper manipulation of the trolley and the free movement of the trolley pole as long as it remains in engagement with the wire; a further object of our invention being to counterbalance the upward spring of the trolley pole both in drawing down and returning the trolley to place by means of compressed air so that the operator is not obliged to manipulate the trolley pole against the upward pulling tendency of the spring.

Our invention consists particularly in the use of an electromagnet in circuit with the rheostat which automatically trips or releases compressed air mechanism connected to the rope.

It also consists in the arrangement of parts and details of construction set forth with particularity in the claims appended.

In the drawings, Figure 1 is a side elevation partly sectional of our retriever, showing the piston just prior to its initial movement. Fig. 2 is a plan view of Fig. 1, also partly in section. Fig. 3 is a side view partly sectional of the rear end of the retriever, with the parts in their normal position. Fig. 4 is a top view of the air valve, and Fig. 5 is a section of Fig. 4 on the line *x*—*x*.

Like reference characters throughout the several views designate like parts.

2 designates a bed plate which may be any convenient portion of the car. Supported on standards 3 from the bed plate is the compressed air cylinder 4 closed at both ends by the cylinder heads 5, 5′ of any ordinary construction. The head 5 is provided with a stuffing box 6, such as commonly used through which passes the piston rod 7, having thereon the piston 8, provided with suitable packing 8′ so as to have an air tight engagement with the inner face of the cylinder. The head 5′ is provided with the brackets 9 cast or otherwise formed thereupon in which is mounted the pulley 10 over which the trolley rope 14 passes,—the lower surface of the barrel of the pulley 10 being below the lowest point of the cylinder 4 and the standards 3 being pierced for the passage of said rope as at 3′. The upper side of the cylinder 4 is provided with upwardly extending brackets 4′ supporting a spring actuated reel 11 to which the end of the trolley rope is to be attached and on which it is to be wound. In the construction illustrated the brackets 4′ are provided with bearings through which passes a shaft 11′. This shaft carries the reel 11. At one end the shaft is keyed to a ratchet wheel 13. The interior of the reel 11 is hollow as shown and provided with a coiled spring 12 which is attached at one end to the circumference of said reel and at the other to the bearing in which the shaft 11′ is supported. It is to be understood, however, that any other construction whereby a retracting revolution is given to the reel 11 is within the spirit of our invention, provided it attains the object intended, namely to keep a constant strain upon the trolley rope 14 under normal conditions, and when the trolley wheel is upon the wire. In other words, the reel 11 is designed to take up slack and keep the trolley rope taut at all times. From the reel 11 the trolley rope 14 passes around the pulley 15 mounted in a yoke 16 upon the end of the piston rod 7. This yoke, as will be seen in the plan view moves backward and forward upon the guide rods 17 which are attached to the cylinder head 5 on opposite sides thereof. At their rear ends the guides 17 are supported in standards 17′. From the pulley 15 the trolley rope 14 passes, as before explained, through the openings in the standards 3, 3 to and around the pulley 10 and then upward to the trolley pole, being attached to the same at or near its middle and suitably insulated therefrom. The particular point of attachment of the rope to the trolley pole is not of particular

importance except that it is to be so placed as not to be in the way of the usual trolley rope.

It is to be understood that the spring 12 for rotating the reel 11 is strong enough to take up the ordinary slack, but such a wheel would not be quick enough to immediately draw down upon a trolley pole when actuated, nor would it be strong enough for this purpose. In addition it may be said that the reel alone is difficult to handle after the rope has been pulled down as the reel must be released or else the operator is obliged to pull upward on the rope with all his strength in order to unwind the rope from the reel and it is for this reason that we have provided the movable pulley 15 shiftable by means of compressed air, operating on the piston in cylinder 4. In order to accomplish this end, we provide means for admitting compressed air behind one side or the other of the piston 8 automatically by the slipping off of the trolley wheel or by the actuation of the operator. The means for this purpose comprises a casing 18 having therein a rotatable four-way valve actuated as will be later described, conducting pipes 19, 20, leading from said valve casing one to each end of the cylinder, an inlet pipe 21 for compressed air, and an outlet pipe 22.

The four-way valve used by us is of the ordinary construction and is shown in detail in Figs. 4 and 5. It comprises the barrel 24 rotatable within the casing and provided with the oppositely disposed passages 24′; the opposite ends of each of said passages being adapted to connect with the inlet 21 and with the pipes 19 or 20, one of said passages 24′ being adapted to connect between the inlet and the pipe 20 when the valve is in one position, and the other of said passages at this time connecting between the outlet and the pipe 19. This connection of course is reversed when the valve is turned in the other position. It will be seen from this that upon the rotation of the valve through the arc of a circle, air will be admitted either to one end or the other of the cylinder and allowed to escape from the other. The mechanism is so arranged that when air is admitted to one pipe the piston is at the end of the cylinder adjacent thereto in which said pipe opens, the pipe of course opening in the clearance behind the piston.

Attached to the spindle of the valve barrel 24 are the three radially projecting arms 26, 27 and 28. As we have shown the construction these arms are attached to a sleeve which forms the barrel 24 which in turn is fixed upon the valve spindle 23. To one of these arms is attached a rope or other connection 28′ leading to the cab of the trolley car or to any other convenient point, the rope being for the purpose of actuating the compressed air valve, to release the rope 14 and move it back again to the trolley wire after the trolley wheel has been drawn down, as will be later described. The arm 27 carries at its end an armature 27′ adapted to contact with the poles of an electromagnet 30, which is suitably supported from the cylinder frame as by the bracket 30′ bolted or otherwise attached to said cylinder and which is in shunt with the car motor. This electromagnet may be of any suitable construction but must have sufficient strength to normally hold the armature 27′ and the arm 27 in contact with it and against the action of a spring latch now to be described.

31 designates a pawl whose detent end is adapted to engage with the ratchet of the reel 13 on the shaft 11′. This pawl is mounted on a sleeve 31′ which rotates upon a fixed shaft 32. The inner end of the shaft is received and supported in a socket bearing 32′ formed on the upper side of cylinder 4, the shaft projecting outward to a point beyond the outer face of the valve casing 18. At its outer end the sleeve 31′ carries the downwardly extending tappet finger 33 which at its lower end is rearwardly inclined as at 33′ and has a rearwardly and downwardly inclined face. In alinement with the tappet finger 33 is the arm 26 of the rotatable sleeve on the barrel 24, the extreme lower corner of the finger 26 being cut away on an incline to form a cam face to contact with the inclined inner face 33′ of the finger and to move against said finger, thus forcing the pawl 31 away from engagement with the ratchet 13. In its normal position when the armature 27′ is in contact with the electromagnets 30, the extreme end of the arm 26 bears against the finger 33 and thus holds the pawl out of engagement with the ratchet as shown in Fig. 3. When, however, current in the magnet 30 ceases, as when the trolley slips off the wire, and the current from the wire ceases to pass through the rheostat of the car to which the magnet wires lead, then the weight of the arms 28 and 27 will turn the rotatable piece 24 whereupon the spring 34 attached at one end to the finger 33 and at the other end to the arm 28 throws the pawl 31 into engagement with the ratchet tooth of the reel 13 which happens to be opposite. The reel 13 is thus held from turning immediately upon the cessation of current in the rheostat and at the same time the four-way valve is opened, compressed air enters behind piston 8, and the piston is forced forward through the cylinder carrying forward the pulley 15 and dragging downward upon the auxiliary trolley rope 14.

It will be seen that the wheel 15 as arranged acts as a pulley and hence that the trolley pole will be drawn downward just

twice the length of the stroke of the piston 8. This stroke need not be long as only a slight depression of the trolley pole will be sufficient to draw the trolley pole downward sufficiently far to get it out of the way of the supports of the cable. As long as the valve and the rotatable sleeve are in the position shown in Fig. 1, (in which position it is to be understood the piston will have been driven from the position shown in Fig. 1 to the opposite end of the cylinder 4), the pulley 15 will be held at its extended position and the auxiliary trolley rope 14 drawn down. When however it is desired to replace the trolley it is only necessary to pull upon the rope 28′ when the rotatable sleeve will turn and the arm 26 will free the pawl 31 from the ratchet wheel 13. At the same time the valve 24 will be turned to admit compressed air to the pipe 19 and hence behind the piston whereupon the piston will be moved to the other end of the cylinder (to the position shown in Fig. 1) slackening the rope 14.

It is to be noted that the peculiar form of valve which we use permits the escape of air from one side of the piston while air is being admitted on the other side of the piston. In order that the motorman or operator may be notified that the trolley is off, we have provided the whistle 35 upon the compressed air outlet from the cylinder, this whistle being operated by the passage of the compressed air from the cylinder as the piston is moved forward upon the automatic actution of the retrieving mechanism.

While we have referred to compressed air as the medium used for forcing out the piston, we wish it understood that we do not confine ourselves thereto as we regard the use of any fluid capable of being forced into the cylinder to force out the piston as within the spirit of our invention.

With our construction, we provide a slack-take-up reel with a comparatively light spring strong enough to reel up the slack of the rope but not strong enough to draw down upon the trolley, and we provide adjunctive devices operated by compressed air which will act to draw down upon the trolley when the wheel leaves the wire but under such control that by operating the valve the compressed air may be used to replace the trolley or to instantly relieve the force which is drawing downward upon the trolley rope.

It will be seen that our mechanism provides for the constant oscillation of the trolley rope and its constant tautness, and that the withdrawal of the trolley is not dependent upon any spring or other like device which is liable to lose its tension and to become less and less operative, but upon a positive impulse automatically given which will remain precisely the same no matter how many years the mechanism is operated, consistent with the condition of the various parts.

Our device is compact, simple and entirely positive in its operation.

In practical operation this retriever acts automatically and instantly to draw down upon the trolley rope and to instantly remove the trolley from the wire, dragging the trolley pole downward out of chance contact with the stays or guys supporting the feed wire.

In order to provide in practice for the temporary cessation of current as in going over cut-outs, frogs or other little irregularities, the time elapsing after the current is broken before the pole is drawn down can be accurately controlled and predetermined by the relative size of the air ports used. In other words, the break will be practically momentary and before the apparatus can act the current will again be on and the armature will again be drawn upward to position. The spring which acts upon the arm 28 and the pawl arm 33 may also be calculated to this end or abandoned entirely, relying upon the action of gravity to release the parts. It will be obvious also that any voluntary breaking of the circuit will cause the retriever to act and thus that with electrical connections which are obvious to anyone skilled in the art, it is within the power of the motorman to break a circuit through his car and thus draw down the trolley pole to meet special conditions of the wire, as for instance when the wire connections are broken, when tackle is being used for making repairs, or the feed taps are broken, thus by pushing a button or throwing a switch the mechanism can be immediately operated, obviating the chance of the pole striking obstructions and doing damage.

Another important advantage of our device consists in the fact that when the circuit breaker in the power house is blown out, the poles on all cars using this device are immediately pulled down without delay and automatically. This is very important as it allows the attendant at the power house to get the "breaker" in again and allows the engines to pick up load gradually and before the complete momentum of the "cycle" is lost. Whereas if the breaker blows out and all the motormen began to "pull" on the line at once an excessive overload strain is placed on the engine thus using more coal, burning out generators, etc.

It will be seen that no more movement is required for resetting this mechanism than is now required to replace the trolley pole without the retrievers.

Having described our invention what we claim is:

1. A trolley retriever comprising a cylinder, a piston therein, a flexible connection leading from a trolley pole and connected to

said piston, a source of compressed air communicating with both ends of said cylinder, and electrically controlled means for opening said cylinder at one end for the admission of compressed air and for opening said cylinder at the other end for the extrusion of air behind the piston for drawing down upon the trolley pole, the electrically controlled means being connected in circuit through the trolley wheel whereby upon the trolley wheel leaving the wire the said electrically controlled means shall be positively deënergized to permit a positive depression of the pole, the electrically operated means constructed to hold the rope drawing means out of operation while the trolley wheel is in contact with the trolley wire.

2. A trolley retriever constructed to insure a positive depression of the trolley pole and a positive release thereof, the same comprising a cylinder, a piston therein, flexible connections from the piston to a trolley pole operating to draw down upon the pole when the piston moves in one direction, electrically operated means acting to hold the rope-drawing means from operation while the trolley wheel is in contact with the trolley wire, a valve for admitting compressed air at either end of the cylinder behind the piston, said valve being normally held in such position as to prevent the admission of air to one end of the cylinder, the means for holding the valve in its closed position being released upon the trolley wheel leaving the wire, whereby the valve may be operated by the valve-opening means, means tending at all times to open the valve against said holding means, and hand-actuated means for operating said valve to conduct air to the other end of said cylinder.

3. In a trolley retriever, a reel normally acting to take up slack in the trolley rope, combined with means for holding said reel from unwinding, and means for drawing down upon said rope when the trolley wheel leaves the wire, said last-named means embodying an electro-magnet holding said means out of operation, said electro-magnet being so connected as to be deënergized when the trolley wheel leaves the wire.

4. In a trolley retriever, means for holding the free end of the trolley rope; a pulley wheel over which said rope passes; means for increasing the distance between said wheel and the means for holding the free end of the trolley rope; an electro-magnet acting when energized to hold said pulley extending mechanism from operation, said electro-magnet being so connected to the trolley wheel that it will be deënergized upon the trolley wheel leaving the wire.

5. In a trolley retriever, a spring reel rotatable in both directions and normally acting to take up slack in the trolley rope; in combination with means for holding the reel from movement and means for drawing down upon said rope, a spring normally acting to throw into action the reel-holding mechanism and the mechanism for drawing down upon the rope, and electrically operated means acting to hold the reel-holding mechanism out of engagement with the reel and the rope-drawing mechanism from operation while the trolley wheel is in contact with the trolley wire.

6. In a trolley retriever, a spring reel for normally taking up the slack of the trolley rope rotatable in both directions; a compressed air cylinder; a piston in said cylinder connected to said trolley rope; a valve for admitting compressed air to said cylinder behind the piston normally held closed; a pawl normally held out of contact with said reel but adapted to engage with the same to prevent the unwinding of the rope; and means for holding said pawl out of engagement and for holding said compressed air valve closed, said means being thrown out of operation when the trolley wheel leaves the wire to permit the valve and pawl to operate.

7. In a trolley retriever, a spring reel for normally taking up the slack of trolley rope rotatable in both directions; a compressed air cylinder; a piston rod projecting from said cylinder and carrying at its end a pulley over which the trolley rope passes; a valve for admitting compressed air to said cylinder behind the piston, said valve being normally closed; a pawl normally held out of contact with the reel but adapted to engage with the same to stop its rotation, said valve being mounted upon a spindle, said spindle being provided with an arm engaging with the pawl to hold it out of engagement with the reel; and an electromagnet holding said valve closed and the arm thereof in engagement with the pawl, said electro-magnet being so connected to the trolley wheel as to be deënergized when the trolley wheel leaves the wire.

8. In a trolley retriever, a spring reel for normally taking up the slack of the trolley rope rotatable in both directions, a compressed air cylinder, a piston rod projecting from said cylinder and carrying at its end a pulley over which the trolley rope passes, a valve for admitting compressed air to said cylinder normally closed, a latch normally held out of contact with said reel, means for opening the inlet valve to the cylinder, and an electromagnet normally holding said valve closed and said latch out of engagement with the reel, said electro-magnet being so electrically connected with the trolley wheel that the current thereto is interrupted by the trolley wheel leaving the wire.

9. In a trolley retriever, a spring reel for

normally taking up the slack of the trolley rope, rotatable in both directions, a compressed air cylinder, a piston rod projecting from said cylinder and carrying at its end a pulley over which the trolley rope passes, an air inlet pipe having branches leading to both ends of said cylinder, a valve in said inlet pipe closing or opening one or the other passage respectively, and means for holding the said reel from rotation and opening said inlet valve to admit air behind the piston upon the trolley wheel leaving the feed wire.

10. In a trolley retriever, a spring reel for normally taking up the slack of the trolley rope rotatable in both directions, a compressed air cylinder, a piston rod projecting from said cylinder and carrying at its end a pulley over which the trolley rope passes, an air inlet pipe having branches leading to both ends of said cylinder, a rotatable valve in said inlet pipe closing or opening one or the other passage respectively, a latch normally out of engagement with the reel but adapted to engage with the same to hold it from rotation, and radially projecting arms on said rotatable valve, one of said arms adapted to normally hold the latch out of engagement with the reel, the other of said arms carrying an armature, and an electromagnet adapted to attract said armature and hold the rotatable valve in one position, means for drawing said armature away when current through the electromagnet is broken, said electro-magnet being electrically connected with the trolley wheel so that current therethrough is broken when the trolley wheel leaves the wire.

11. In a trolley retriever, a spring reel for normally taking up the slack of the trolley rope rotatable in both directions, a compressed air cylinder, a piston rod projecting from said cylinder and carrying at its end a pulley over which the trolley rope passes, an air inlet pipe having branches leading to both ends of said cylinder, a rotatable valve in said inlet pipe closing or opening one or the other passage respectively, a latch normally out of engagement with the reel but adapted to engage with the same to hold it from rotation, three radially projecting arms on said rotatable valve, one of said arms adapted to normally hold the latch out of engagement with the reel, another arm having a connection whereby the valve may be manually operated, the other of said arms carrying an armature, and an electromagnet adapted to attract said armature and normally hold the rotatable valve in one position, thus opening the inlet valve and allowing the said latch to engage with the reel, means for drawing said armature away when current through the electromagnet is broken, said electromagnet being electrically connected with the trolley wheel so that the current therethrough is broken when the trolley wheel leaves the wire.

12. In a trolley retriever, a spring reel for normally taking up the slack of the trolley rope rotatable in both directions, a ratchet on the shaft of said reel, a compressed air cylinder, a piston rod projecting from said cylinder and carrying at its end a pulley over which the trolley rope passes, an air inlet pipe having branches leading to both ends of said cylinder, a rotatable valve in said inlet pipe closing or opening one or the other passage respectively, a pawl normally out of engagement with the ratchet on the reel shaft but adapted to engage the same to hold it from rotation, three radially projecting arms on said rotatable valve, one of said arms adapted to normally hold the said pawl out of engagement with the ratchet, another arm having a connection whereby the valve may be manually operated, the other of said arms carrying an armature, and an electromagnet adapted to attract said armature and normally hold the rotatable valve in one position, means for drawing said armature away when the current through the electromagnet is broken, and thus opening the inlet valve and allowing said pawl to engage with the ratchet, said electro-magnet being electrically connected with the trolley wheel so that the current therethrough is broken when the trolley wheel leaves the wire.

13. In a trolley retriever, a longitudinal cylinder, a piston therein having a piston rod projecting out through one end of said cylinder and carrying at its end a pulley over which the trolley rope passes, a spring reel mounted upon said cylinder to which the end of the trolley rope is attached after passing over the piston pulley, a ratchet on the shaft of said reel, a pawl adapted to engage with the said ratchet to hold the reel from movement but normally held out of engagement with said ratchet, an inlet pipe from a source of compressed air having passages leading to both ends of said cylinder, a rotatable valve in said inlet pipe adapted to be turned to direct the air into one or the other end of the cylinder, an armature mounted on the spindle of said valve, an electromagnet adapted to electrically engage said armature and to hold said inlet valve closed, said electro-magnet being electrically connected with the trolley wheel so that it will be deënergized when the said trolley wheel leaves the wire, an arm projecting from the spindle of said valve holding said pawl out of engagement with the reel shaft ratchet when the armature is engaged with the electromagnet, and means for manually operating said valve for admitting air to the forward end of

said cylinder for reëngaging the armature with the electromagnet and for releasing the pawl from engagement with the reel shaft ratchet.

14. In a trolley retriever, a compressed air cylinder having a piston therein, a pulley mounted upon said piston over which the trolley rope passes, means for holding the end of the trolley rope, an inlet pipe for compressed air, passages leading from said inlet pipe to both ends of the cylinder, a valve in said inlet pipe adapted to direct compressed air into one or the other of said passages, means for operating said valve upon the disengagement of the trolley wheel with the feed wire whereby compressed air shall be directed behind the piston to force it outward, and means operated by hand for actuating said valve to direct air in front of said piston, to retract it, and electrically operated means constructed to hold the rope drawing means out of operation while the trolley wheel is in contact with the trolley wire.

15. A trolley retriever provided with mechanism for drawing down upon the trolley rope, an armature associated therewith, an electro-magnet for said armature connected in circuit with the trolley wheel, an armed member carrying said magnet said magnet being deënergized by the trolley wheel leaving the trolley wire, spring reel mechanism for taking up slack in said trolley rope, and a latch device coöperating with one arm of said armed member and controlled by said electro-magnet constructed to hold the reel stationary and to provide a fulcrum for the trolley-draw-down machanism to work on.

16. A trolley retriever having a spring reel for keeping a constant tension upon the trolley rope; means for locking said reel immediately upon the trolley wheel leaving the wire; a trolley rope leading from said reel to a trolley pole; an electromagnet connected in circuit with the trolley wheel; and mechanism adapted to engage with and draw down upon said rope held out of actuation by said magnet but adapted to operate when the magnet is deënergized.

17. In a trolley retriever, a spring reel rotatable in both directions and normally acting to take up slack in the trolley rope, combined with a cylinder, a piston therein, means for admitting fluid upon either side of the piston, a connection between said piston and pole for insuring a positive depression of the trolley pole and a positive release of the latter, and electrically operated means deënergized when the trolley leaves the wire, for controlling said fluid admitting means.

18. In a trolley retriever, a cylinder, a double acting piston therein, means for connecting said piston with the trolley rope, and means for admitting compressed air on one side of said piston to depress the pole, and means for admitting compressed air to the other side of said piston for the return stroke of the piston to return the latter to its original position and electrically operated means acting to hold the rope drawing means from operation while the trolley wheel is in contact with the trolley wire.

19. In a trolley retriever, a cylinder, a double acting piston therein, means for connecting said piston with the trolley rope, means for admitting compressed air on one side of said piston to depress the pole, and means for admitting compressed air to the other side of said piston for the return stroke of the piston to return the latter to its original position and electrically operated means acting to hold the rope drawing means from operation while the trolley wheel is in contact with the trolley wire.

In testimony whereof, we have signed our names to this specification in the presence of two subscribing witnesses, this 19th day of September, 1907.

ROSCOE F. LEVENS.
ALFRED H. WHATLEY.

Witnesses:
HOWARD E. BARLOW,
E. I. OGDEN.