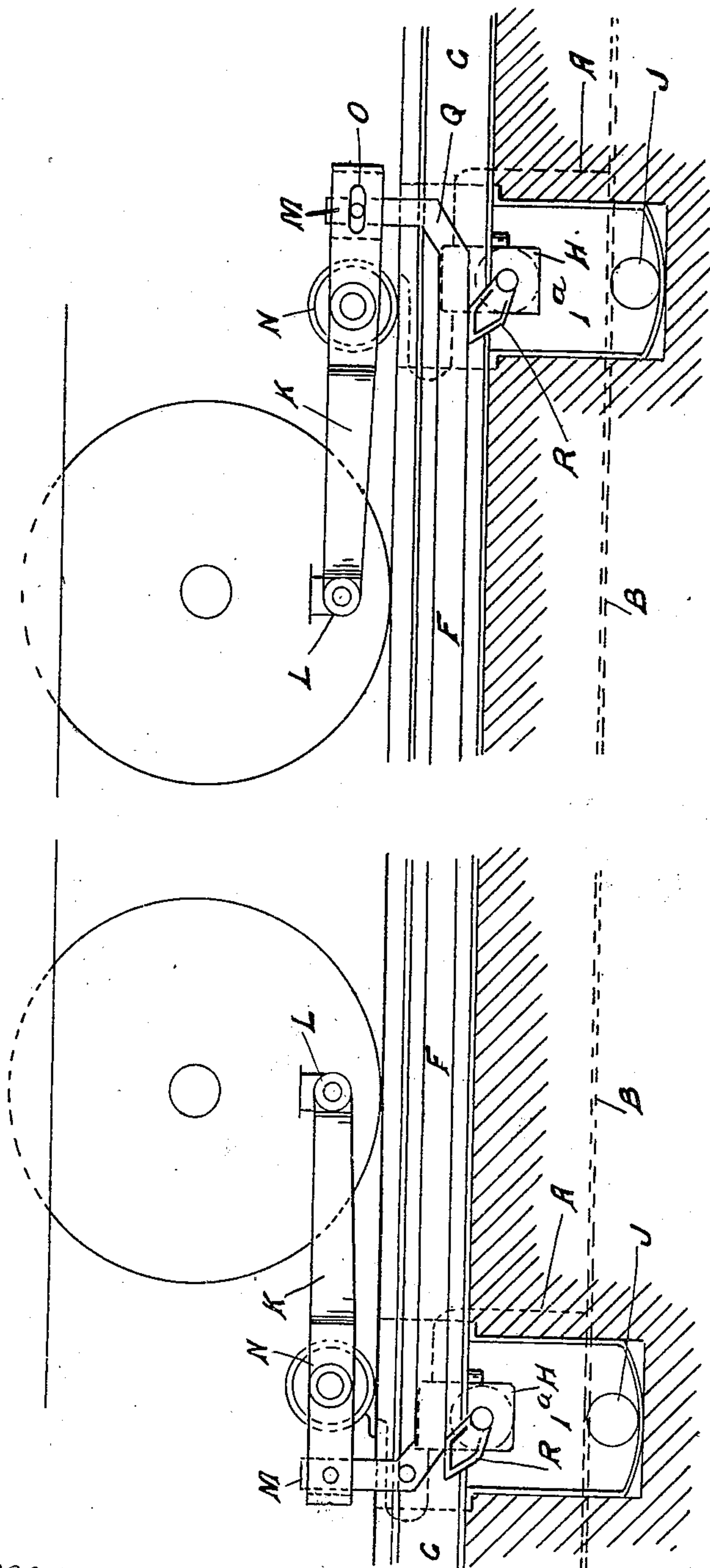


921,665.

S. G. BENNETT.
CONSTRUCTION OF ELECTRIC TRAMWAYS.
APPLICATION FILED NOV. 16, 1905.

Patented May 18, 1909.
4 SHEETS—SHEET 1.

Fig. 1



Witnesses.
H. L. Drumble.
L. P. Rock

Inventor.
Samuel G. Bennett
by E. L. Rock
Atty.

S. G. BENNETT.
CONSTRUCTION OF ELECTRIC TRAMWAYS.
APPLICATION FILED NOV. 18, 1905.

921,665.

Patented May 18, 1909.

4 SHEETS—SHEET 2.

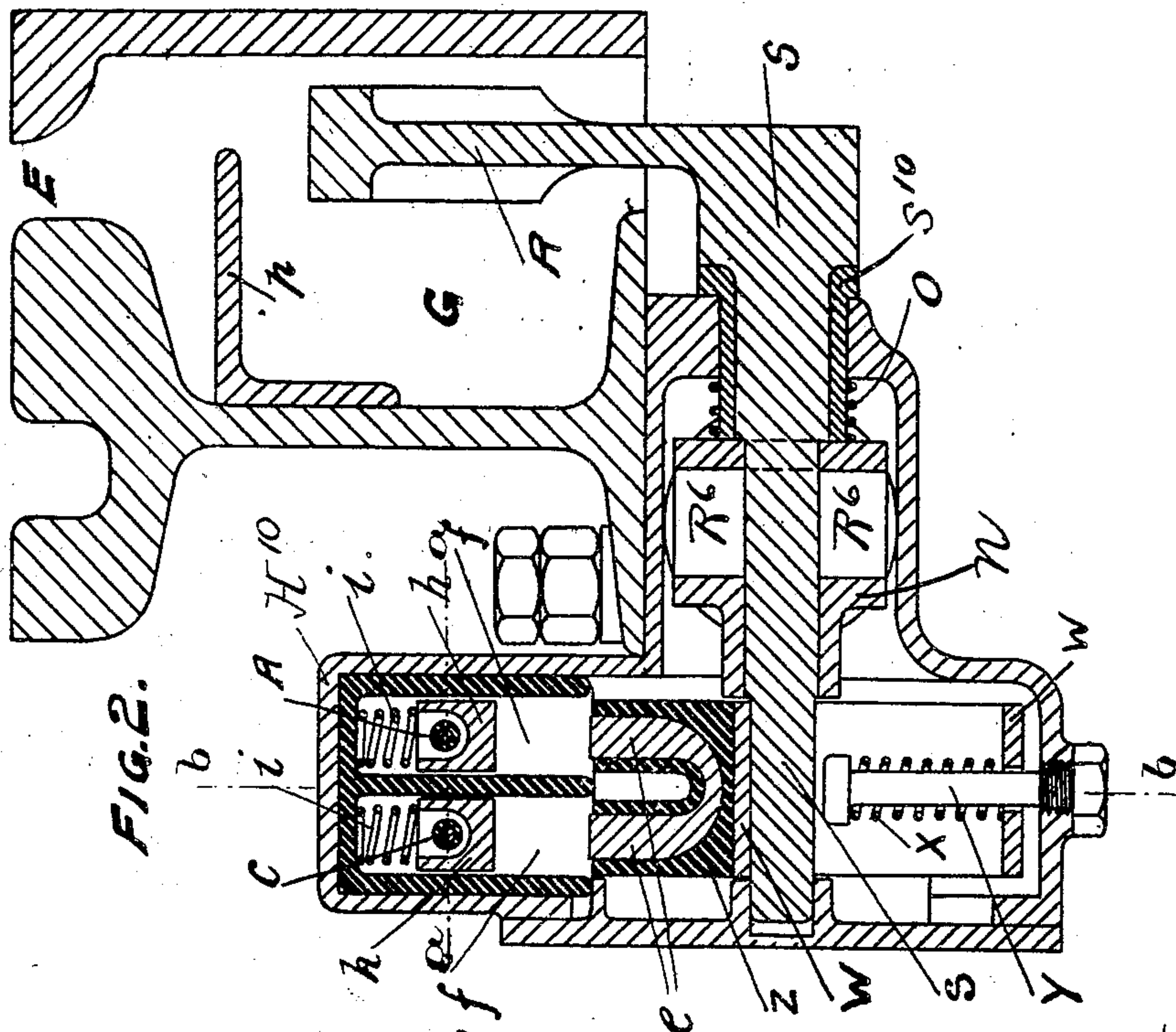


FIG. 2.

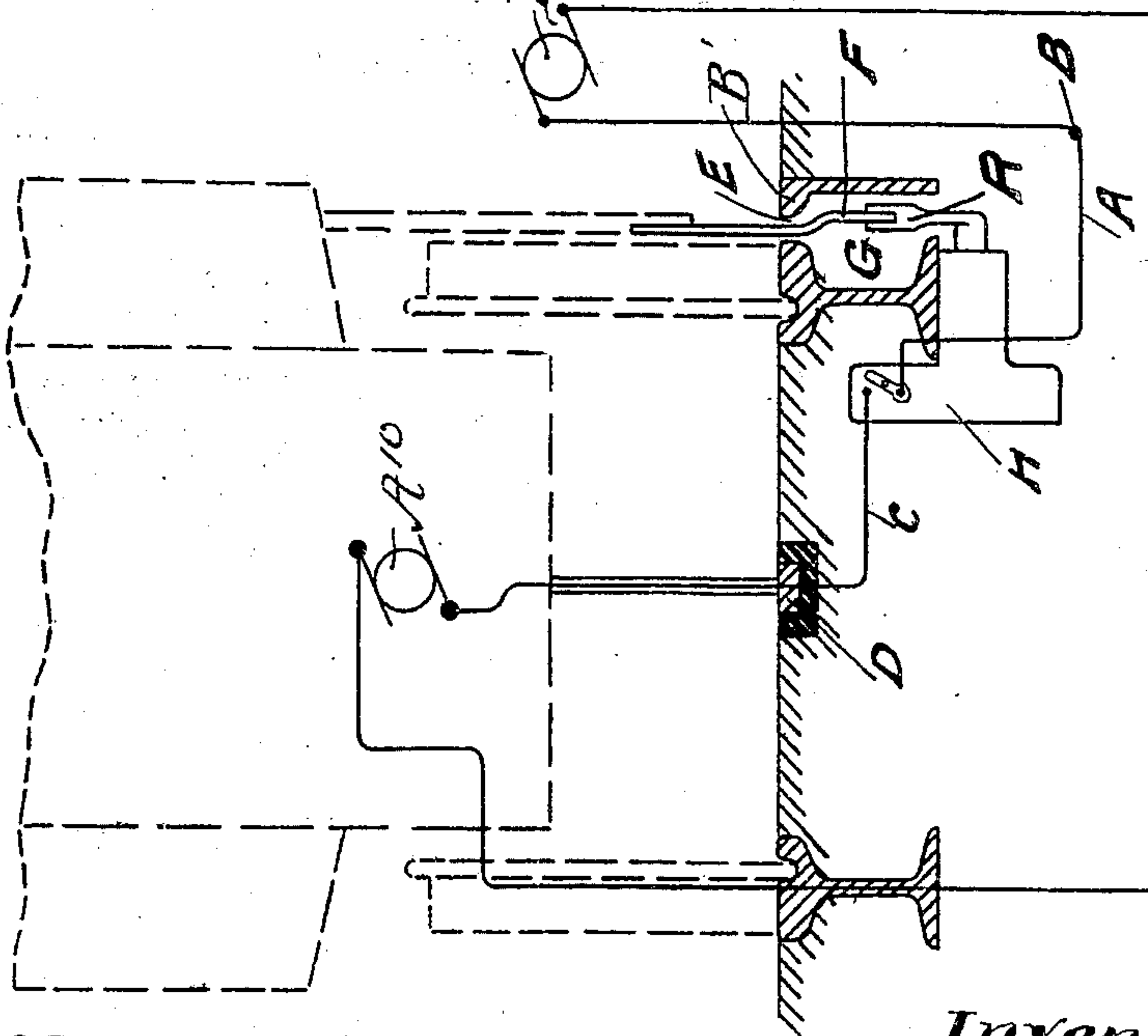


FIG. 3.

Witnesses.
H. L. Trimble.
Charles G. Cope.

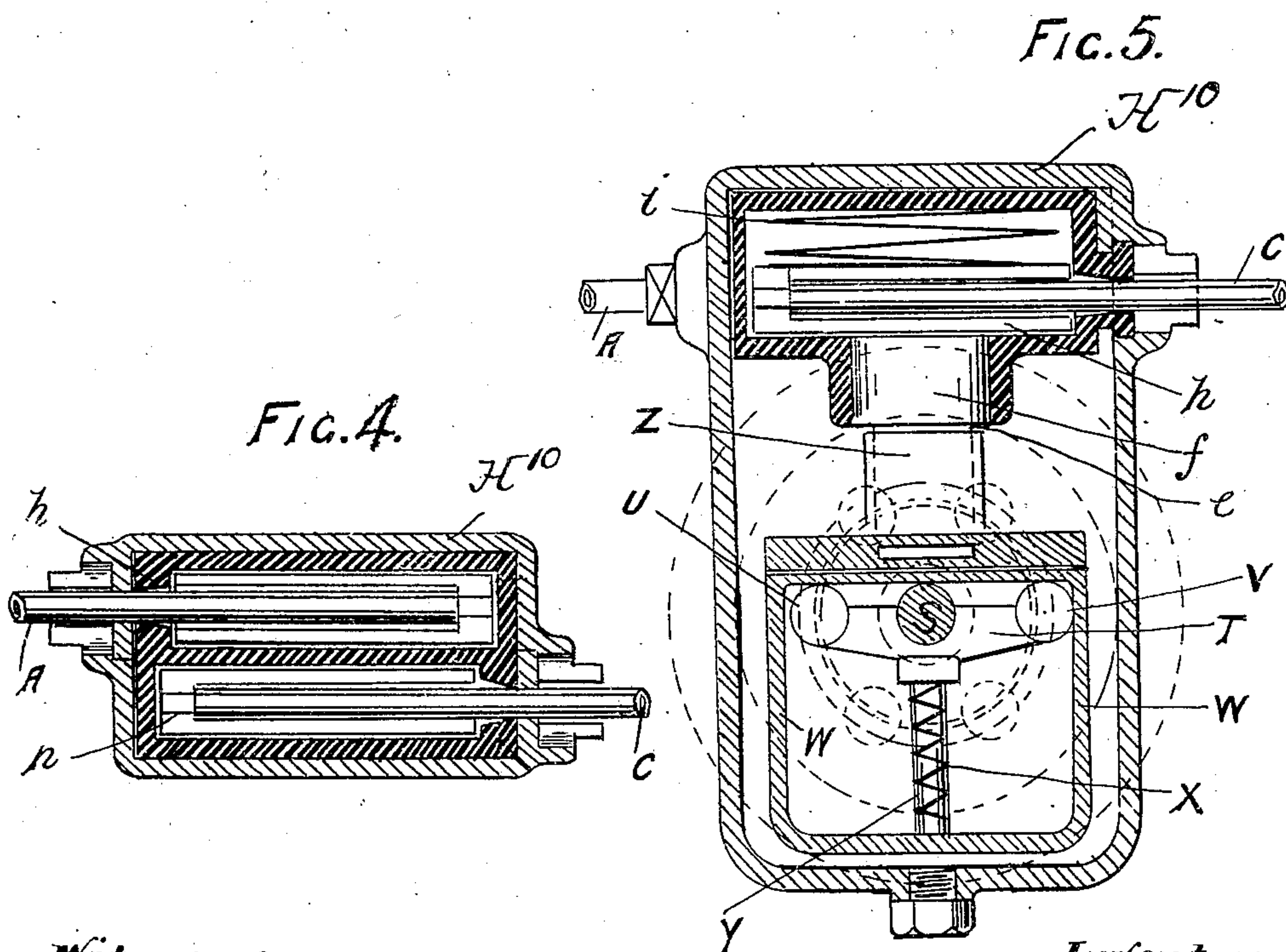
Inventor.
Samuel G. Bennett
by Charles G. Cope
attorney.

S. G. BENNETT.
CONSTRUCTION OF ELECTRIC TRAMWAYS.
APPLICATION FILED NOV. 18, 1905.

921,665.

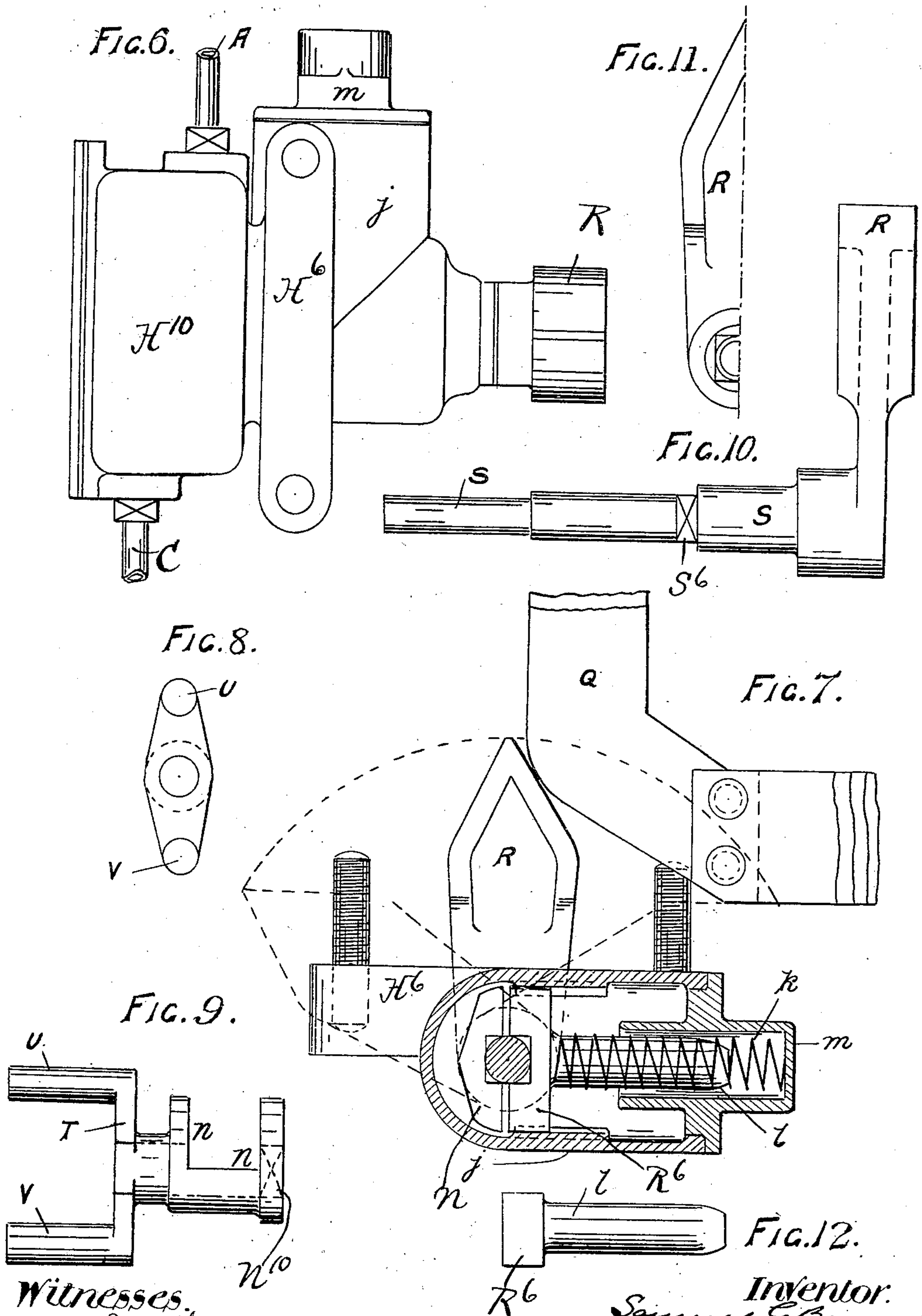
Patented May 18, 1909.

4 SHEETS—SHEET 3.



Witnesses.
H. L. Trimble.
L. F. Brock.

Inventor.
Samuel G. Bennett
by G. H. Nichols
his attorney



Witnesses.
 H. L. Drimble.
 L. B. Brock

Inventor.
 Samuel G. Bennett
 by Charles H. Reeves
 his attorney

UNITED STATES PATENT OFFICE.

SAMUEL GREEN BENNETT, OF HEATH TOWN, WOLVERHAMPTON, ENGLAND.

CONSTRUCTION OF ELECTRIC TRAMWAYS.

No. 921,665.

Specification of Letters Patent.

Patented May 18, 1909.

Application filed November 16, 1905. Serial No. 287,579.

To all whom it may concern:

Be it known that I, SAMUEL GREEN BENNETT, a subject of the King of Great Britain, residing at Clyde House, Heath Town, Wolverhampton, in the county of Stafford, England, have invented certain new and useful Improvements in the Construction of Electric Tramways; and I hereby declare that the following is a full, clear, and exact description of the same.

This invention relates to an electric tramway provided with a shallow conduit having switches arranged at suitable intervals, each of these switches being formed with a projecting lever which works in the conduit on a central spindle communicating with and actuating the internal mechanism of the switch. The normal position of these levers is substantially vertical and so long as they remain in this position the electric current is cut off from the main cable. To the bogie of the tram car is connected a plow which operates the switch levers. This plow may be similar both in construction and in the means of attachment to the bogie, to the plow described in my British Patent 5154 of 1900, but as it is not used for the purpose of collecting the electric current it does not require to be insulated and therefore may be attached to the bogie in a simpler manner than in the patent above referred to. When the plow comes into contact with the switch levers, it moves them from their vertical, to their horizontal, position, and this movement of the levers is communicated to the mechanism contained in the switches and makes the electrical contacts which permits the currents to pass through the switches while the plow remains in contact with the switch levers. When the plow releases the levers they automatically return to their normal vertical position and cut off the current. Each switch is electrically connected to a corresponding stud placed between the tram rails. These studs are of hard iron or steel suitably inserted in molded blocks of stone or reconstructed granite. When the plow engages a switch lever the current circuits through the switch to the stud which thus becomes electrified. Beneath the tram car is suspended a collecting skate usually made of hard steel of any suitable form and as in the case of the plow it is always sufficiently long to come in contact with the second stud before leaving the first one. The electric current passes from the switch to the stud and thence through

the collecting skate to the motors in the tram cars.

The accompanying drawings illustrate the nature of the invention.

Figure 1, is a view showing the method of attaching the plow to the tram car, and the arrangement of the switches in the street boxes. Fig. 2, is a vertical section through the conduit and the center of one of the switch boxes. Fig. 3, is a diagram of the system showing the connection between the live wire, switch box and studs. Fig. 4, is a section on the line *a—a* Fig. 2, showing the arrangement by which the metallic transmitters are fixed to the live main cable and the cable which communicates with the stud. Fig. 5, is a side elevation of the switch in section on line *b—b* Fig. 2. Fig. 6, is a plan of the switch. Fig. 7, shows the lever of the switch in various positions. Figs. 8 and 9 are details of the parts of the switch. Figs. 10 and 11 are details of the lever and spindle. Fig. 12 is a plan view of the guide spindle.

Like letters of reference refer to like parts throughout the specification and drawings.

The main cable B is supplied with current from the main generator B¹⁰, and to this cable the switches H are electrically connected as shown at A. The electric current passes periodically through the switches by means of the cables C, to the studs D, where it is collected by the skate attached to the tram car, and transmitted to the tram car motors A¹⁰. The track B' is provided with a slot E, in which the plow F, works in a shallow conduit G, of substantially the depth of the tram rails. Each switch H is inclosed by a switch casing H¹⁰, bolted to the rails by fastening plates H^c, and is placed in a street box *l*^a, with the lever R projecting into the shallow conduit. The street boxes *l*^a project below the shallow conduit G and the lever end of each street box is provided with a drain J, which communicates with the main sewer to prevent the accumulation of water or mud in the conduit and street boxes.

The plow F may be mounted and fitted to the tram car in the manner described in my British Patent 5154 of 1900, in which the plow is mounted upon an arm at each end of the car, the arms being mounted upon a pin or spindle. A simple method of attachment, however, is shown in Fig. 1, in which each of the projecting arms K are supported at one end on a projection L, forming a continuation of the mounting of the tram car

axle box and at the other end M, it is attached to the nose or arm Q of the plow. To insure its easy running, it carries a roller N, which engages the track rail. To provide
 5 for curves which may exist in the track B', a slot O is provided in one or both of the projecting arms K, so that the plow can automatically adapt itself as regards length to the requirements of the curve. The plow is
 10 shown in Fig. 1, as connected to a single bogie car and the small slot shown in the drawing will be sufficient to allow for adjustment when traveling around the curves. The plow can be attached to the front and back
 15 bogies of a tram car where two bogies are used but in the case of the plow being connected to a two bogie car, sufficient allowance must be made for adjustment either by increasing the length of the slot O, or by hav-
 20 ing a slot at each end of the arm K. The plow is usually so constructed as to possess the necessary flexibility to adapt itself readily to any curves which may be present in the track, and is provided with suitable
 25 nose pieces as shown at Q, the nose pieces being preferably at such an angle as will enable the plow to engage and turn the switch levers. When the nose piece engages the switch lever it moves the latter into and
 30 maintains it in a horizontal position until the plow has passed. When the plow has passed the switch lever, the latter resumes its normal vertical position and automatically cuts off the electric current from the stud.
 35 The mechanism of the switches by which the current is controlled is as follows:— The lever R is formed with a spindle S, which projects through the switch, as shown in the drawings, and is provided with a bushing S¹⁰,
 40 in the switch casing H¹⁰. Near the end of the spindle S farthest removed from the lever R, is firmly fixed a cam T as shown in Fig. 5, and in detail in Figs. 8 and 9. This cam T has two projecting arms U and V and
 45 works within a bridle W, preferably made of gun metal. The bridle W surrounds the cam F and its projecting arms and slides in suitable guides formed in the body of the switch box. When the lever R has been depressed
 50 by the plow, it rotates the spindle S, and causes the cam T to raise the bridle W, and when the lever R resumes its normal position, the bridle is forced downward by the action of the spring X mounted on the pin
 55 Y. Attached to the upper part of the bridle is an insulated projecting piece Z, and at the upper end of this projecting piece there is fitted a U-shaped contact piece e, which is insulated in all the parts except the extreme
 60 top end which are for the purpose of making contact with the metallic transmitters h hereinafter described. The two arms of this U-shaped contact piece e enter two insulated chambers f as shown in Figs. 2 and 5, and in
 65 the upper ends of these two insulated cham-

bers as shown in Figs. 2, 4 and 5, the two metallic transmitters are fixed to the two cables A and C. The cable A is attached to the main live cable B, and the cable C communicates with the stud D, and is without
 70 current except when the contact is made between it and the transmitter h connected to the main live cable. When the lever R is made to assume a horizontal position by the
 75 plow, the projecting piece Z, attached to the bridle rises until the U-shaped contact piece e is forced into contact with the two transmitters h. This contact causes the electric current to pass through the contact piece e
 80 to the stud where it is collected by the skate. When the car has passed, the switch lever R is released and the current is cut off by the automatic action of the switch. To provide a uniform contact and to compensate
 85 for wear the transmitters h are made movable in a vertical direction, each of them being kept in this vertical position in its seating by means of a spiral spring i. When the contact piece e comes into contact with the
 90 two transmitters the transmitters move vertically and accommodate themselves to any variations of lift which may occur through the contact motion of the lever R. Although the cables are fixed to the interior of
 95 the transmitters their flexibility prevents any difficulty arising from the movement of the transmitters.

To insure the return of the switch lever R to its normal vertical position a projecting cylinder j is provided at right angles to the
 100 lever spindle S. The cylinder j contains a spring k which is loosely mounted on a guide spindle l as shown in Figs. 7 and 12. The outer end of the cylinder is protected by a cover m which has an annular projecting por-
 105 tion in which the adjacent end of the spring k is loosely placed, the guide spindle l working in the same, as shown in Fig. 7. On the flat part S⁶ of the spindle S is placed a cam n, having a square hole n¹⁰ to receive the flat
 110 part S⁶ of the spindle. The cam n is a continuation of the casting forming the cam T as shown in Fig. 9. The head R⁶ of the guide spindle l abuts on the face of the cam n and when the lever R is moved by the plow out of
 115 its normal vertical position, the cam n forces back the guide spindle and compresses the spring k so that when the plow releases the switch lever R the spring k will cause the lever to assume its normal position and auto-
 120 matically cut off the electric current from the switch. In order to compensate for wear a spiral spring o is placed on the spindle of the lever as shown in Fig. 2. The switch is con-
 125 tained in its casing or box which is practically water tight and in order to prevent the levers being interfered with through this slot, a guard p of L-iron of suitable length, as shown in Fig. 2, is generally bolted to the
 130 tram rail. This of course necessitates the

arms carrying the plow or the nose piece Q being cranked as shown in the drawings to pass the guards p. The function or duty to be performed by the plow F differs from that of the plow described in my British Patent 5154 of 1900 since in the present application it is employed for the purpose of actuating the switches, whereas in the case of my British patent it was for the purpose of collecting and transmitting the electric current.

What I claim as new, and desire to secure by Letters Patent is;—

1. An electric tramway comprising a track, a main current supply wire, a plurality of contact studs disposed longitudinally of the track, means attached to the car for collecting current from the contact studs, a switch box for each contact stud, a switch contained in each switch box consisting of an oscillating spindle extending laterally across the switch box and through one side thereof, a lever attached to the outer end of the spindle, a cam secured to the spindle within the switch box, a bridle surrounding the cam vertically movable in the switch box, an insulating piece attached to the upper surface of the bridle, two contact bars, supported in the switch box above the insulating piece, insulated from one another and from the switch box, a U-shaped contact piece carried by the insulating piece for contacting with the contact bars and connecting them when the bridle is in its uppermost position, a second cam mounted on the spindle and a spring pressed plunger engaging the last mentioned cam for holding the spindle in the position in which the U-shaped contact piece is out of contact with the contact bars, conductors connecting one contact bar of each switch with the main current supply wire, conductors connecting the other contact bar of each switch with a contact stud, and means carried by the car for operating the levers of the switch spindles.

2. An electric tramway comprising a track, a main current supply wire, a plurality of contact studs disposed longitudinally of the track, means attached to the car for collecting current from the contact studs, a switch box for each contact stud, a switch contained in each switch box consisting of an oscillating spindle extending laterally across the switch box and through one side thereof, a lever attached to the outer end of the spindle, a cam secured to the spindle within the switch box, a bridle surrounding the cam vertically movable in the switch box, a spring for holding the bridle in its lowermost position, an insulating piece attached to the upper surface of the bridle, two contact bars, supported in the switch box above the insulating piece, insulated from one another and from the switch box, a U-shaped contact piece carried by the insulating piece for contacting with the contact bars and connecting them when the

bridle is in its uppermost position, a second cam mounted on the spindle and a spring pressed plunger engaging the last mentioned cam for holding the spindle in the position in which the U-shaped contact piece is out of contact with the contact bars, conductors connecting one contact bar of each switch with the main current supply wire, conductors connecting the other contact bar of each switch with a contact stud, and means carried by the car for operating the levers of the switch spindles.

3. An electric tramway comprising a track, track rails for the track, a plurality of contact studs positioned between the track rails at equal distances from one another longitudinally of the track rails, a car, means attached to the car for collecting current from the contact studs, a channel formed in the track parallel to the track rails, a plow attached to the car and extending into the channel, a main current supply wire, a plurality of street boxes corresponding in number to the contact studs embedded in the track adjacent to the channel, switch boxes contained in the street boxes, switches contained in the switch boxes, each switch consisting of an oscillating spindle extending laterally across the switch box and through the side thereof adjacent to the channel, a lever attached to the outer end of the spindle and extending upward into the channel in the path of the plow, a cam secured to the spindle within the switch box, a bridle surrounding the cam vertically movable in the switch box, an insulating piece attached to the upper surface of the bridle, two contact bars, supported in the switch box above the insulating piece, insulated from one another and from the switch box, a U-shaped contact piece carried by the insulating piece for contacting with the contact bars and connecting them when the bridle is in its uppermost position, a second cam mounted on the spindle and a spring pressed plunger engaging the last mentioned cam for holding the spindle in the position in which the U-shaped contact piece is out of contact with the contact bars, conductors connecting one contact bar of each switch with the main current supply wire, and conductors connecting the other contact bar of each switch with a contact stud.

4. An electric tramway comprising a track, track rails for the track, a plurality of contact studs positioned between the track rails at equal distances from one another longitudinally of the track rails, a car, means attached to the car for collecting current from the contact studs, a channel formed in the track parallel to the track rails, a plow attached to the car and extending into the channel, a main current supply wire, a plurality of street boxes corresponding in number to the contact studs embedded in the

track adjacent to the channel, switch boxes
contained in the street boxes, switches con-
tained in the switch boxes, each switch con-
sisting of an oscillating spindle extending
5 laterally across the switch box and through
the side thereof adjacent to the channel, a
lever attached to the outer end of the spindle
and extending upward into the channel in
the path of the plow, a cam secured to the
10 spindle within the switch box, a bridle sur-
rounding the cam vertically movable in the
switch box, a spring for holding the bridle in
its lowermost position, an insulating piece
attached to the upper surface of the bridle,
15 two contact bars, supported in the switch
box above the insulating piece insulated from
one another and from the switch box, a
U-shaped contact piece carried by the insu-

lating piece for contacting with the contact
bars and connecting them when the bridle is in 20
its uppermost position, a second cam mount-
ed on the spindle and a spring pressed plunger
engaging the last mentioned cam for holding
the spindle in the position in which the U-
shaped contact piece is out of contact with 25
the contact bars, conductors connecting one
contact bar of each switch with the main cur-
rent supply wire, and conductors connecting
the other contact bar of each switch with a
contact stud. 30

In witness whereof I have hereunto set my
hand in the presence of two witnesses.

SAMUEL GREEN BENNETT.

Witnesses:

WALTER A. E. BARTLAM,
JUSTUS JONES.