

W. G. WAGENHALS.  
ELECTRIC ARC HEADLIGHT.

(Application filed Nov. 18, 1897.)

(No Model.)

2 Sheets—Sheet I.

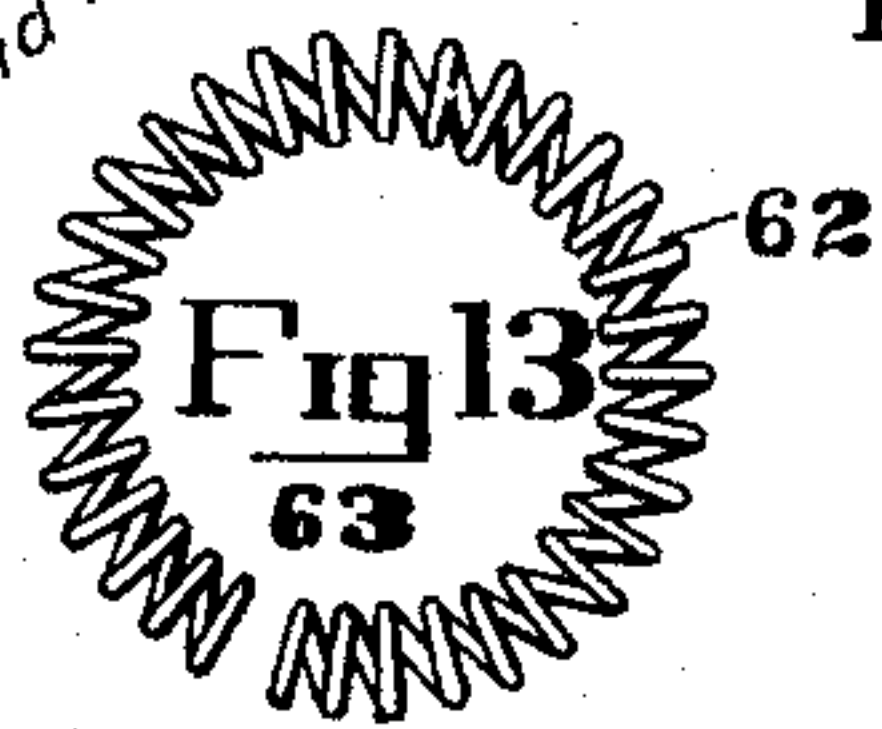
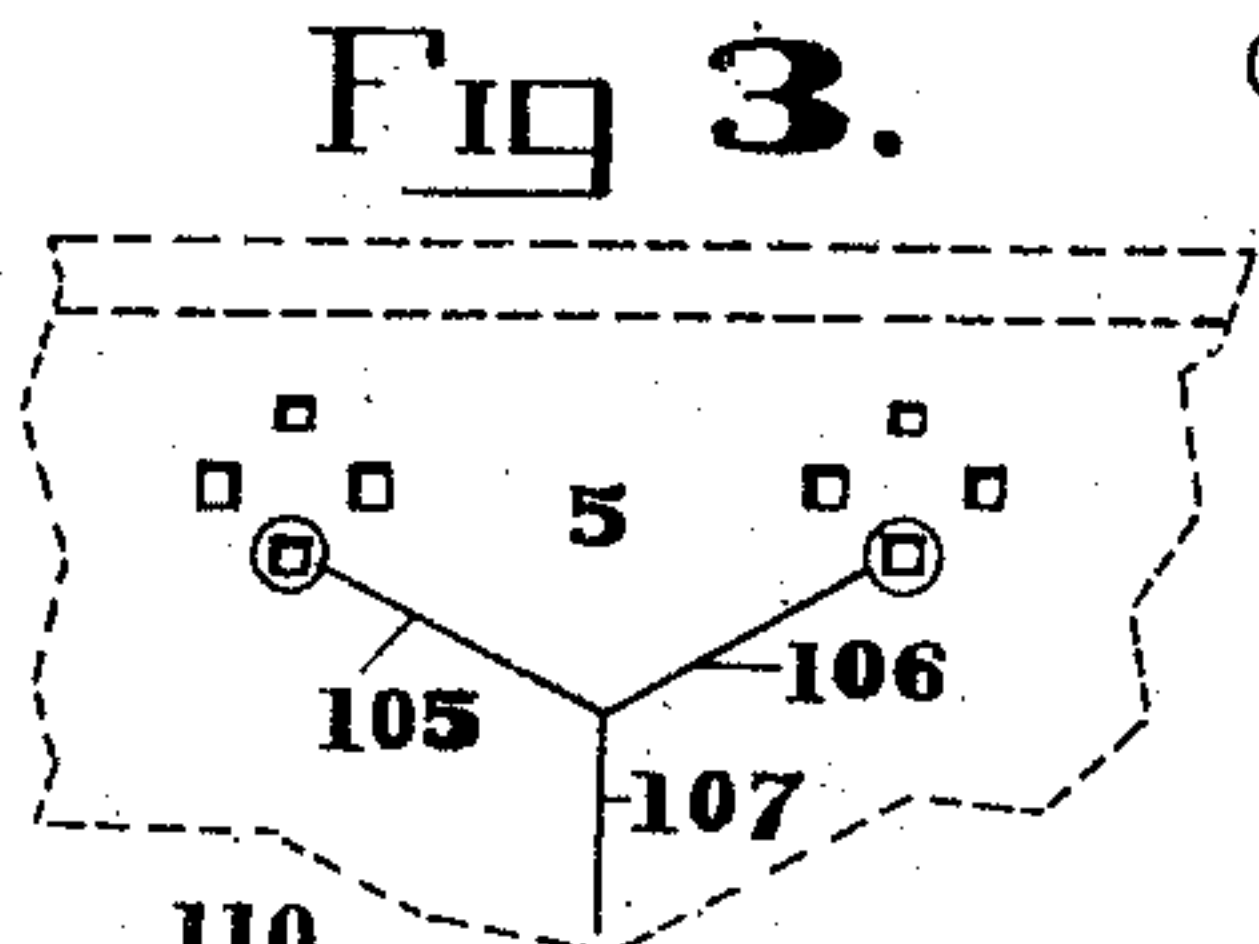
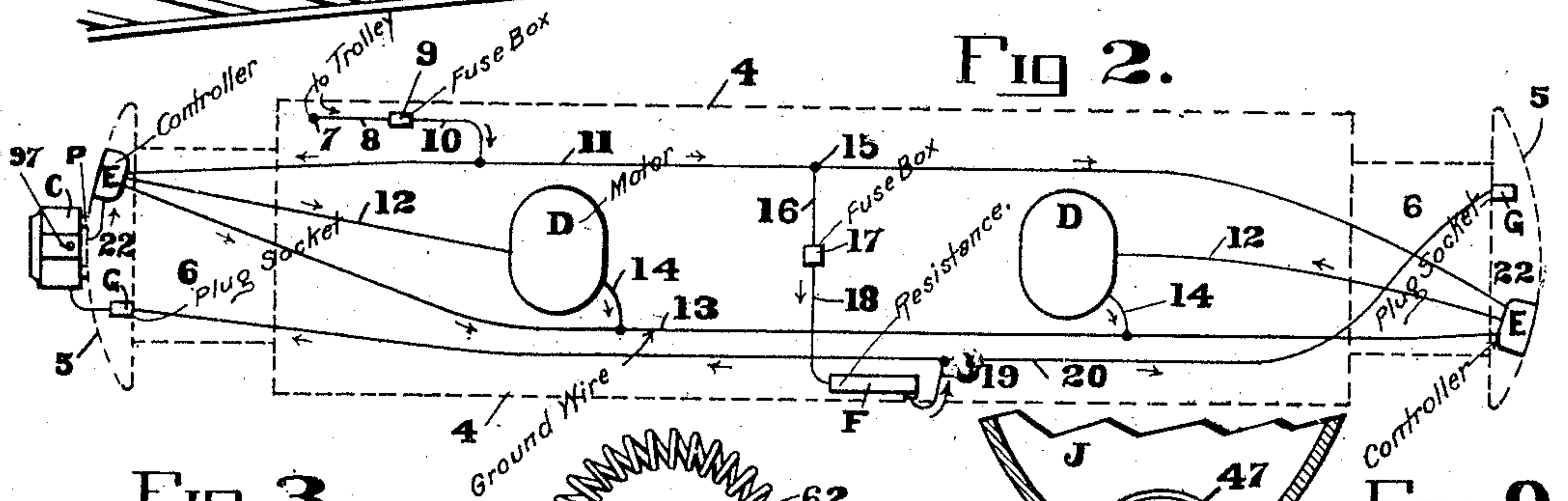
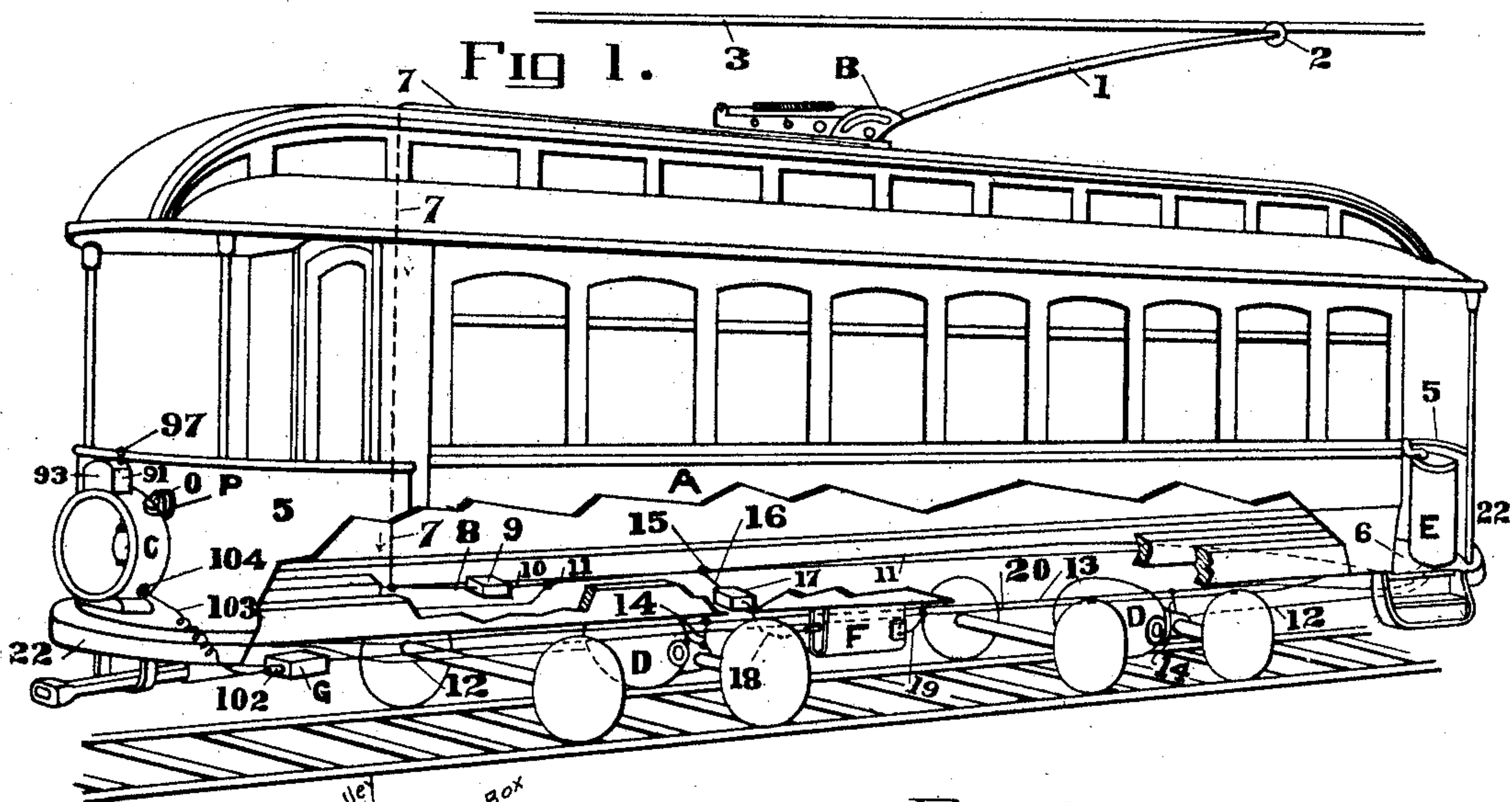
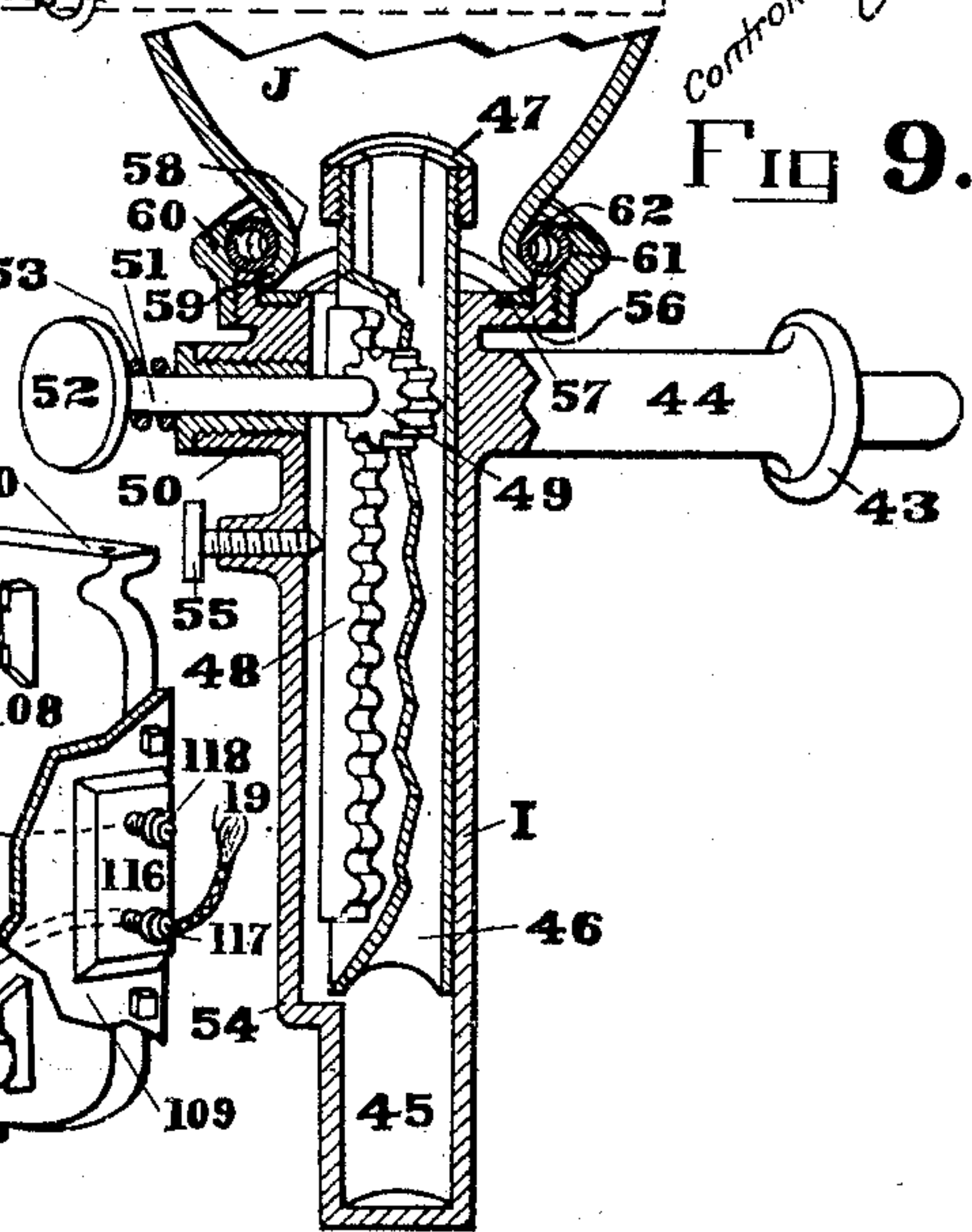
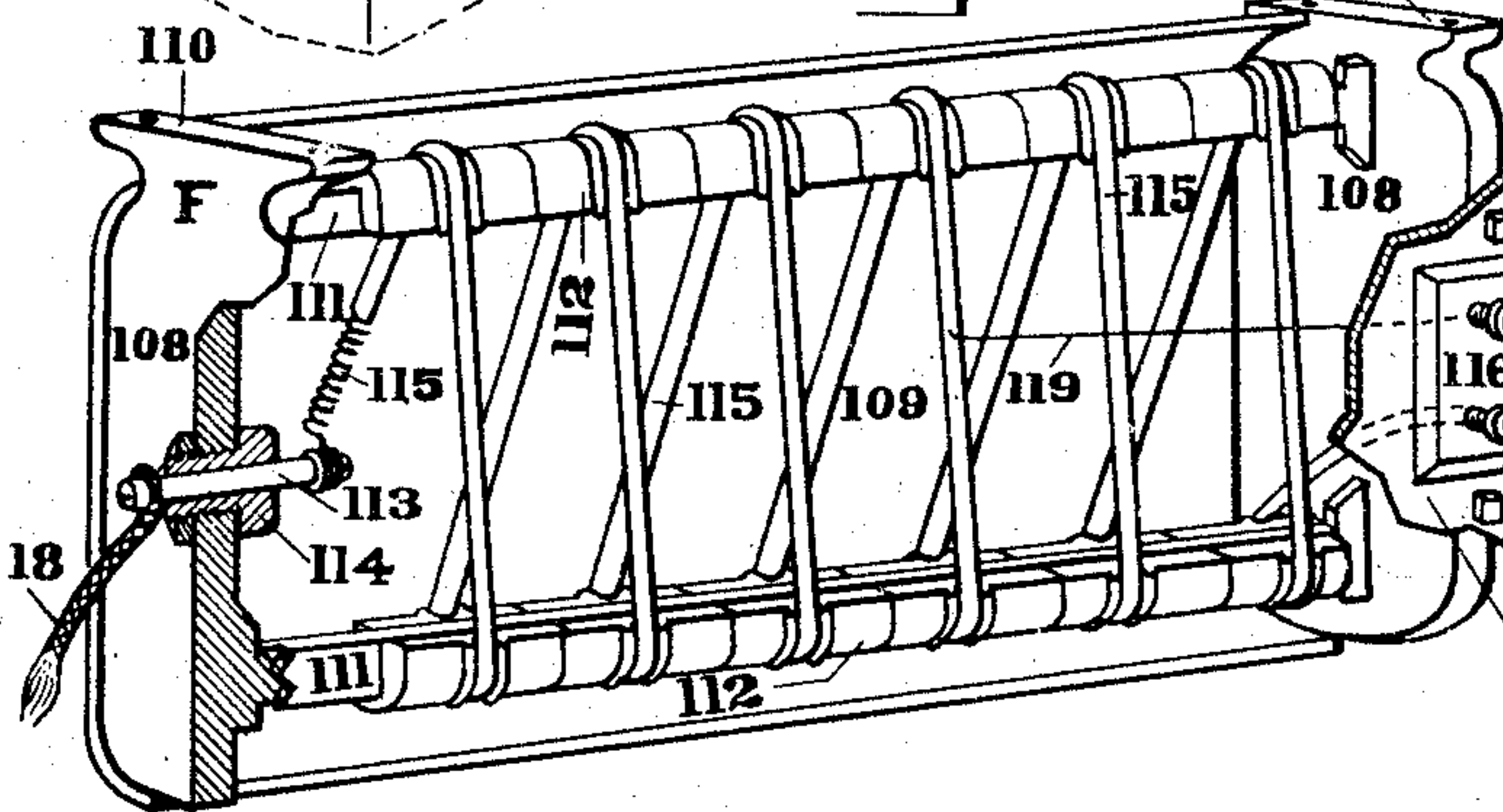


Fig 11.



Attest.  
E. B. Egan  
H. C. Colson.

W. G. Wagenhals  
By J. Kirby  
his Atty

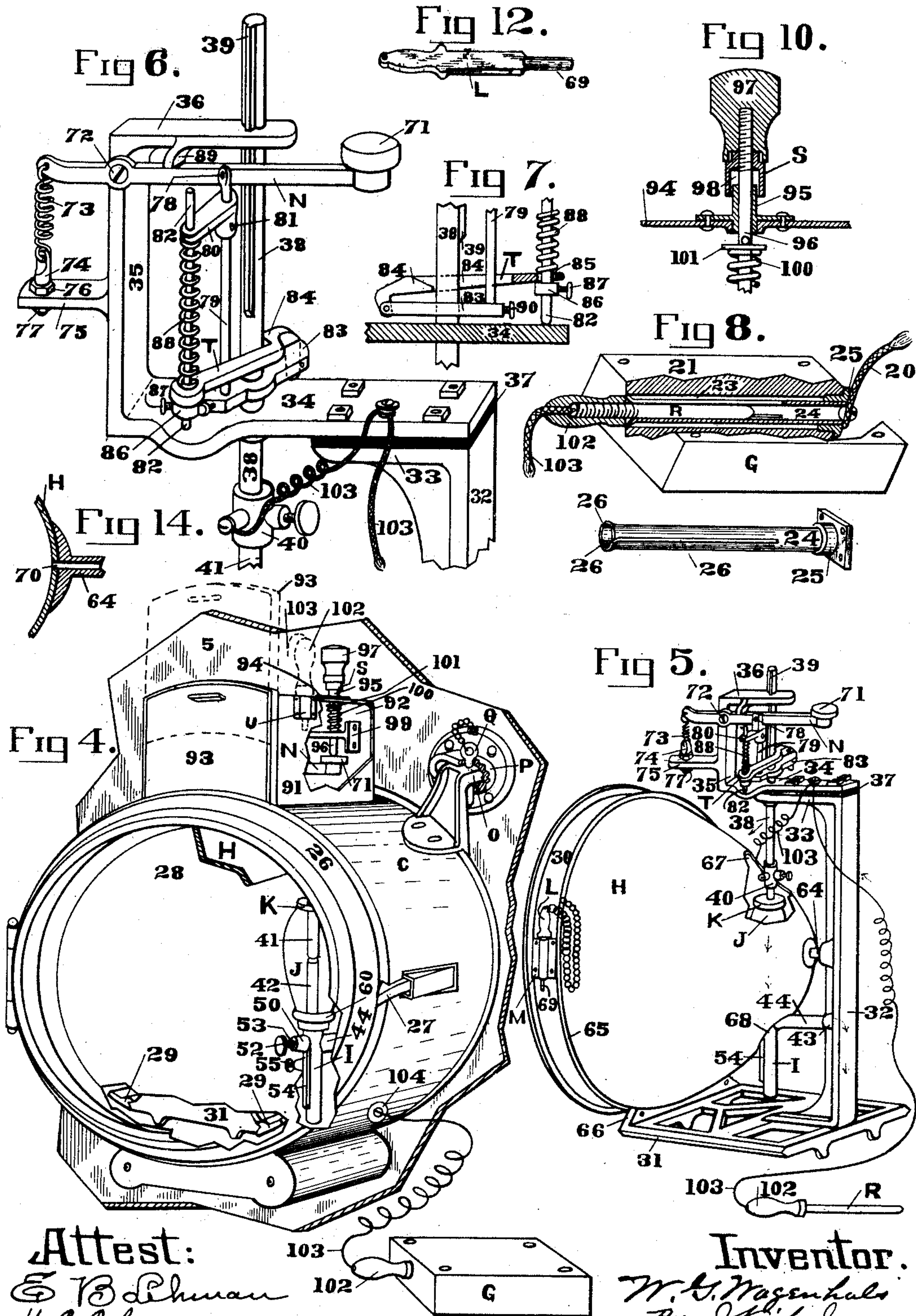


W. G. WAGENHALS.  
ELECTRIC ARC HEADLIGHT.

(Application filed Nov. 18, 1897.)

(No Model.)

2 Sheets—Sheet 2.



Attest:  
E. B. Dehman  
H. C. Colson.

Inventor.  
W. G. Wagenhals  
By *[Signature]*  
His Atty



# UNITED STATES PATENT OFFICE.

WILLIAM G. WAGENHALS, OF DAYTON, OHIO, ASSIGNOR TO THE UNITED STATES HEADLIGHT COMPANY, OF UTICA, NEW YORK.

## ELECTRIC-ARC HEADLIGHT.

SPECIFICATION forming part of Letters Patent No. 615,927, dated December 13, 1898.

Application filed November 18, 1897. Serial No. 659,027. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM G. WAGENHALS, of Dayton, in the county of Montgomery and State of Ohio, have invented new and useful Improvements in Electric-Arc Headlights, of which the following is a full, clear, and exact description.

My invention relates to electric (inclosed arc) headlights for use on electrically-propelled railway-cars and other electric vehicles, and has for its objects to provide, first, a headlight of the arc type which shall receive its electric current direct from the source by which the vehicle is driven through a suitable resistance by which the number of amperes of current consumed by the arc and the candle-power of the same is controlled; second, a resistance for such headlights by which the number of amperes of current can readily be changed and the volume of light thereby increased or reduced, as may be desired; third, an improved form of carbon-holder whereby the carbon can be easily and quickly adjusted and whereby the waste of carbon will be reduced to a minimum; fourth, a simple and efficient support for such type of headlight by which the same can be quickly attached to and detached from a car, locomotive, or other vehicle; fifth, means for quickly and accurately adjusting the carbons to their proper relations with the focal point of the reflector, and, sixth, simple and efficient means whereby the carbon-operating mechanism can be manipulated from the exterior of the case; also, to so construct the interior of such headlight that the reflector and the lamp, with its operating mechanism, can be withdrawn together from the case for the purpose of trimming or otherwise, and to combine with such detachable headlight suitable means for making and breaking the circuit as the headlight is attached to and detached from its support, the objects aforesaid, together with certain other improvements, being accomplished by new and novel combinations, the details of which will be hereinafter fully described, and pointed out in the claims, and which are clearly illustrated in the drawings forming a part of this specification, in which—

Figure 1 is a broken perspective view in outline of an electric motor-car which I have selected as being best adapted to illustrate the application of my invention and in which figure is shown a portion of the running-gear with the motors attached, the floor-timbers of the car, and a portion of one of the dashboards with my improved headlight attached thereto, and the connecting-wires which convey the current to the headlight; Fig. 2, a plan of the wiring beneath the floor of the car, together with the motors and controllers, the outline of the car being represented by dotted lines; Fig. 3, a rear view of a portion of a car-dashboard, showing ground-wire connections with the dash-sockets which carry the headlight; Fig. 4, an enlarged perspective view of the complete headlight mounted in the dash-sockets attached to the car-dashboard, the circuit-plug and its cooperating socket being shown coupled together, the latter being detached from the car-body; Fig. 5, a perspective view of the interior of the headlight removed from its case; Fig. 6, an enlarged perspective view of the upper-carbon-feeding mechanism, the several movable parts thereof being shown in their normal positions; Fig. 7, a broken side elevation, partly in section, of the clutch-arm and clutch-lever, together with their cooperating rods, and shows the positions occupied by the several parts when the carbon-rod is released, as seen from the reverse side of Fig. 6; Fig. 8, an enlarged broken perspective view of the circuit-plug and its cooperating socket, the metallic tube being also shown detached; Fig. 9, a broken perspective view of the lower-carbon holder, partly in elevation and partly in section; Fig. 10, an enlarged sectional view of the exterior mechanism for manipulating the carbon-feeding lever; Fig. 11, a broken perspective view of the headlight resistance, showing its internal construction; Fig. 12, a perspective view of the carbon-setting gage; Fig. 13, a plan view of the globe-holding spring, and Fig. 14 a sectional view of a portion of the reflector and its back stem.

Similar letters and figures of reference indicate corresponding parts in all the figures of the drawings.



A represents a car-body provided with a trolley B, having a pole 1 and a grooved wheel 2 at one end thereof, the wheel being adapted to traverse an overhead current-conveying wire 3 in a manner common to the construction of electric railways.

4 represents by dotted lines the outline of the car below the floor, 5 the dashboards, and 6 the platforms thereof.

10 C is the headlight, which in Figs. 1, 2, and 4 is shown attached to the dashboard.

D D are electric motors, and E E controllers, which may be of any suitable construction.

15 The electric current by which the car is driven is conveyed from the wire 3 to underneath the car by means of the trolley-pole 1, wheel 2, and wire 7, the current passing from the said wire through a wire 8, fuse-box 9, 20 and wire 10, thence through wire 11 to the controllers, one of which is usually located on each platform, the current being carried from the controllers to the motors by wires 12. A ground-wire 13 connects with the controllers 25 and with any convenient part of the running-gear that will carry the current to the ground and to which the motors are connected by wires 14. The wire 11 is tapped at 15 by a wire 16, which supplies current to the head- 30 light through a fuse-box 17, wire 18, and a resistance F, hereinafter more fully described, the current passing from the headlight resistance through wires 19 and 20 to plug-sockets G G, one of which is located at 35 each end of the car, as shown in Figs. 1 and 2, and which is shown in Fig. 8 of the drawings as consisting of a block of wood 21, adapted to be screwed to the under side of the end sills or bumpers 22 and having a longitudinal bore 23, in which is placed a metallic tube 24, provided with a flange 25, by 40 which the tube is screwed to the block, at the rear end thereof, and to which the ends of wire 20 are connected, the other end of the tube being flared outwardly to permit the circuit-plug to enter freely. The inner diameter of the tube is slightly less than that of the circuit-plug, and the tube being slotted, 45 as shown at 26, when the plug is inserted springs to accommodate the latter, and thereby forms positive contact between the two metal surfaces, the bore in the block being of sufficient size to accommodate the outward spring of the tube.

55 The headlight-case C is provided with the usual hinged door 26, clutch 27, and glass 28. Ways 29 are secured to the case, on the inside thereof, and are adapted to receive the interior of the headlight, which consists of a parabolic reflector and certain working parts of 60 the headlight adapted to be contained within the case, all mounted on a sliding base, so as to be removable therewith from the case.

65 H represents the reflector, and 30 an extension of same.

31 is the sliding base, on which is mounted a vertically-extended arm or bracket 32, having

a lateral extension 33, on which is mounted a bracket 34, having vertical and lateral extensions 35 36, a layer of insulating material 37 70 being placed between the latter bracket and the extension 33 of bracket 32 to separate the two poles of the arc. A carbon-rod 38, having a rib 39, slides freely up and down through suitable perforations in the bracket 75 34 and extension 36 thereof, the function of the rib being to keep the rod from turning. To the lower end of the carbon-rod is attached an upper-carbon holder 40, carrying a carbon 41. A lower-carbon holder I for holding a 80 carbon 42 is attached to the vertical arm 32 at 43 by means of an arm 44, and it consists of a hollow sleeve 45, closed at its lower end to exclude air and containing a carbon carrier or tube 46, slotted and screw-threaded at 85 its upper end and being provided with an interiorly slightly-tapered screw-threaded nut 47, adapted to press the slotted end of the tube against the carbon and hold it securely therein. On the exterior of tube 46 is se- 90 cured a rack 48, which engages a pinion-wheel 49, mounted in an extension 50 of the sleeve 45 and having a shaft 51, to which is attached an operating-button 52, between 95 which and the outer end of the extension 50 is located a coil-spring 53, its function being to impart a steady movement to the pinion-wheel, the rotation of which raises or lowers the rack, carrying with it the tube 46 and the carbon 42, a housing 54 being formed on the 100 sleeve 45 and inclosing the rack 48, which when elevated or lowered to a desired position can be secured in such position by means of a set-screw 55, adapted when screwed tight against the rack to prevent possible jarring 105 down, which might otherwise be caused by the jolting movement of the car, and it is obvious that short pieces of carbon can be held in tube 46, which being movable can from time to time be elevated, so as to carry the 110 free end of the carbon up to its proper burning-point, and thus waste is reduced to a minimum. The upper end of the hollow sleeve 45 terminates in an enlarged exteriorly-screw-threaded head 56, provided with a recess 57, 115 into which any suitable packing can be inserted to form a yielding cushion for a globe J, having its lower end provided with a contracted neck 58 and a flaring lip 59. An interiorly-screw-threaded cap 60, having an annular groove 61 and a central opening of sufficient size to permit the lip on the globe to pass through, registers with the exteriorly-screw-threaded head 56. A coil-spring 62 encircles the groove 61 of the cap 60, forming 120 a central opening 63, the diameter of which is normally about equal to that of the contracted neck of the globe J, the spring being sufficiently elastic to permit the lip 59 of the globe to be pressed through the opening 130 63, when the spring will overlap the lip and hold the globe in position. A metallic cap K rests on the top of globe J and has a central opening through which the upper car-



bon can slide freely. The back of the reflector is provided with a stem 64, by which it is attached to the vertical arm 32, the front or open end of the reflector having an outwardly-turned flange or rim 65, by which it is secured to a web 66 on the sliding base 31, openings 67 and 68 being cut through the reflector for the passage of the carbon-holders and to provide sufficient room to insert or remove the globe. To obtain best results, the carbons should be adjusted to their proper relation with the focal point of the reflector, which can be done in the following manner: The sliding base 31, together with its attached appurtenances, is withdrawn from the case. The globe is then removed by removing cap K, raising carbon-rod 38, and unscrewing cap 60. The lower carbon is then placed in position in tube 46 and secured in place by turning nut 47. Stem 69 of a carbon-gage L is then inserted in a bore 70 of the reflector-stem 64 and the carbon raised until its upper end touches the under flat side of said gage, in which position it is secured in the manner hereinbefore described. The gage is then removed and placed in a pocket M, attached to the extension 30 of the reflector, as shown in Fig. 5, the gage being chained to the reflector to prevent displacement. After removing gage L cap K is replaced and carbon 41 inserted in holder 40. Rod 38 is then lowered until carbon 41 rests on the upper end of carbon 42 and which is done by pressing down on a button 71, on the release of which carbon 41 will be raised a suitable distance to form the arc, the normal length of which is about three-sixteenths of an inch.

I will now describe the mechanism by which the upper carbon is manipulated, also the operation of the lamp. A lever N, having a button-shaped end 71, is pivoted at 72 to the vertical extension 35 of bracket 34. To the opposite end of this lever is connected one end of a spiral spring 73, the lower end of which terminates in a screw-threaded rod 74, which passes through an arm 75, projecting from the vertical portion 35 of bracket 34 and is provided with nuts 76 and 77. To the lever N is also pivoted, at 78, a vertical rod 79, to which is attached a movable arm 80, held in place on the rod by a set-screw 81, and the outer end of which is pierced to receive and slide freely over a vertical rod 82. To the lower end of rod 79 is secured a clutch-arm 83, through which the carbon-rod 38 slides freely and to one end of which is pivoted a clutch-lever T, having a cam 84, the opposite end of this clutch-lever being pierced with a hole 85 for the passage of rod 82, the bottom end of which below the clutch-lever T is provided with a movable collar 86, held in place by a set-screw 87. A spiral spring 88 encircles the rod 82, the under side of arm 80 and the upper side of clutch-lever T forming bearings for the ends thereof. Thus by pressing on the button 71 of lever N rods 38, 79, and 82, arm 80, clutch-arm 83, and clutch-lever T will be carried downward until

the lower end of rod 82 strikes the top side of bracket 34, which arrests the downward movement of the end of the clutch-lever, through which rod 82 passes, when a further downward movement of clutch-arm 83 will carry with it the pivoted end of the clutch-lever, thereby shifting the position of cam 84 sufficient to release carbon-rod 38, which will then drop until carbon 41 strikes against the end of carbon 42, and further movement of rod 38 is thereby prevented, and the return movement of clutch-arm 83, caused by the action of spring 73, when pressure on lever N is released, will cause cam 84 to reengage rod 38 and carry it upward until lever N is arrested by stop 89. It will be observed on referring to Fig. 7 that hole 85 in the end of the clutch-lever is slightly larger than the diameter of rod 82, which difference is provided to accommodate the oscillating movement of the lever-arm. The tension on spring 73 can be regulated by the nuts 76 and 77. It will be further observed that by raising or lowering nut 86 on rod 82 the arc distance between the carbons will be lengthened or shortened accordingly and that the length of arc is governed by the limit of movement of the clutch-lever T, which can be adjusted to a proper movement by means of set-screw 87 of the collar 86, the function of spring 88 being to exert pressure against the end of clutch-lever T and keep it down against collar 86. The side and back walls of case C are extended at the top in box-like form, as indicated at 91 and 92, to provide room for the mechanism which extends above the reflector, the front end of the extension thus formed being provided with a sliding door 93, adapted to be raised, as shown by dotted lines in Fig. 4, to permit the interior of the headlight to be inserted in and withdrawn from the case, and to the top wall 94 of the extension is secured a hollow sleeve 95, through which and through said wall operates a spring-actuated rod 96, to the upper end of which is attached, preferably by screwing thereon, a non-conducting knob 97, below which is attached, also preferably by screwing thereon, to rod 96 a hollow sleeve S, having an enlarged bore 98 to correspond with the outer diameter of sleeve 95 and overlapping the upper end of the same, the function of sleeve S being to prevent rain, snow, &c., beating into the case and short-circuiting the lamp. A bridge or bracket 99 is secured to the walls 91 of the extension, on the inside thereof, and through which the lower end of rod 96 is free to operate, this rod being so located and arranged that when the interior is in its place within the case the lower end thereof will rest upon the button-like end 71 of lever N. Therefore by depressing knob 97 lever N will also be depressed, thereby adjusting the upper carbon to proper relation with the lower one, as previously described, and as frequent as occasion may require. A spiral spring 100, with its lower end seated on the top side of



bridge 99 and its upper end bearing against a collar 101, attached to rod 96, serves to carry the rod back to its upward position, when the hand is released from knob 97.

5 The headlight is detachably supported by brackets O, two of which are by preference employed and which are attached to the back of the case near the top thereof. These brackets are adapted to enter sockets P, attached  
10 to each dashboard, preferably by bolts, and are held in position in the sockets by pins Q, which extend through holes in the brackets and sockets, thereby preventing removal of the headlight without first withdrawing the  
15 pins and by which arrangement the headlight cannot be accidentally displaced. A cushion (not shown) composed, preferably, of rubber or other soft material may be attached to the  
20 bottom of the case to rest against the dashboard and hold the headlight in a vertical position.

When the headlight is in position for use, as shown in Figs. 1 and 4, connection thereto with the current-conveying wire 20 is made  
25 by inserting a circuit-plug R, having a non-conducting handle 102, into one of the plug-sockets G, the said circuit-plug being connected with a wire 103, leading through a bushed aperture 104, attached to the case and  
30 connecting with the bracket 34, thence to the upper-carbon holder 40, as shown in Figs. 4, 5, and 6. On the rear side of the dashboard or other support from which the headlight is suspended and to one of the bolts which se-  
35 cure each of the sockets P to the same, conducting-wires 105, 106, and 107 are connected, as shown in Fig. 3, the wire 107 leading to and connecting with the ground connection (not shown) inside of the controller, thus  
40 forming a connection with the main ground-wire 13, and the lower carbon 42 is thus grounded through its holder I, arm 44, vertical bracket 32, slide 31, case C, and brackets P, the light being generated by the pass-  
45 ing of the current from carbon 41 (positive pole) to carbon 42, (negative pole,) as is well understood by persons skilled in the art of electric lighting. A pocket U is secured to one of the sides of the extension-top of the  
50 case in which to carry the circuit-plug when the headlight is detached from its support and when it is disconnected, the same being represented by dotted lines in Fig. 4.

I will now describe the form of resistance  
55 which I have from experience found to be best adapted for use in connection with my improved headlight.

108 represents ends, and 109 sides, forming a case provided with feet 110, by which the  
60 resistance may be attached to a suitable support.

111 represents two horizontal bars extending from end to end of the case and which carry a series of grooved insulators 112. At  
65 one end of the case there is attached a connecting bar or arm 113, separated from the case by an insulator 114. To the outer end of this post

wire 18 is connected, and to its inner end is connected one end of a coil 115 of suitable re-  
70 sistance-wire wound in the form of a spiral spring and drawn zigzag over and under the insulators 112, as clearly shown in Fig. 11. To the opposite end of the case is fixed a piece of insulating material 116, to which is  
75 attached binding-posts 117 and 118, the other end of the resistance-coil being connected with post 117. A wire 119 connects the resistance-coil, at a suitable distance from the end thereof, with the binding-post 118.

When it is desired to utilize the maximum  
80 resistance offered by the coil 115, wire 19 is connected with binding-post 117, and when less resistance, and consequently more powerful light, is required wire 19 is connected with binding-post 118. Hence it will be ob-  
85 served that by increasing the number of binding-posts and connecting the same with the resistance-coil at various points thereof a corresponding amount of current will be consumed by the arc of the lamp and its candle-  
90 power increased or diminished proportionately. It will also be observed that by the arrangement just described provision is made whereby the resistance can be adjusted to  
95 consume a greater or lesser number of amperes of current.

In the foregoing I have described what I have found from experience in actual service to be the best manner of carrying out  
100 the details of my invention; but I do not wish to limit the invention to such exact construction and arrangement of parts as I have described, as the same may be departed from in various ways without departing from the  
105 spirit thereof.

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

1. An electric-arc headlight having a case and a parabolic reflector provided with upper and lower openings on a line with the focal  
110 point thereof and an electric-arc-lamp fixture mounted on a base and contained within said case, a positive and a negative carbon adjustably supported by said lamp-fixture and extending through said openings, in combina-  
115 tion with the dashboard of an electrically-propelled vehicle, means for attaching said case to said dashboard, wires 11; 13 and 20, a resistance having connection with said  
120 wires 11 and 20, a plug-socket at each end of said latter wire, and suitable connections between the positive and negative poles of the lamp and said wires 13 and 20, substantially as set forth.

2. An electric-arc headlight having a case  
125 and a parabolic reflector provided with upper and lower openings on a line with the focal point thereof and an electric-arc-lamp fixture mounted on a base and contained within said case, a positive and a negative carbon adjust-  
130 ably supported by said lamp-fixture and extending through said openings, in combination with the dashboard of an electrically-propelled vehicle, means for detachably sup-



porting said case on said dashboard, wires 11; 13 and 20, a resistance having connection with said wires 11 and 20, a plug-socket at each end of said latter wire, and suitable connections between the positive and negative poles of the lamp and said wires 13 and 20, substantially as set forth.

3. The combination with a vehicle propelled by electricity, of a case and an electric-arc lamp contained therein, means for detachably securing the case to the vehicle, a carbon-feed-operating device attached to the case but disconnected from the lamp-fixture, an upper-carbon-carrying rod adapted to slide in suitable guides attached to the lamp-fixture, spring-retracting feeding mechanism adapted to coact with said rod and said carbon-feed-operating device, means whereby the latter can be manipulated, and suitable connections with the lamp and the case and the vehicle whereby electric current is conveyed from the propelling power of the vehicle to and from the lamp, substantially as set forth.

4. In an electric-arc headlight, a case in which is contained an electric-arc lamp; the said case being provided with an extension-top, a carbon-feed-operating device attached to said extension-top but detached from the lamp-fixture, an upper-carbon-carrying rod adapted to slide in suitable guides attached to the lamp-fixture, spring-retracting feeding mechanism adapted to coact with said rod and said carbon-feed-operating device, means whereby the latter can be manipulated, in combination with an electrically-propelled vehicle, and means for supporting the said case thereon, substantially as set forth.

5. The combination with the dashboard of a vehicle propelled by electricity conveyed to a motor forming a part of the machinery of such vehicle, of a headlight-case, a removable electric-arc lamp contained within the case, a carbon-feed-operating device attached to the case but detached from the lamp-fixture, carbon-feeding mechanism attached to the lamp-fixture and adapted to coact with said carbon-feed-operating device, means whereby the latter can be manipulated, a main-circuit wire for conducting the electric current to the said motor, a circuit plug-socket, a conducting-wire leading from the said main-circuit wire to the said plug-socket, a fuse-box and a resistance located between the main-circuit wire and said plug-socket, a circuit-plug adapted to engage the plug-socket and having a connecting-wire leading to the positive pole of the lamp whereby the current is conveyed thereto, brackets secured to the case, sockets secured to the dashboard and adapted to receive said brackets and by which means the headlight-case is detachably held in position on the dashboard, a conducting-wire connected with said sockets whereby connection is made with the negative pole of the lamp through the medium of said brackets

and the case and the return-current thereby carried to the ground, substantially as set forth.

6. The combination with an electrically-propelled vehicle, of an electric-arc headlight and a case therefor; the said case being provided with a carbon-feed-operating device attached thereto and whereby the upper carbon of the lamp can be adjusted independently of the lower carbon, a base upon which are mounted a reflector and an upwardly-extending bracket carrying the lamp mechanism, the said base and its attachments being contained within and removable from the case, means for attaching the case to the vehicle and whereby the same may readily be detached therefrom, suitable conductors for conveying electric current to the headlight and from the headlight through the case to the ground, and a device for making and breaking the circuit between the headlight and said vehicle, substantially as set forth.

7. The combination of a vehicle propelled by electricity, of a headlight-case provided with means for detachably securing the case to said vehicle, an electric-arc lamp contained within the case, auxiliary carbon-feeding mechanism attached to the case but disconnected from the lamp-fixture therein and whereby the upper carbon of the lamp can be manipulated, a conductor leading from the positive pole of the lamp through an opening in the case, a circuit-plug at the free end of said conductor, and a pocket secured to the case and in which to carry said circuit-plug when not in use, substantially as set forth.

8. In an electric-arc headlight, the combination of a base upon which are mounted a reflector and an upwardly-extending bracket carrying the lamp mechanism, a case in which the said base and its attachments are adapted to be contained, upper and lower carbon holders, a carbon-carrier movable within the lower-carbon holder, and provided with a device for securing a carbon therein, means for lowering and raising the carrier in said holder, and an auxiliary carbon-feeding device fixed to the case but disconnected from the lamp-fixture and whereby the upper carbon can be manipulated, substantially as set forth.

9. In an electric-arc headlight, a case therefor, a reflector mounted within the case and having upper and lower openings therein, a holder secured to a suitable support and protruding through said lower opening in the reflector, a globe-holder secured to the upper end of said holder, a globe carried by said globe-holder, a carbon-carrier movable in said holder and provided with a device for securing a carbon therein, and means for raising and lowering the carrier in said holder, in combination with an upper-carbon holder fixed to a movable rod adapted to slide through said upper opening in the reflector, substantially as set forth.

10. The combination with a headlight-case



and an electric-arc lamp contained therein, of a spring-retracting carbon-feed-operating device attached to the case but disconnected from the lamp-fixture, an upper-carbon-carrying rod adapted to slide in suitable guides attached to the lamp-fixture, spring-retracting feeding mechanism adapted to coact with said rod and said carbon-feed-operating device, and means whereby the latter can be manipulated, substantially as set forth.

11. In an electric headlight, a case and an electric-arc lamp contained therein, a carbon-feed-operating device attached to the case but disconnected from the lamp-fixture, in combination with an upper-carbon-carrying rod adapted to slide in suitable guides attached to the lamp-fixture, spring-retracting feeding mechanism adapted to coact with the said rod and said carbon-feed-operating device, and means whereby the said feeding mechanism can be manipulated from the exterior of the case independently of the lower carbon therein, substantially as set forth.

12. In an electric headlight, a case and an electric-arc lamp contained therein, a carbon-feed-operating device attached to the case on the outside thereof but detached from the lamp-fixture, in combination with an upper-carbon-carrying rod adapted to slide in suitable guides attached to the lamp-fixture, spring-retracting feeding mechanism adapted to coact with said carbon-feed-operating device, and means whereby the latter can be manipulated from the exterior of the case, substantially as set forth.

13. In a headlight-case; the rear end of the body of which is closed and the front end thereof open, a main door hinged to said body and adapted to close said open end, a box-like extension forming the top of said case and being in open communication with the interior thereof and having its rear end closed and its front end open, in combination with a sliding door adapted to close the said open end of said extension and to register with said main door, substantially as set forth.

14. The combination with an electrically-propelled vehicle of an electric-arc lamp removably contained within a case provided with a main door hinged to the body of the case at the front or open end thereof and a box-like extension in open communication with said body and having its front end open, a sliding door adapted to close said open end and to register with said main door, a carbon-feed-operating device attached to the case but detached from the lamp-fixture therein, carbon-feeding mechanism attached to the lamp-fixture and adapted to coact with said carbon-feed-operating device, means whereby the latter can be manipulated, brackets secured to the case, sockets secured to the vehicle and adapted to receive said brackets, and pins loosely engaging said brackets and sockets whereby the same are coupled to-

gether and said case detachably connected with said vehicle, substantially as set forth.

15. As an improvement in dash electric headlights, the combination with the dashboard of a railway-car, of an electric-arc headlight having a case provided with a main door in the body thereof and a top extension having an open end closed by a door which registers with said main door, a sliding base, ways secured to the case on the inside thereof to receive said sliding base, a reflector secured at its front or open end to said sliding base and at its rear to a bracket extending upwardly from said base, a fixed lower-carbon holder protruding through an opening in the lower side of the reflector, and containing a movable carbon-carrier, an upper-carbon holder fixed to a movable rod and adapted to slide through an opening in the upper side of the reflector, upper and lower carbons carried by said carbon-carrier and said carbon-holder, a carbon-gage whereby said carbons can be adjusted to their proper relations with the focal point of the reflector, auxiliary carbon-feeding mechanism attached to the case and disconnected from the lamp-fixture whereby the upper carbon can be manipulated from the exterior of the case by the motorman while the vehicle is in motion, and means for attaching the case to the dashboard of the car and whereby the same may readily be detached therefrom, substantially as set forth.

16. In an electric-arc headlight, a case provided with a door in the body thereof and an extension-top having an open end closed by a door, the said case containing a lamp-frame consisting of a sliding base adapted to engage ways secured to the case on the inside thereof, a vertical bracket mounted on said sliding base, a reflector having its front or open end secured to said sliding base and its rear end supported by said bracket, a negative-carbon holder carried by said bracket, a globe carried by said carbon-holder, a positive-carbon holder and mechanism for operating the same, said positive-carbon holder and said operating mechanism being carried by said vertical bracket and the whole being removable from the case, substantially as set forth.

17. In an electric-arc headlight, the combination of a case provided with a door, and an extension-top having an open end closed by a door, a slide held in ways secured on the inside of the case, a reflector secured at its front or open end to the slide and at its rear to a bracket extending upwardly from said slide, a fixed lower-carbon holder protruding through an opening in the lower side of the reflector, a carbon-carrier operative in said carbon-holder, a globe-holder carried by said carbon-holder, a globe held in said holder within the reflector, an upper-carbon holder fixed to a movable rod and adapted to slide through an opening in the upper side of the reflector, upper and lower carbons carried by



said carbon-carrier and said carbon-holder; their meeting ends being within said globe, a cap mounted on the top of said globe and through which said upper carbon extends, and means for adjusting the carbons to their proper relations with the focal point of the reflector, substantially as set forth.

18. In an electric-arc headlight, the combination of a case provided with a door and an extension-top having an open end closed by a door, a slide held in ways secured on the inside of the case, a reflector secured at its front or open end to the slide, and at its rear to a bracket extending upwardly from said slide, a fixed lower-carbon holder protruding through an opening in the lower side of the reflector, a carbon-carrier operative in said carbon-holder, a globe-holder carried by said carbon-holder, a globe held in said holder within the reflector, an upper-carbon holder fixed to a movable rod and adapted to slide through an opening in the upper side of the reflector, upper and lower carbons carried by said carbon-carrier and said carbon-holder; their meeting ends being within said globe, a cap mounted on the top of said globe and through which said upper carbon extends, devices for adjusting the carbons to their proper relations with the focal point of the reflector, a conducting-wire for conveying the electric current to the upper carbon, an aperture in the case for the passage of said wire, a circuit-plug connected to the free end of said wire, a receiving-socket with which said circuit-plug engages, a conducting-wire connected with said socket, and means for conveying the current from the headlight to the ground, substantially as set forth.

19. The combination with a headlight-case provided with a main door in the body thereof and an extension-top having an open end closed by a door, of an electric-arc lamp contained within said case, a carbon-feed-operating device attached to the case but detached from the lamp-fixture, an upper-carbon-carrying rod adapted to slide in suitable guides attached to the lamp-fixture, spring-retracting feeding mechanism adapted to coact with said rod and said carbon-feed-operating device, and means whereby the latter can be manipulated, substantially as set forth.

20. The combination with the dashboard of a railway-car, of a headlight-case, brackets secured thereto, sockets secured to said dashboard; the said brackets being adapted to enter the said sockets, holes in said brackets and sockets and which holes register with each other when so engaged, and pins engaging said holes whereby the case is detachably connected with said dashboard, substantially as set forth.

21. In an electric-arc headlight, the combination of a reflector, having a bored stem at the back thereof, positive and negative carbons carried by suitable holders, and a gage adapted to enter the bore of said stem, where-

by the meeting ends of the carbons can be set to their proper relation with the focal point of the reflector, substantially as set forth.

22. In an electric-arc headlight, the combination of a reflector having a bored stem at the back thereof, positive and negative carbons carried by suitable holders, a gage whereby the meeting ends of the carbons can be set to their proper relations with the focal point of the reflector, and a pocket attached to the reflector or adjacent thereto, in which to carry said gage, substantially as set forth.

23. In a carbon-holder for an electric-arc headlight, a holder adapted to be secured to a support and having a globe-holder secured to the upper end thereof, a globe carried by said globe-holder, a carbon-carrier movable in said carbon-holder and provided with a device for securing a carbon therein, in combination with rack-and-pinion mechanism for raising and lowering the carrier in said holder, substantially as set forth.

24. For use with an electric-arc headlight, the combination of a resistance consisting of a case composed of the ends 108, sides 109, feet 110 formed on the said ends, horizontal bars 111 extending from end to end of the case, grooved insulators 112 carried by the said horizontal bars, connecting-bar 113 attached to one of said ends and insulated therefrom by the insulator 114, the spirally-coiled resistance-wire 115 having one end connected with said connecting-bar and arranged in zig-zag form over and under the insulators 112, a block of insulating material 116 secured to one of said sides at the opposite end of the case, binding-posts 117 and 118 secured to said block, one end of said coiled wire being connected with the binding-post 117 and a connection between binding-post 118 and the resistance-wire at a suitable distance from the end thereof, and whereby the resistance capacity may be regulated, substantially as set forth.

25. In an electric-arc headlight, a case having an electric-arc lamp and a reflector mounted on a supporting-base contained therein, in combination with a carbon-feed-operating device attached to the case but detached from the lamp-fixture, carbon-feeding mechanism attached to the lamp-fixture and adapted to coact with said carbon-feed-operating device, and means whereby the latter can be manipulated; the lamp together with its reflector and supporting-base being removable bodily from the case without removing the said carbon-feed-operating device, substantially as set forth.

In testimony whereof I have hereunto subscribed my name this 16th day of November, 1897.

WILLIAM G. WAGENHALS.

Witnesses:

H. B. MUST,

ED. L. SPENCER.