

**No. 707,606.**

**Patented Aug. 26, 1902.**

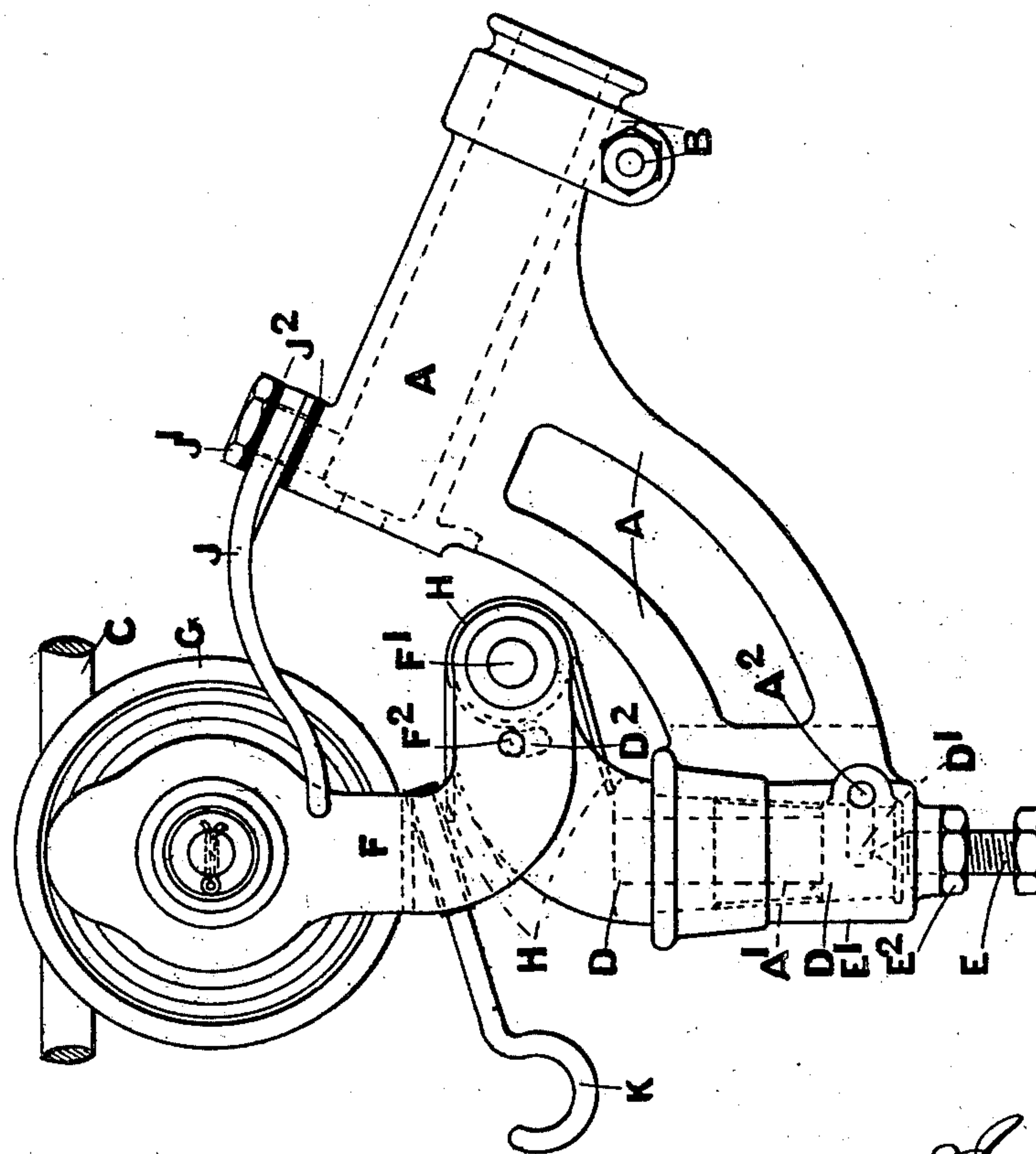
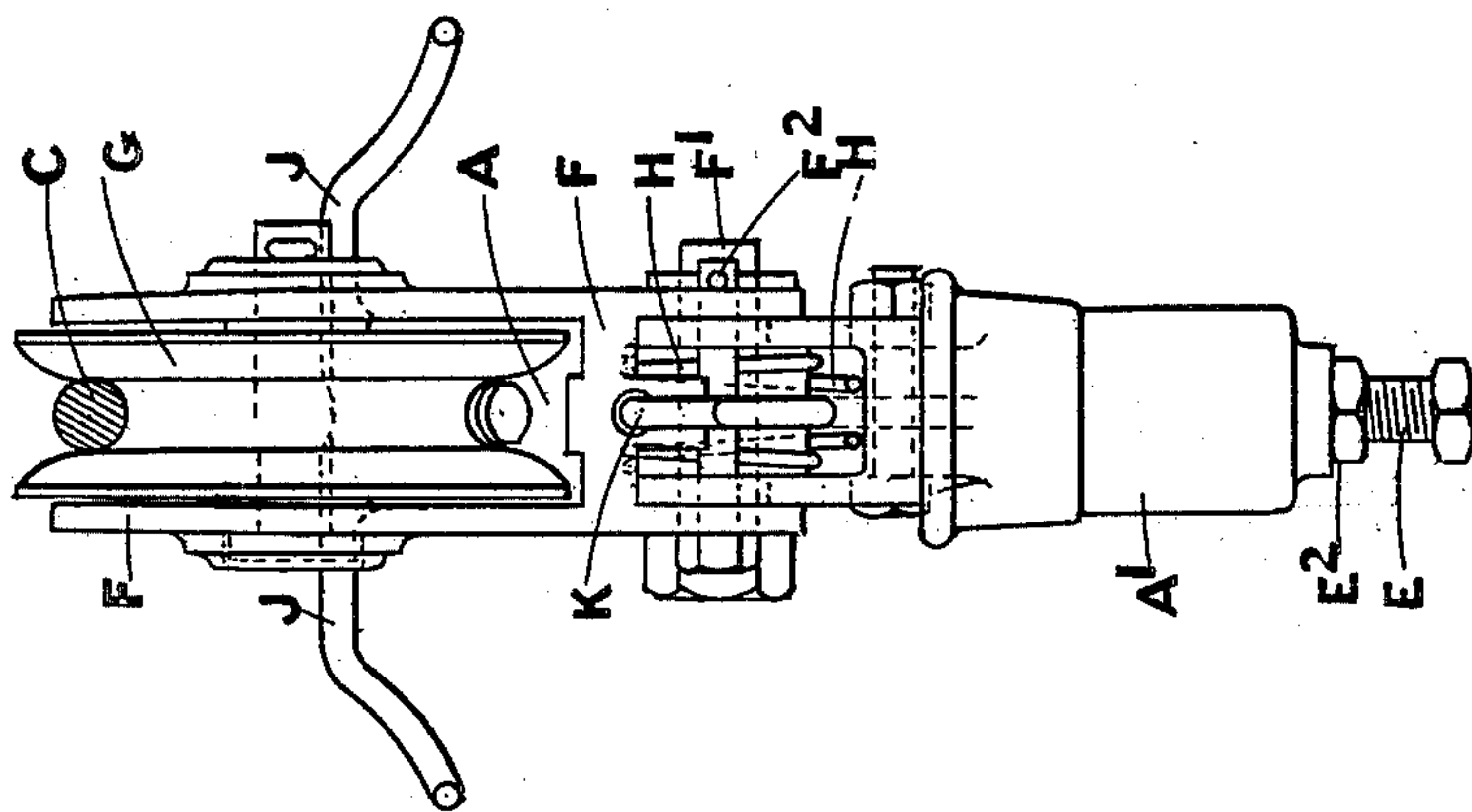
**J. G. LISTER.**

## TROLLEY FOR USE IN ELECTRIC TRACTION.

(Application filed Dec. 14, 1901.)

(No Model.)

**3 Sheets—Sheet 1.**



Witnesses

W. K. Bond

*W. M. Thompson*

Inventor

John G. Lister

By Wm. A. Fowler.

Attorney

No. 707,606.

Patented Aug. 26, 1902.

J. G. LISTER.

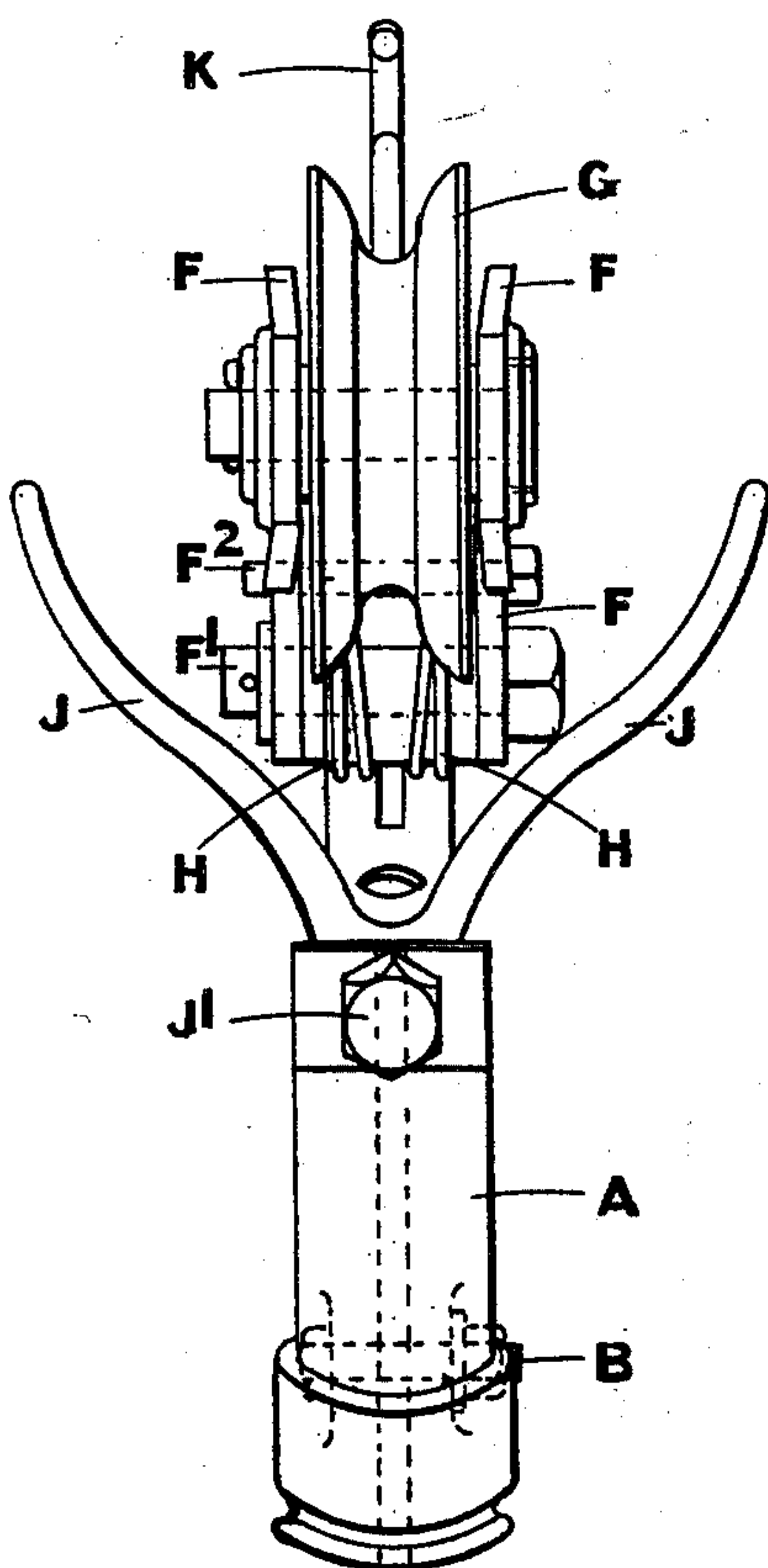
TROLLEY FOR USE IN ELECTRIC TRACTION.

(Application filed Dec. 14, 1901.)

(No Model.)

3 Sheets—Sheet 2.

FIG 3



Witnesses  
W. K. Boulton  
J. G. Lister

Inventor  
John G. Lister.  
By W. K. Boulton  
Attorney

No. 707,606.

Patented Aug. 26, 1902.

J. G. LISTER.

TROLLEY FOR USE IN ELECTRIC TRACTION.

(Application filed Dec. 14, 1901.)

(No Model.)

3 Sheets—Sheet 3.

FIG 5

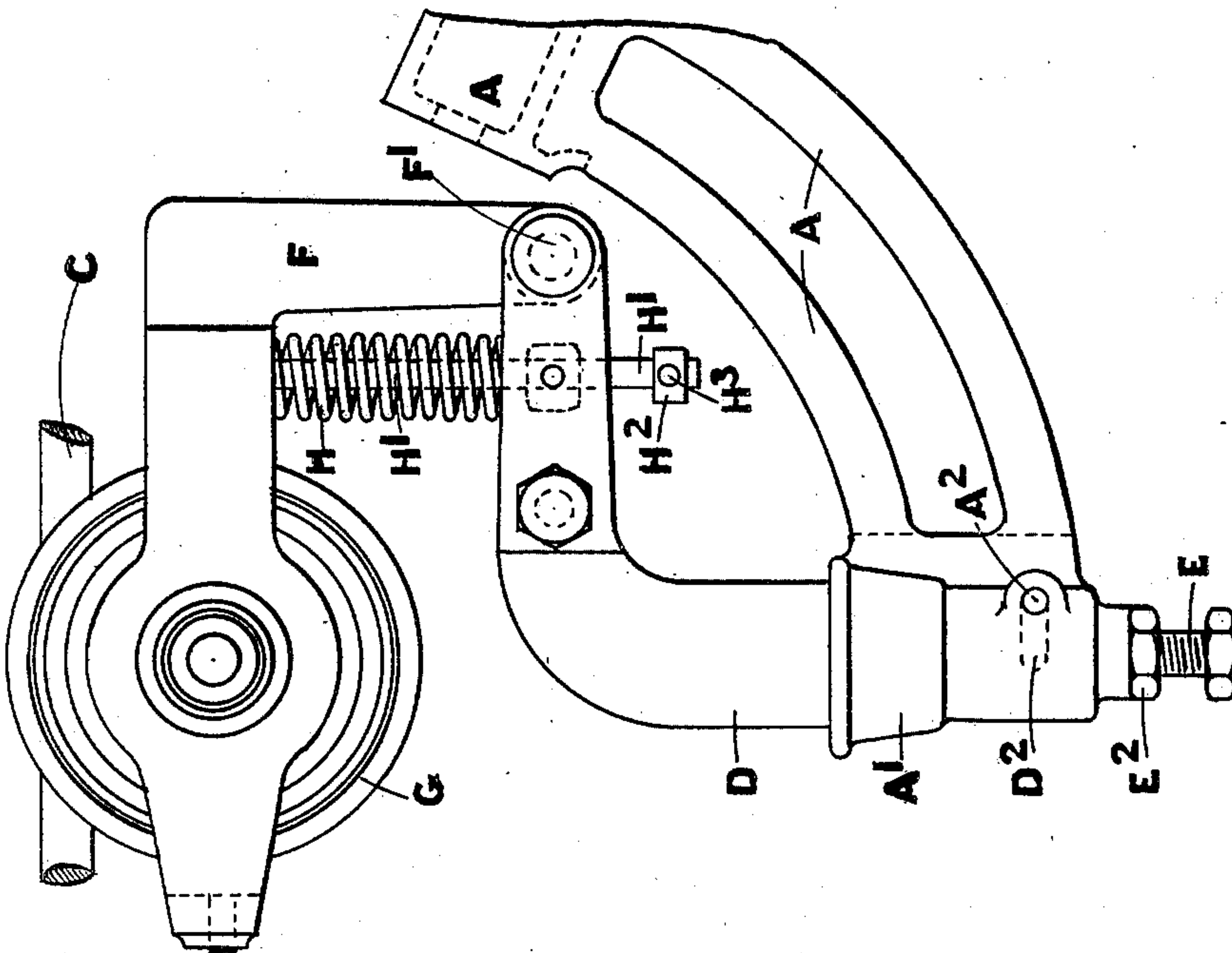
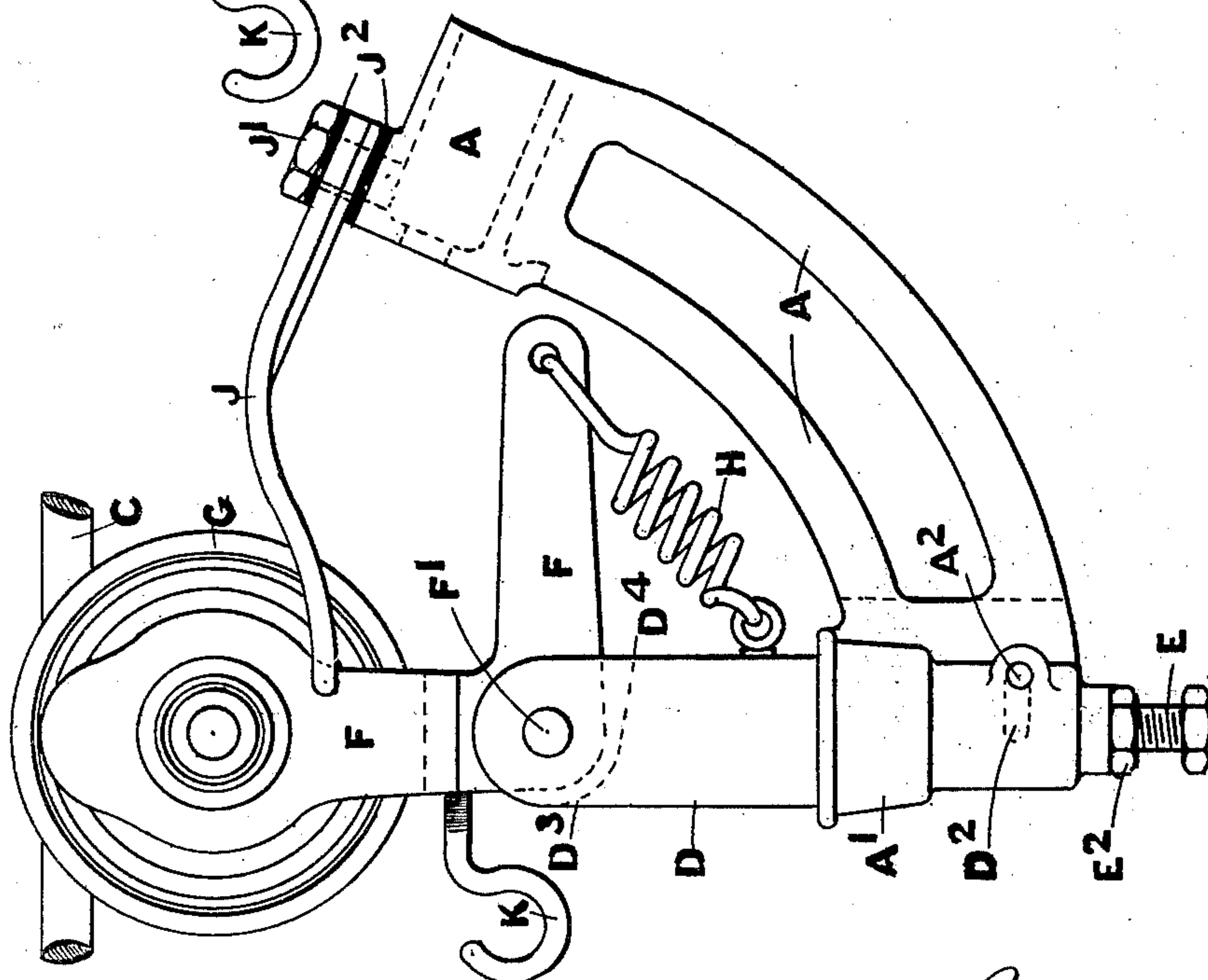


FIG. 4



Witnesses  
W. H. Bonelli  
J. H. Kimbrough

Inventor  
John G. Lister  
By J. M. Boulter  
Attorney



# UNITED STATES PATENT OFFICE.

JOHN GEO. LISTER, OF SHEFFIELD, ENGLAND.

## TROLLEY FOR USE IN ELECTRIC TRACTION.

SPECIFICATION forming part of Letters Patent No. 707,606, dated August 26, 1902.

Application filed December 14, 1901. Serial No. 85,896. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN GEORGE LISTER, a subject of the King of England, residing in Sheffield, Yorkshire, England, have invented certain new and useful Improvements in or Relating to Trolleys for Use in Electric Trac-  
5 tion, (for which I have made application for Letters Patent in Great Britain under No. 12,456, dated June 18, 1901,) of which the fol-  
10 lowing is a specification.

This invention relates to improvements in trolleys for use in electric traction, and has particular reference to trolleys which are em-  
15 ployed in systems having overhead conduc-  
tors.

The object of this invention is the construc-  
tion of a trolley which shall tend to keep in  
constant contact with the conductor and  
shall, if accidentally displaced, be retained  
20 in close proximity to the conductor.

In trolleys according to this invention a  
flexible connection is arranged between the  
trolley-wheel and boom, the wheel being kept  
in close contact with the conductor by means  
25 of springs or weighted levers or the like, so  
that the spring or weight in pressing the  
wheel against the conductor does not have to  
overcome the forces due to the weight or in-  
ertia of the boom. Preferably the wheel is  
30 mounted at the end of a pivoted arm or lever  
at the end of the boom, a spring being pro-  
vided to act upon the arm or lever, so as to  
press the wheel into contact with the conduc-  
tor. A fork is also preferably situated at the  
35 end of the boom, its prongs normally extend-  
ing beneath the conductor and is so ar-  
ranged that should the trolley-wheel be dis-  
placed from the conductor the fork immedi-  
ately rises and by engaging with the conduc-  
40 tor holds the trolley in close proximity to it,  
so that the wheel may be quickly replaced  
and prevents the boom from becoming en-  
tangled with or damaging any of the guard-  
wires or other structures arranged above the  
45 conductor. The upward movement of the  
fork may conveniently be caused by the  
springs or other means employed for coun-  
teracting the weight of the boom.

In the accompanying drawings, Figure 1 is  
50 an elevation of one construction of trolley  
according to this invention. Fig. 2 is an end  
view of Fig. 1. Fig. 3 is a plan of Fig. 1.

Figs. 4 and 5 are elevations, respectively, of  
two modifications of the constructions shown  
in Figs. 1, 2, and 3.

Like letters indicate like parts throughout  
the drawings.

With reference first to Figs. 1, 2, and 3 a  
downwardly-extending bracket A is secured  
by a suitable clamping device B to the free  
60 end of the boom, (not shown in the drawings,) which is situated on the car and which con-  
tains an electric conductor leading to the car-  
motors. Suitable means are provided for  
causing the boom to approach a conductor C,  
65 conveying the power from the generating-  
station.

A socket A' is formed at the lower extremity  
of the bracket A and is preferably made  
conical inside, as indicated by dotted lines in  
70 Fig. 1. In this socket A' a spindle D is rota-  
tably mounted, being formed conical in shape  
to correspond with the shape of the socket.  
A screw-threaded hole is provided at the bot-  
tom of the socket A', in which is situated a  
75 screw E, having a pivot-point E', upon which  
the spindle D has a bearing. The screw E is  
locked in the desired position by a lock-nut  
E<sup>2</sup>, and the wear of the spindle D and socket  
A' may be compensated for by adjusting the  
80 screw E.

A circumferential groove D' is made to ex-  
tend partially around the spindle D and a  
pin-bolt or the like A<sup>2</sup> passes through a hole  
in the socket A' and engages this groove D'  
85 thereby limiting the rotary movement of the  
spindle D and locking it in the socket A'.  
The spindle D is bent back toward the boom  
above the socket A', and one end of a lever  
F is pivoted to its free end at F'. A trolley-  
90 wheel G is rotatably mounted at the other  
end of the lever F.

Springs H are arranged to act between the  
spindle D and lever F, so as to cause the lat-  
ter to tend, with the trolley-wheel G, to move  
95 upward toward the conductor C. The move-  
ment of the lever F about its pivot F' is lim-  
ited by stops comprising a slot D<sup>2</sup> in the  
spindle D and a pin F<sup>2</sup> passing through the  
said slot D<sup>2</sup> and fastened to the lever F.  
100

A fork J is secured to the upper part of  
the bracket A by a screw J' and is of such a  
shape and is so arranged that its prongs ex-  
tend on either side of the trolley-wheel G and



beneath the conductor C when the trolley-wheel is in position on the conductor. Should the trolley-wheel for any reason be displaced from the conductor C the fork J will rise with the boom (operated by the springs hereinbefore referred to as counter-acting its weight) and will at once come into contact with the conductor C, thus holding the trolley-wheel in close proximity thereto ready to be easily replaced. It is preferred to thoroughly insulate the fork J, so as to prevent the possibility of running the car with the fork, but not the trolley-wheel, in contact with the conductor. In the drawings, J<sup>2</sup> represents a flanged collar of insulating material through which the screw J' passes.

A hook K is secured to the lever F, carrying the trolley-wheel G, whereby the boom may be operated through the flexible connection between it and the trolley to remove the latter from the conductor. It will be understood that the cord or rod usually employed for this purpose is attached to the hook K, and as the latter forms practically a crank with the spindle D the trolley may readily be adjusted in the required direction by the cord or rod. Moreover, owing to the lever F being pivoted to the spindle it will be found in many cases that the trolley automatically adjusts itself in the required direction—i. e., longitudinally with the car. When a cord is used for operating the boom, it is preferred to provide a ring or hook upon some convenient portion of the boom and a hook or ring would then be attached to the cord in such a manner that when the hook or ring on the cord was in engagement with the ring or hook on the boom the cord would extend in a loop from the latter to the trolley-lever, so as to prevent undue tightening of the cord, which would lock the trolley-spindle.

In the modification illustrated in Fig. 4 the spindle D is straight, and the pivot F' of the lever F is situated at the bend of the lever. With this construction the spring H may be a spiral one, as shown. The stops for limiting the movement of the lever about its pivot are formed on the spindle D, as indicated in dotted lines at D<sup>3</sup> and D<sup>4</sup>, respectively.

In the modification shown in Fig. 5 both the spindle and the lever F are bent, that part of the lever nearer its pivot F' being normally arranged at about a right angle to the adjacent portion of the spindle D. In this case the spring H may also be a coiled one and is normally in compression. It is arranged around a pin H', secured to the lever F and passing through a slot in the spindle D. Beneath this slot a collar H<sup>2</sup> is secured to the pin H' and forms one stop for limiting the movement of the lever F about its pivot F', the spring H itself acting as the other stop. The collar H<sup>2</sup> may be adjusted on the pin H' by a set-screw H<sup>3</sup>. With this construction the trolley-wheel G may be mounted in a slot

in the lever F, the hook K being secured to the end of the lever, as shown. In this modification the horizontal portion of the lever F will in certain cases take the place of the fork J. If desired, however, approximately horizontal projections may be secured to the lever F in order to form a substitute for the fork J. In all cases it is preferred that the axis of the trolley-wheel G should be situated approximately at the intersection of the planes containing the center of the boom and the axis of the spindle D. Owing to the fact that the springs H acting on the lever F do not have to overcome the forces due to the weight and inertia of the boom and to the fact that the trolley-wheel is capable of up-and-down motion in relation to the boom, lighter springs may be used at the base of the boom than those usually employed, and it is thus possible to work with less friction between the wheel G and the conductor C than has hitherto been the case.

It is to be understood that besides the modifications described others may be made, if desired, without departing from this invention.

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

1. In a trolley for use in electric traction, the combination of a socket, a spindle therein, a lever pivoted to said spindle, a spring acting between the spindle and the lever and a trolley-wheel mounted on the lever, for the purpose set forth.
2. In a trolley for use in electric traction the combination of a socket, a spindle therein bent above the socket, a bent lever pivoted to the spindle, a spring acting between the spindle and lever and a trolley-wheel mounted on the lever for the purpose set forth.
3. In a trolley for use in electric traction the combination of a socket, a spindle therein, a lever pivoted to the spindle, a spring acting between the spindle and lever, a trolley-wheel mounted on the lever and a hook on the lever for operating the boom for the purpose set forth.
4. In a trolley for use in electric traction the combination of a socket, a spindle therein, a lever pivoted to the spindle, a spring acting between the lever and spindle, a trolley-wheel mounted on the lever, and a fork mounted adjacent to and embracing the trolley-wheel for the purpose set forth.
5. In a trolley for use in electric traction the combination of a socket, a spindle therein, a lever pivoted to the spindle, a spring acting between the spindle and lever, a trolley-wheel mounted on the lever, a hook on the lever for operating the boom, and a fork mounted adjacent to and embracing the trolley-wheel for the purpose set forth.
6. In a trolley for use in electric traction the combination of a socket, a spindle therein, a lever pivoted to the spindle, a spring acting between the spindle and lever, a trolley-wheel mounted on the lever, a circumferential



groove extending partially around the spindle and a pin engaging the groove by passing through a hole in the socket for the purpose set forth.

5 7. In a trolley for use in electric traction the combination of a conical socket, a conical spindle therein a lever pivoted to the spindle, a spring acting between the spindle and lever, a trolley-wheel mounted on the lever and  
10 an adjustable pivot-point at the bottom of the socket for the purpose set forth.

8. In a trolley for use in electric traction the combination of a conical socket, a conical spindle therein a lever pivoted to the spindle,  
15 a spring acting between the spindle and lever, a trolley-wheel mounted on the lever, a circumferential groove extending partially around the spindle, a pin passing through the socket and engaging the groove and an adjustable pivot-point at the bottom of the socket  
20 for the purpose set forth.

9. In a trolley for use in electric traction the combination of a conical socket, a conical spindle therein, a lever pivoted to the spindle, a spring acting between the spindle and lever, a trolley-wheel mounted on the lever, a hook on the lever for operating the boom, a fork mounted adjacent to and embracing the trolley-wheel, a circumferential groove extending partially around the spindle, a pin  
25 passing through the socket and engaging the groove and an adjustable pivot-point at the bottom of the socket for the purpose set forth.

In testimony whereof I have signed my  
name to this specification in the presence of  
two subscribing witnesses.

J. GEO. LISTER.

Witnesses:

A. H. GREENWOOD,  
A. C. TEVIS.