(No Model.) 4 Sheets—Sheet 1.

G. E. BAIRD.

CLOSED CONDUIT ELECTRIC RAILWAY.

No. 538,649. Patented May 7, 1895.

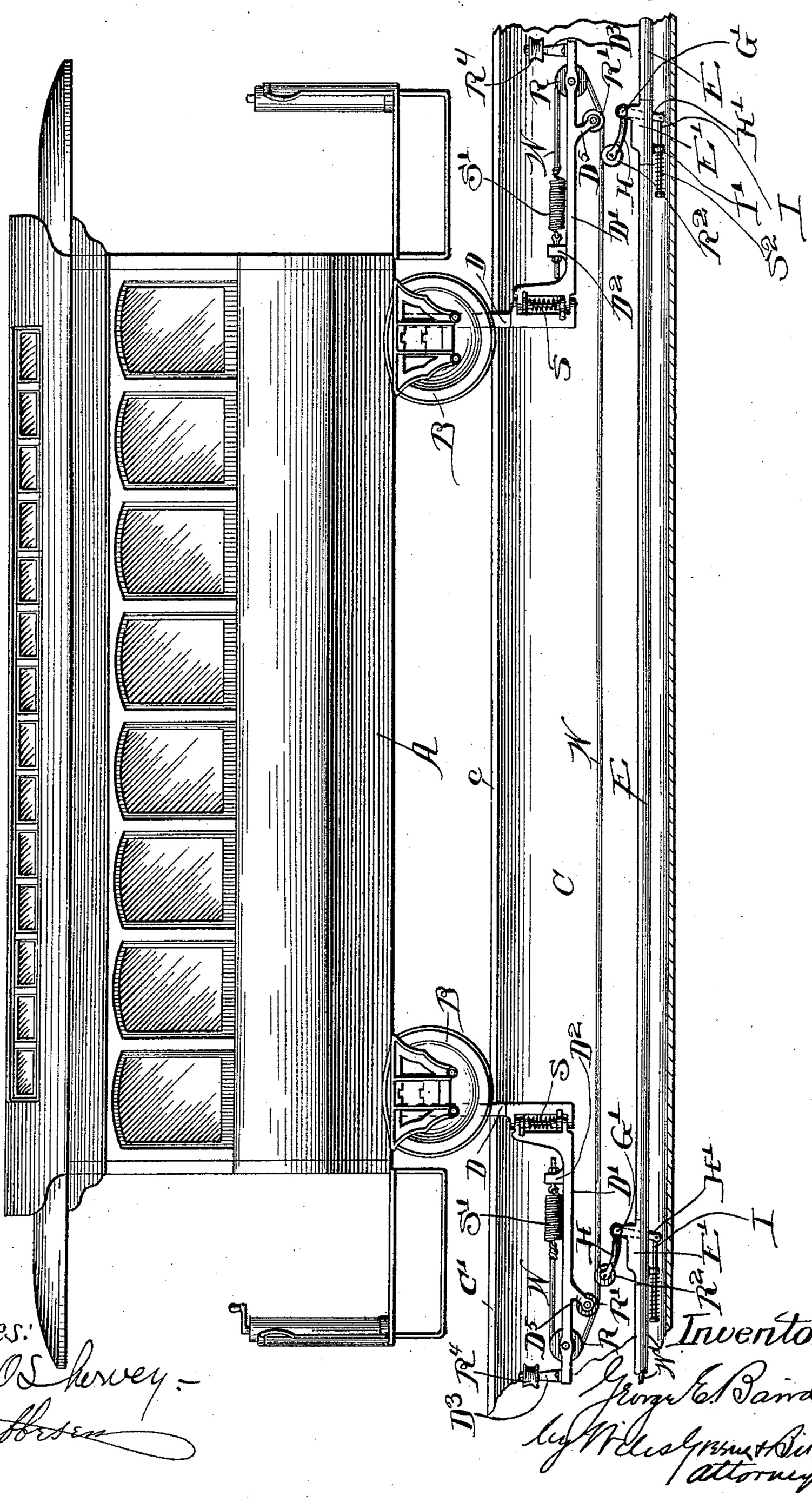


Fig. 1.

Witnesses:
Charles D. Shervey
A. D. P. Ebbesen

Inventor:
George E. Baird
by Wilkinson & Dickerson
Attorneys

(No Model.) 4 Sheets—Sheet 2.

G. E. BAIRD.

CLOSED CONDUIT ELECTRIC RAILWAY.

No. 538,649. Patented May 7, 1895.

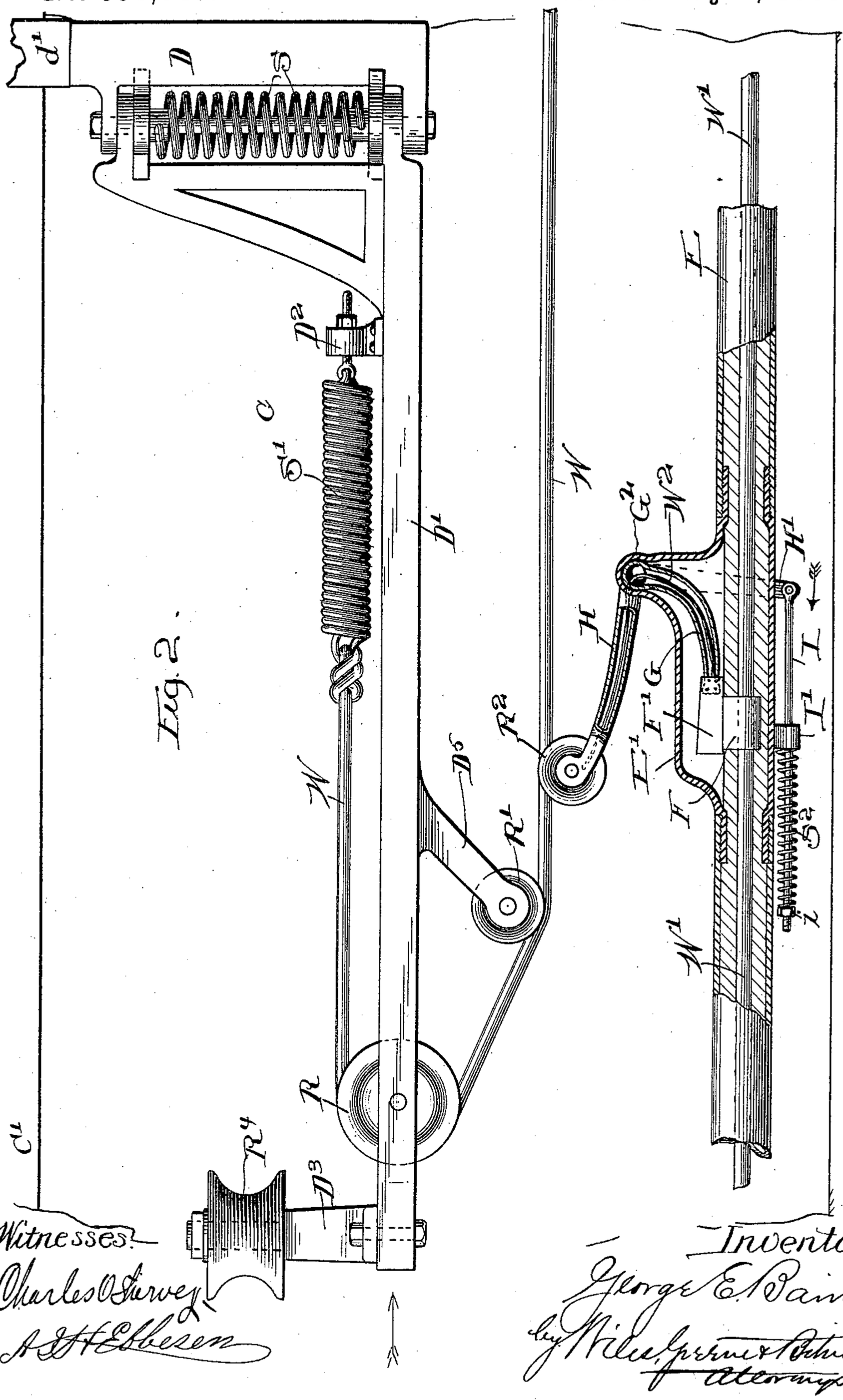


Fig. 2.

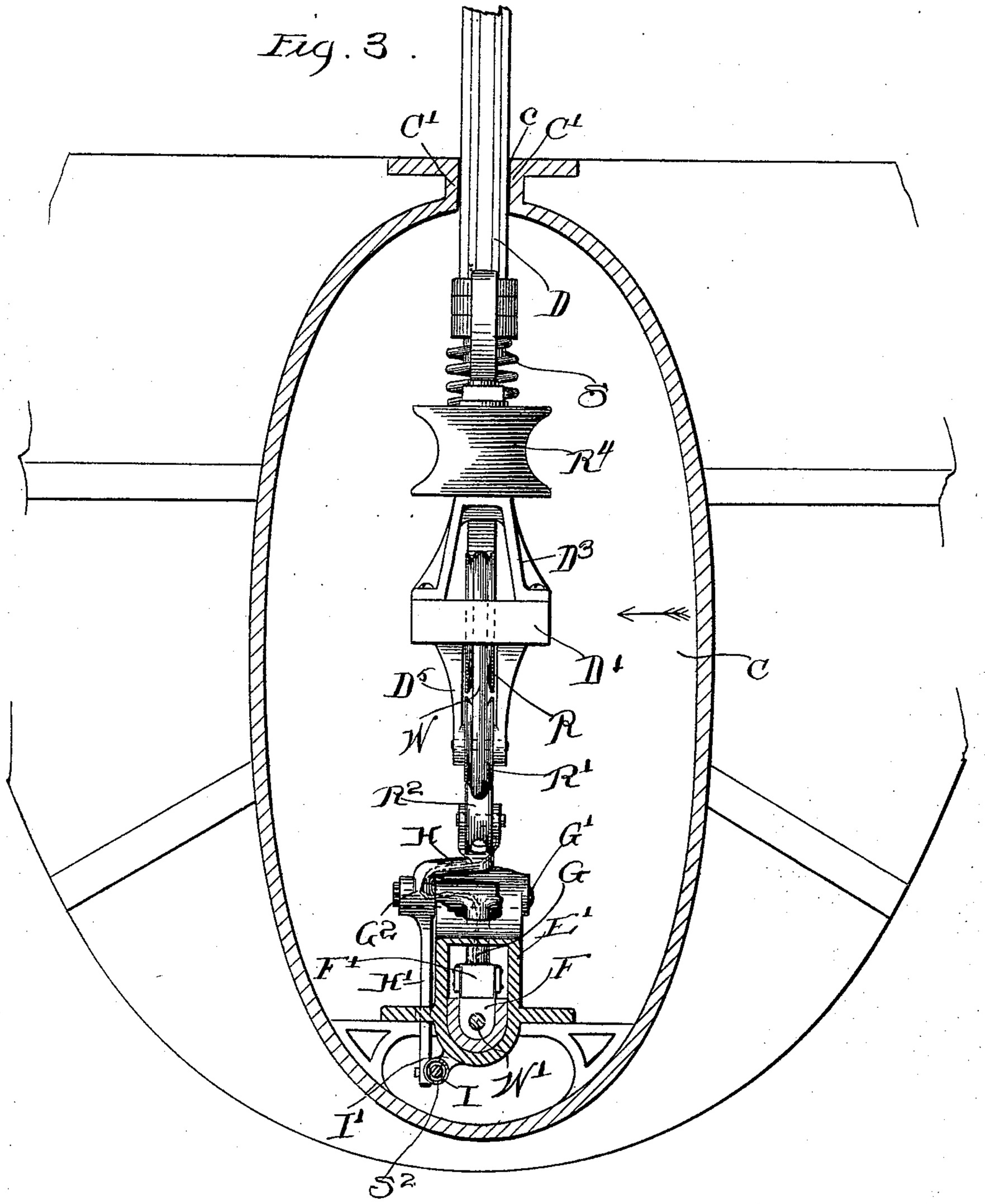
(No Model.) 4 Sheets—Sheet 3.

G. E. BAIRD.

CLOSED CONDUIT ELECTRIC RAILWAY.

No. 538,649. Patented May 7, 1895.

Fig. 3.



Witnesses:
Charles A. Shirey.
A. D. W. Ebbesen

Inventor:
George E. Baird
by Wilkinson Gerner & Robinson
Attorneys

(No Model.) 4 Sheets—Sheet 4.

G. E. BAIRD.

CLOSED CONDUIT ELECTRIC RAILWAY.

No. 538,649. Patented May 7, 1895.

Fig. 4.

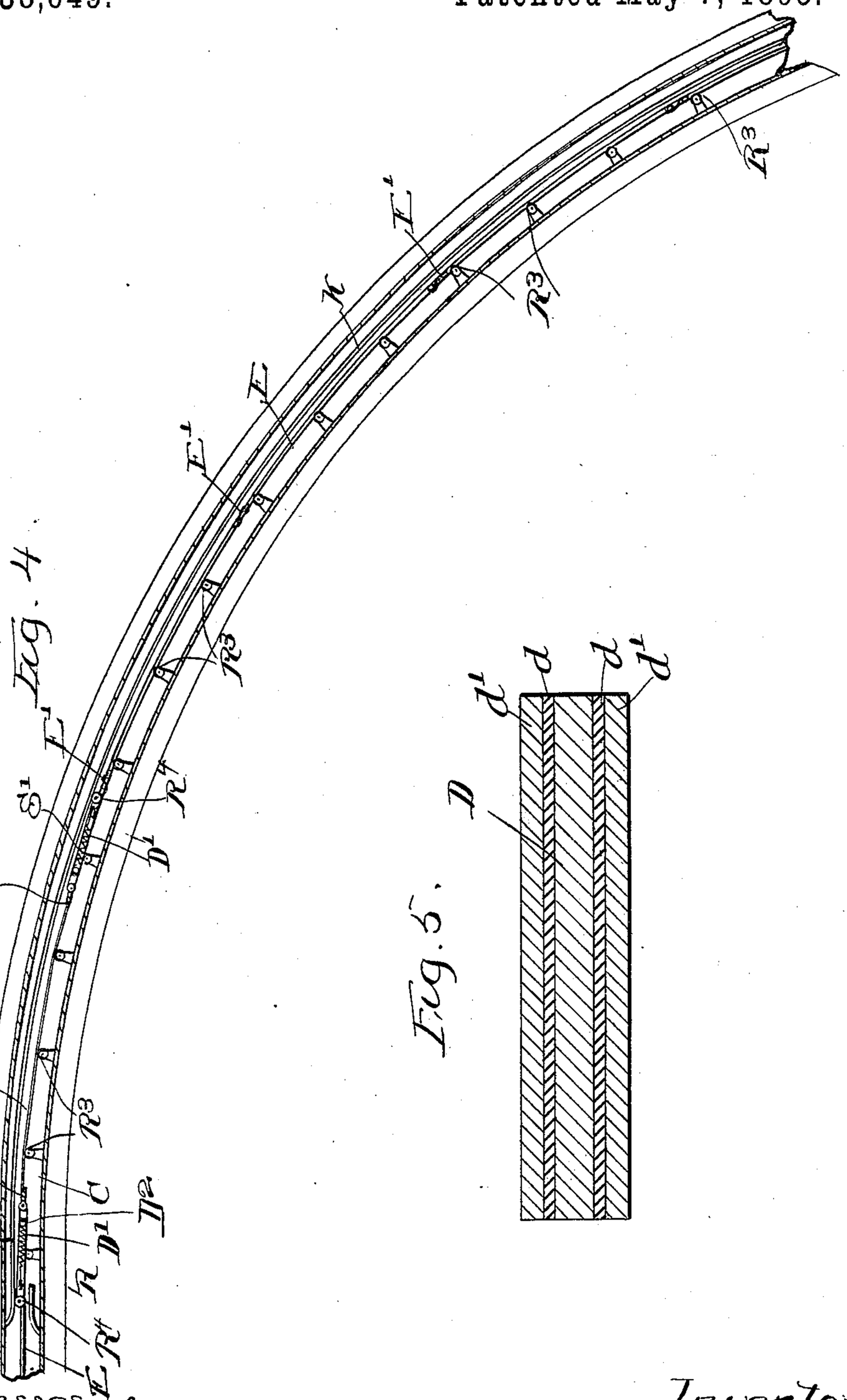


Fig. 5.

Witnesses:
Charles A. Shervey.
A. D. P. Ebbesen

Inventor:
George E. Baird
by Wilkinson & Bikren
Attorneys

UNITED STATES PATENT OFFICE.

GEORGE E. BAIRD, OF CHICAGO, ASSIGNOR OF ONE-HALF TO WILLIAM D. HENKEE AND ANDREW REINER, OF BLUE ISLAND, ILLINOIS.

CLOSED-CONDUIT ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 538,649, dated May 7, 1895.

Application filed April 30, 1894. Serial No. 509,465. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. BAIRD, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Closed-Conduit Electric Railways, of which the following is a specification.

My invention relates to improvements in electric railways of that class in which a car running on suitable parallel rails is provided with an electric motor operated by a current which is transmitted through a conductor lying in a conduit preferably between the rails. A constant and serious source of difficulty in railways of this class has been the imperfect insulation of the conductor and one of the principal objects of this invention is to furnish a simple and effective means for insulating the conductor from accidental contact and leakage, and, at the same time, to provide means for making contacts for closing a circuit through the motor.

The invention is fully described and explained in this specification and shown in the accompanying drawings, in which—

Figure 1 is a view, partly in side elevation and partly in vertical section, showing a car in working relation to the track, the conduit, the conductor, and the circuit-closing devices. Fig. 2 is an enlarged view, partly in side elevation and partly in vertical section, of the circuit-closing device, the view being in the direction indicated by the arrow in Fig. 3. Fig. 3 is an end elevation of the circuit-closing device, showing the chamber in transverse section, the view being in the direction indicated by the arrow in Fig. 2. Fig. 4 is a top plan showing a curve in the conduit and the means for guiding the contact-wire hanger depending from the car, and Fig. 5 is a transverse section of one of the arms D D of the contact-wire hanger.

In these views, A is the body of a car supported by the usual wheels, B, B, which rest on the parallel rails, R, R, of a track. Between the rails, R, R, and preferably below the level of the surface on which they rest is a conduit, C, of suitable material and cross-section formed with the usual upwardly opening longitudinal slot, *c*, bounded on either side by parallel slot rails, C′, C′. From the body of the car two suitably placed arms, D, D, extend downward through the slot, *c*, preferably so hung as to have slight lateral oscillation, but rigid as to longitudinal oscillation with reference to the body of the car. Each of the arms is of suitable conducting material, but at the point where it passes between the slot rails (and preferably throughout its entire extent), the conducting material, D, is covered by a layer of non-conducting material, *d*, and this, in turn, is protected against wear by plates, *d*′, *d*′, of steel or other metal, as illustrated in Fig. 5. To the lower ends of the arms, D, D, are hinged extensions, D′, D′, projecting in opposite directions and susceptible of horizontal oscillation, but held normally in the vertical plane of the two arms by means of springs, S, S, Fig. 1, adapted to yield and permit the extensions to swing in either direction. Each of the extensions, D′, has near its pivotal point an upwardly extending lug, D^2, and near its free end a grooved roller, R, set in the vertical plane of the arms, D, D. A second roller, R′, is mounted in an arm, D^5, below the level of the roller, R, and between it and the inner or hinged end of the extension, and a conducting wire, W, extends about the rollers, R, R′, and has its ends fastened to lugs, D^2, D^2, of the two extensions. Tension springs, S′, S′, are inserted in the wire, W, for the purpose of permitting slight longitudinal extension thereof and of taking up the slack therein, the position of the springs being preferably that shown in Fig. 1 in which they form connections between the ends of the wire, W, and the lugs, D^2, D^2. The rollers, R, R, being above the corresponding rollers, R′, R′, form supports for the upwardly inclined portions of the wire, W, which are advantageous since they are a means of applying a gradually increasing force to the rollers, R^2, as the latter are successively reached by the contact-wire. The rollers R, R, are further important in that they permit the wire, W, and springs, S′, S′, to extend and contract freely as the wire passes from the straight to the curved portions of the track, or vice versa.

In the lower part of the conduit, C, lies a pipe, E, of any desired material and construction and within the pipe is a continuous conducting wire, W′, embedded in any suitable non-conducting substance, preferably such as may be run into the pipe while melted, and solidified by cooling. At suitable intervals chambers E′, E′, are set into the pipe and form continuations thereof and at a suitable point in each of the chambers a block, F, of conducting material is fastened to or placed in electrical contact with the wire, W′, and extends above the wire and into an open space in the chamber, all the blocks, however, being thoroughly insulated against contact with the walls of the chambers. In the body of the chamber, E′, is suspended a lever, G, swinging on gudgeons, G′, G^2, set in suitable bearings in the walls of the chamber, the gudgeon, G^2, being extended outward through the wall of the chamber as shown in Fig. 3, and a bell-crank lever, H, H′, being keyed on said outwardly extending gudgeon as shown in Figs. 2 and 3. On the free end of the lever, G, is rigidly fastened a block, F′, of conducting material adapted when pressed downward to make a contact with the block, F, immediately beneath it and in the free end of the arm, H, of the bell-crank lever is mounted a grooved roller, R^2, lying immediately below the slot, *c*, and in the path of the wire, W, which is supported by the arms, D, D, the block, F′, and the roller, R^2, being connected by a wire, W^2, or other suitable conductor lying within the levers, G, H. The lower end of the member, H′, of the bell crank lever is attached to a rod, I, which passes through a stationary block, I′, fastened preferably to the chamber, E′, and is provided at the end opposite the lever, H′, with an adjustable head, *i*, Fig. 2. A spring, S^2, encircling the rod, I, and lying between the block, I′, and head, *i*, tends to swing the lower end of the lever, H′, in the direction indicated by the arrow thereon in Fig. 2, and thus to hold the block, F′, in its raised position, the upward movement of the block being limited by the top wall or cover of the chamber, E′, or by any other suitable stop.

When the block, F′, of any given contact mechanism is in the position shown in Fig. 2, the roller, R^2, lies above the level of the wire, W, which is supported by and moves with the car, and it is evident that as the car passes over the contact device, the wire, W, must come in contact with the roller, R^2, and press it downward until the block F′, is in contact with the block, F, when the motor on the car will be in electrical connection with the main conducting wire, W′. The relative positions of the rollers, R, R′, at either end of the wire-supporting frame are such that the parts of the wire, W, lying between them incline upward from each of the rollers, R′, to the corresponding roller, R, so that as the wire, W, approaches the roller, R^2, of any contact-making device it brings to bear upon it a gradually increasing downward pressure and as it leaves it, its pressure upon the roller correspondingly decreases, thereby avoiding any shock at the instant of making or breaking contact between the wire, W, and the rollers of the contact devices.

The operation of the mechanism thus described when running on a straight track is evident from the foregoing explanation and presents no difficulties whatever, but in passing around curves slight modifications are necessary and are illustrated in the drawings.

Fig. 4, which is a top plan of a portion of a curved track with the upper portion of the wall of the conduit removed, shows in addition to the features of the conduit already described, a stationary curved bar, or rail, K, lying outside of and below the outer slot rail and a series of grooved rollers, R^3, R^3, mounted on stationary vertical spindles and lying inside of and below the inner slot rail of the curve. The extreme end of each of the extensions, D′, already described, is provided with a vertical standard, D^3, and on each of these standards is mounted a roller, R^4, adapted to strike the inner edge of the curved rail, K, and to be guided by it about the curve. This movement of the rollers, R^4, deflects the extensions, D′, from the plane of the vertical arms, D, D, and tends to swing the wire, W, into the position of a chord of the arc at whose ends the two rollers lie at any given instant. This lateral movement of the wire brings it against the margins of the grooved rollers, R^3, R^3, which it follows in succession as the car passes around the curve. Contact devices like those already described, may be placed at any desired intervals between the rollers, R^3, R^3, and as the wire always forms straight lines from roller to roller it will act with perfect accuracy upon the rollers of the contact devices. The springs, S′, S′, act constantly to take up any slack which may arise from the change of position of the wire, W, in passing from the straight track to the curve or vice versa. The contact making devices are preferably separated by spaces somewhat less than that between the two rollers, R, R, which support the contact wire, W, though the system may be operative if they were placed somewhat farther apart, except at the usual stopping points along the line, since the momentum of a car when in motion would be sufficient to propel it during the short interval of time when the motor was disconnected from the main wire, W′.

Having now described and explained my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with the track, the conduit, the wire, W′, and contact devices constructed and operating substantially as described, of the car moving along the track and propelled by a suitable electric motor, the arms D, D, dependent from the car and in electrical connection with the motor, the extensions, D′, D′, hinged to the arms the roll-

ers, R, R, supported by the extensions, and the contact wire, W, extending about said rollers and fastened to the extensions, said contact wire being adapted to actuate the contact devices successively as the car moves along the track and thus to establish electrical connections between the main wire, W′, and the motor.

2. The combination with the track, the conduit, the main conducting wire, W′, and the contact devices constructed and operating substantially as described, of the car moving along the track and propelled by a suitable electric motor, the arms, D, D, dependent from the car and in electrical connection with the motor, the extensions, D′, supported by the arms, the rollers, R, R, supported by the extensions, a contact wire, W, extending about said rollers and connected with said extensions and the springs, S′, maintaining the tension of said contact wire, the contact wire being adapted to actuate said contact devices successively as the car moves along the track.

3. The combination with the track, the conduit, the main conducting wire, and the contact devices constructed and operating substantially as described, of the car moving along the track and propelled by a suitable electric motor the arms, D, D, dependent from the car, the extensions, D′, D′, hinged to the arms, the contact wire, W, supported by said extensions, and the rollers, R^4, R^4, mounted at the free ends of said extensions and adapted to guide the ends of the extensions in the passage of the car along curves in the track.

4. The combination with the track, the conduit, the main conducting wire and the contact devices constructed and operating substantially as described, of the curved guide rail, K, lying at the outer side of the center of a curved track section, the rollers, R^3, R^3, arranged at suitable intervals along the inner side of the center of the section, the car moving on the track and propelled by a suitable electric motor, the arms, D, D, dependent from the car and in electrical connection with the motor, the hinged sections, D′, D′, supported by the arms, the contact wire, W, supported by said extensions and the rollers, R^4, R^4, mounted at the ends of the extensions and adapted to move along said guide rail, K, as the car moves along the curve, the rollers, R^3, R^3, being adapted to receive and guide the wire, W, during such movement.

5. The combination with the track, the conduit, the main conducting wire, and the contact devices operating substantially as described, of the car moving on the track and propelled by a suitable electric motor, the arms, D, D, dependent from the car, the extensions, D′, D′, hinged to the arms, the contact wire, W, supported by said extensions and the springs, S, S, interposed between the extensions and arms respectively, and resisting the deflection of the extensions from their normal positions; substantially as shown and described.

GEORGE E. BAIRD.

Witnesses:
CHARLES O. SHERVEY,
A. I. H. EBBESEN.