

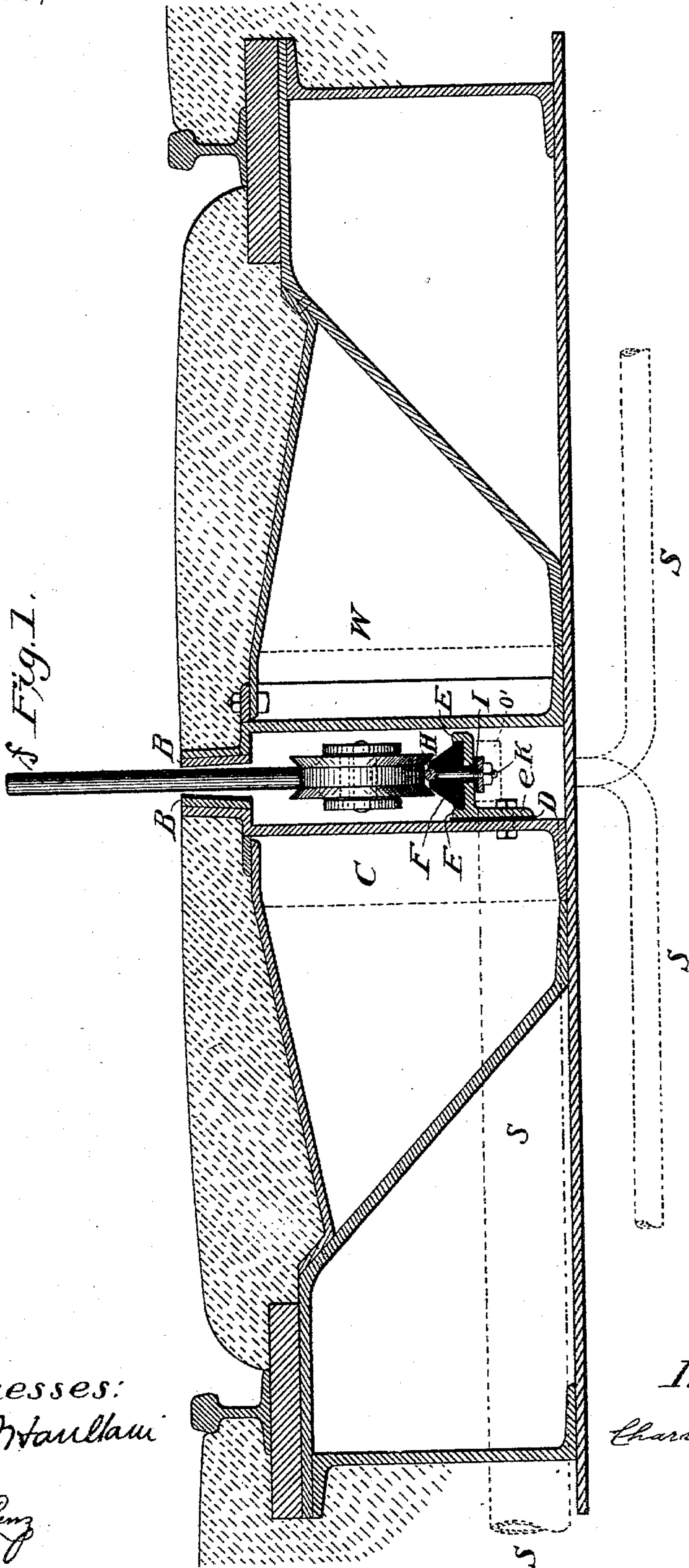
(No Model.)

3 Sheets—Sheet 1.

C. H. JOHNSON.  
CONDUIT ELECTRIC RAILWAY.

No. 545,204.

Patented Aug. 27, 1895.



Witnesses:  
James H. Haulman  
Rich. Lenz

Inventor:  
Charles H. Johnson

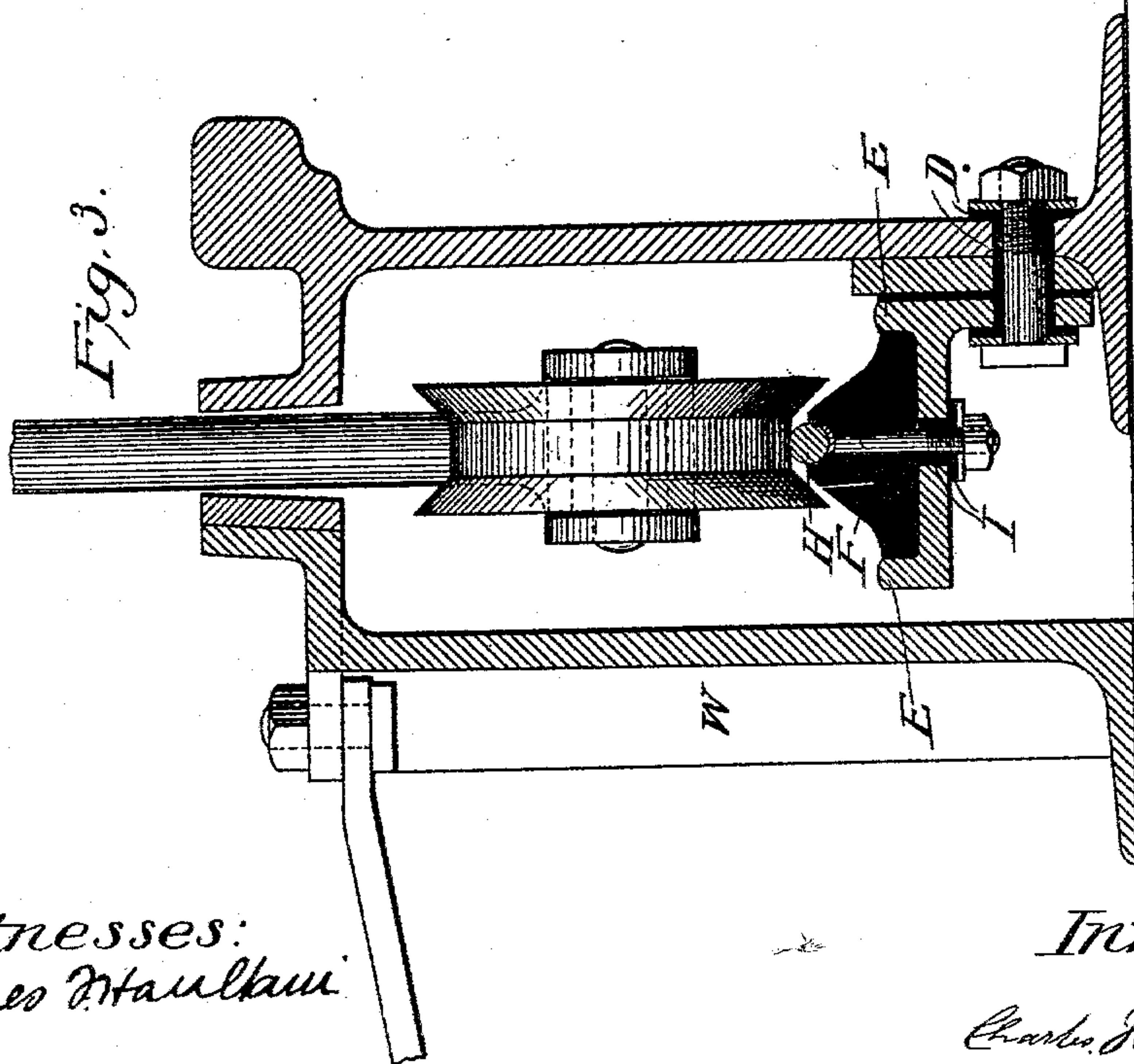
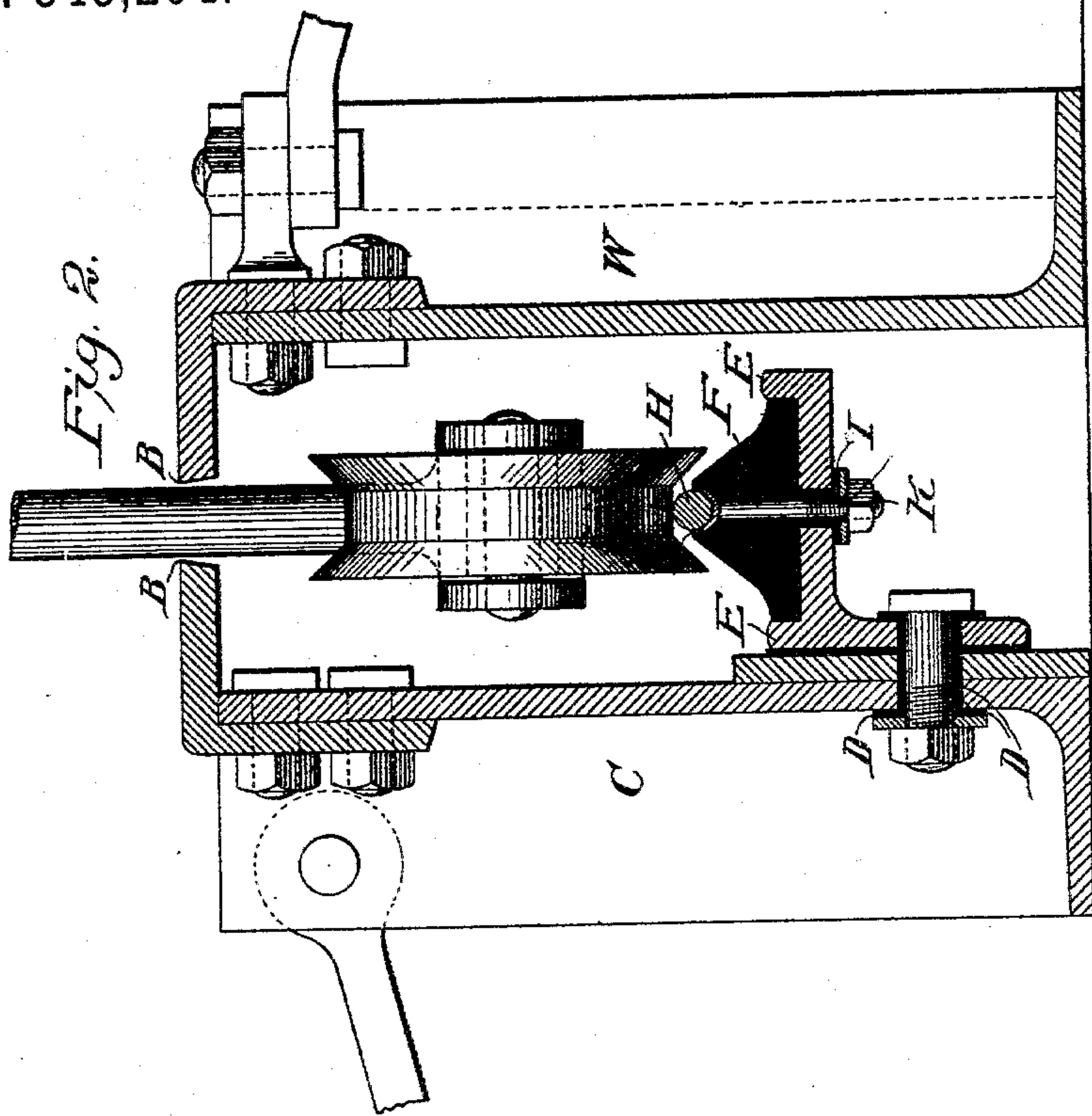
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Witnesses:  
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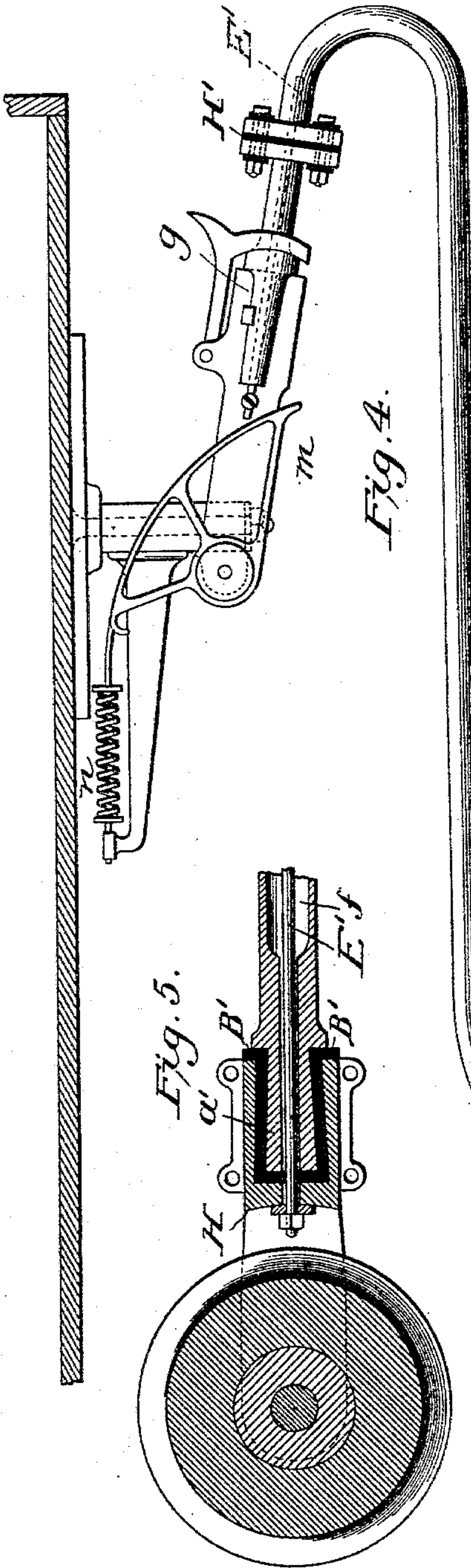
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CONDUIT ELECTRIC RAILWAY.

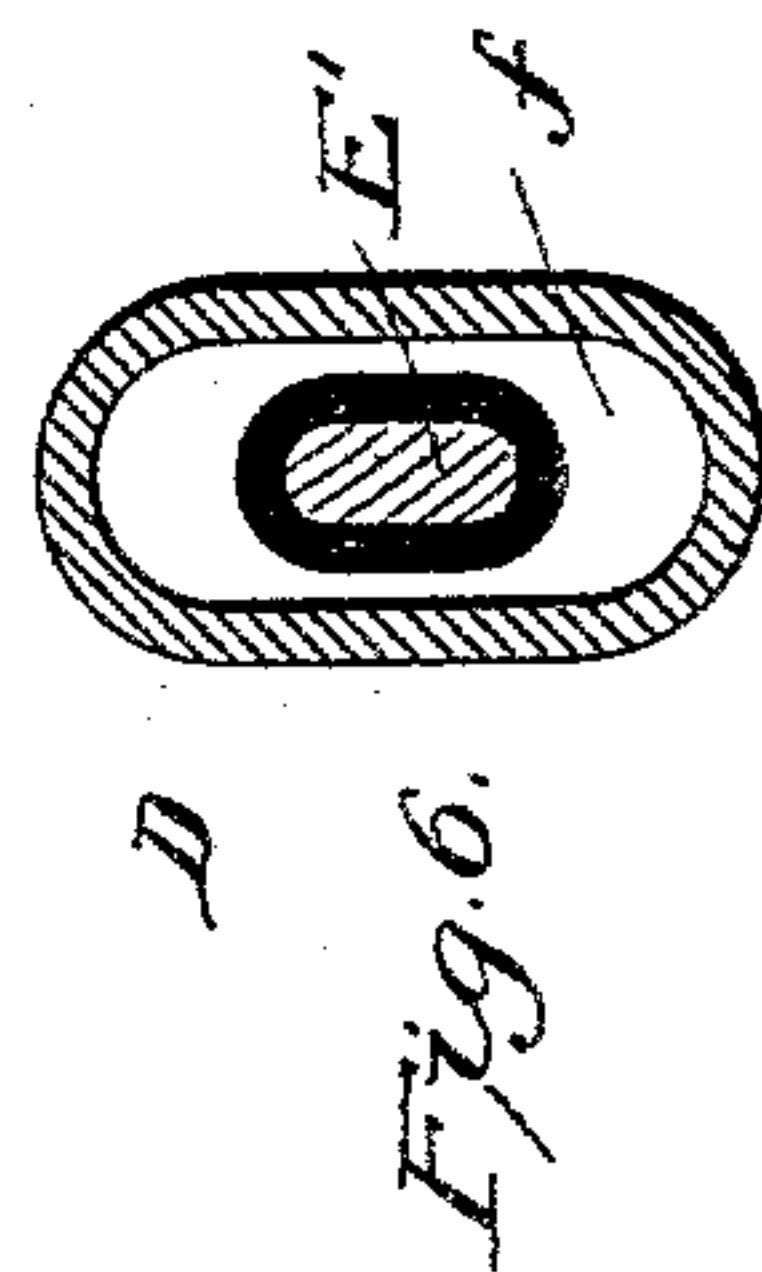
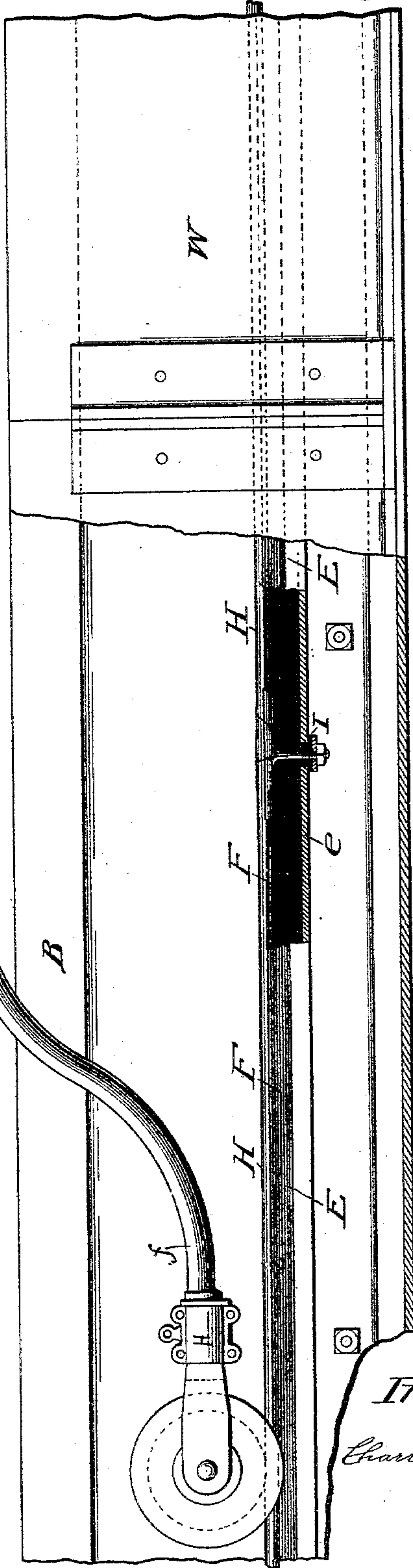
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# UNITED STATES PATENT OFFICE.

CHARLES HENRY JOHNSON, OF SAN JOSÉ, CALIFORNIA.

## CONDUIT ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 545,204, dated August 27, 1895.

Application filed February 23, 1894. Serial No. 501,289. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES HENRY JOHNSON, a citizen of the United States, residing at San José, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Underground Subways for Electric Railroads, of which the following is a specification.

My invention relates to underground subways or conduits for electric railways; and my invention consists partly in a novel manner of insulating the conductors, and of supporting and arranging said insulation and partly in an improved construction of underground trolley carried by the car.

Reference being made to the accompanying drawings, Figure 1 is a cross-section of the line, about one-fourth size, showing the rails, middle section, with slotway, bracings, &c. Fig. 2 is a cross-section through the middle section of the conduit. Fig. 3 is also a cross-section of the same in a modified form. Fig. 4 is a side elevation of the trolley-pole and its attachment to the bottom of the car, showing also the mode of insulating the same. Fig. 5 is an enlarged vertical section of the trolley wheel and holder, showing the insulation. Fig. 6 is a section of trolley-pole with internal feed-wire, and insulator.

The middle section of Fig. 1 is built up of angle-iron and can be put in, one on each end and one in the middle of each length of angle-iron that forms the slotway B; but when the angle-irons butt the middle section should be doubled.

The side C of the middle section can be concreted its whole length, and the other side (marked W) can be boarded up with heavy planks bolted to the middle sections. This is advised for repairing purposes, should a breakage or mishap happen at any section along the line, and when the place of the trouble is located, that section can be dug up and the planks easily removed and repairs done without hinderance to the running of the road.

On the inside of middle section is a lipped angle-iron e, which is attached to every middle-section by one bolt, and for extra safety that part of contact is insulated by a piece of sheet vulcanized fiber. The bolt is also insu-

lated with a tube or washer of same material, as shown at D, Figs. 2 and 3. On top of angle-iron e, Fig. 2, and between the lips E E, is the insulation for the main feed-wire, made of hard vulcanized fiber F, Figs. 2 and 3, or any other suitable insulating material. It is made to fit snugly in the receptacle formed by the lips E, with a recess in its upper edge to receive the main feed-wire or conductor-wire H. This insulation is usually formed of short lengths of, say, eight or ten inches. The bolt K, with its channel-way, Fig. 2, is secured to the main wire, as shown, extending through the insulation F and angle-plate e with a nut on its lower end, which keeps it and its insulation firm and rigid, but allows play enough in the holes to permit of expansion, &c. The bolt is also insulated as it passes through the lipped angle-iron with tube and washers I, and for extra safety a piece of wood o', (dotted line, Fig. 1,) hollowed out, may be fitted over the nut and washer, and any space left filled with tar and pitch mixed or with bitumen, which will prevent water from entering or the accumulation of sand. If at any time it is deemed necessary to have extra feeders to main wire, they can be attached direct to end of bolt K and then properly insulated. At each end of the line, and also at different sections, where thought advisable, a part of the slotway may be hinged to form doorways for removing the trolley from its subway. The drainage is also a very important part of the arrangement, and sewer-pipes, such as S, Fig. 1, can be put in and concreted in place while the road is being built. Such pipe should be put in every two or three blocks and led directly to the main sewers.

Fig. 4 represents the trolley and pole. The trolley is the same as generally used, but the pole f is made out of iron pipe or steel tubing flattened to an elliptical shape to run between the end groove or slot. To stop any chance of short-circuiting, I have insulated the trolley-holder from the pole by making the holder H, Fig. 5, in two halves with a square reversed cone or taper a', fitted with vulcanized fiber liners B' B', that completely surround the square end a' of the pole. Now, through the whole length of this pipe-pole I have a large transmitting-wire E', Fig. 6, flattened ellipti-



cally and properly and heavily insulated. After this wire has been passed through the pole the same is filled with a mixture of tar and pitch in proportions of about eight of pitch to one or two of tar. This mixture will be pliable and expand and contract enough for all purposes. At the other end of the pole *f*, before it enters the upper socket at *g*, is an insulator *II'*, by which the pipe-pole is thoroughly insulated. It is composed of two flanges with a vulcanized-fiber washer between the faces of same and with a hole in the center sufficiently large to let the internal wire *E'* pass through. The bolts and nuts which unite the flanges are insulated from the body by fiber tubing and washers. The pole is attached to the bottom of the car in the same way as it is usually attached to the top of the cars, except that the quadrant *m* and springs *n* are in reverse position, just back of the dashboard, so that the conductor can detach the pole and reattach it at the same or other end of the car in a reverse direction in a very short time. The pole can be made of any length desirable, either short, so as to make the contact near the front end of the car, or it can be made the full length of car, as shown in Fig. 4. In either case a cord for raising the trolley will be properly guided to some point convenient for the conductor to reach it. The trolley can be elevated to any height required within the limits of the subway, and can be elevated over cables at crossings, or in passing from one wire to another in the case of getting off the main line on to a curve, or can be adjusted in any way required for crossing other subway-wires of any other line of cars. For elevated roads it can be applied very cheaply, and the conductor and its supports can be put in without stopping the traffic. It is only necessary to fasten the lipped angle-iron, or channel-iron *e*, to any part between the rails and supply trolley-pole mechanism to the bottoms of the cars.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In combination, the conduit, the angle iron secured therein forming a continuous shelf, the insulating material supported thereby, and the wire having its lower portion embedded within said insulating material and its upper portion exposed, substantially as described.

2. In combination, the conduit, the angle iron secured to the wall thereof, and forming a continuous shelf, flanges projecting upward from said shelf, insulating material upon said shelf and confined by the flanges and a wire having its lower portion embedded in said insulating material, substantially as described.

3. In combination, the conduit, the continuous shelf secured therein, the wire holders having shanks secured in said shelf, the wire passing over said wire holders, and the insulating material filling in the space between said wire and shelf and inclosing the lower portion of the wire throughout its length, substantially as described.

4. A trolley for conduit electric railways comprising the divided pipe *P*, flanges *II'* thereon with means for clamping them together, and an insulating washer interposed between said flanges, substantially as described.

5. A trolley for conduit systems comprising the divided pipe having its sections insulated from each other, the outer section having a squared outer end, the box shaped insulating covering surrounding said squared end, and the trolley wheel carrier having a socket clamped upon said insulating covering, substantially as described.

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Witnesses:

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