

(No Model.)

2 Sheets—Sheet 1.

G. H. BENJAMIN.
ELECTRIC RAILWAY TROLLEY.

No. 506,463.

Patented Oct. 10, 1893.

Fig. 3.

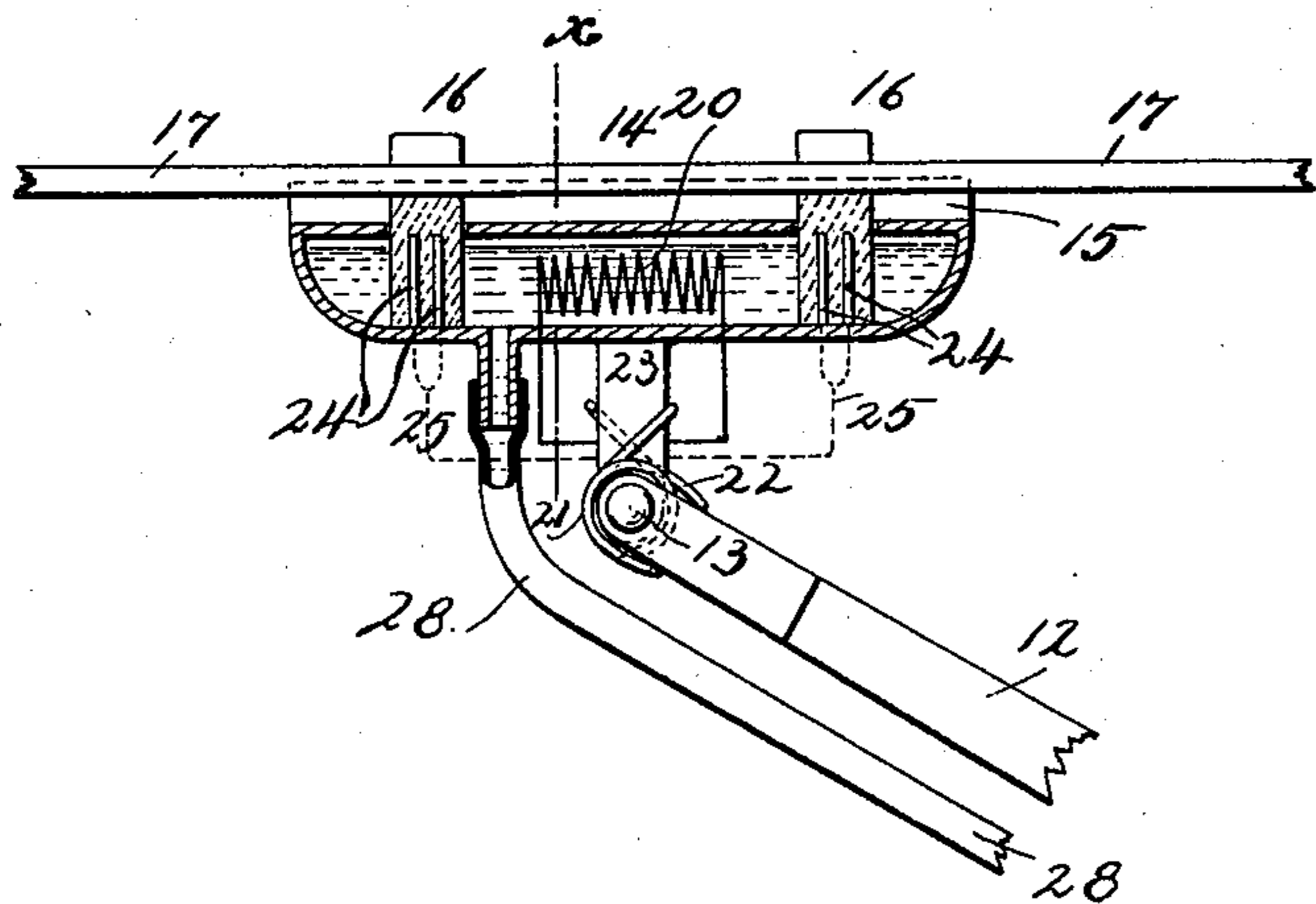


Fig. 4.

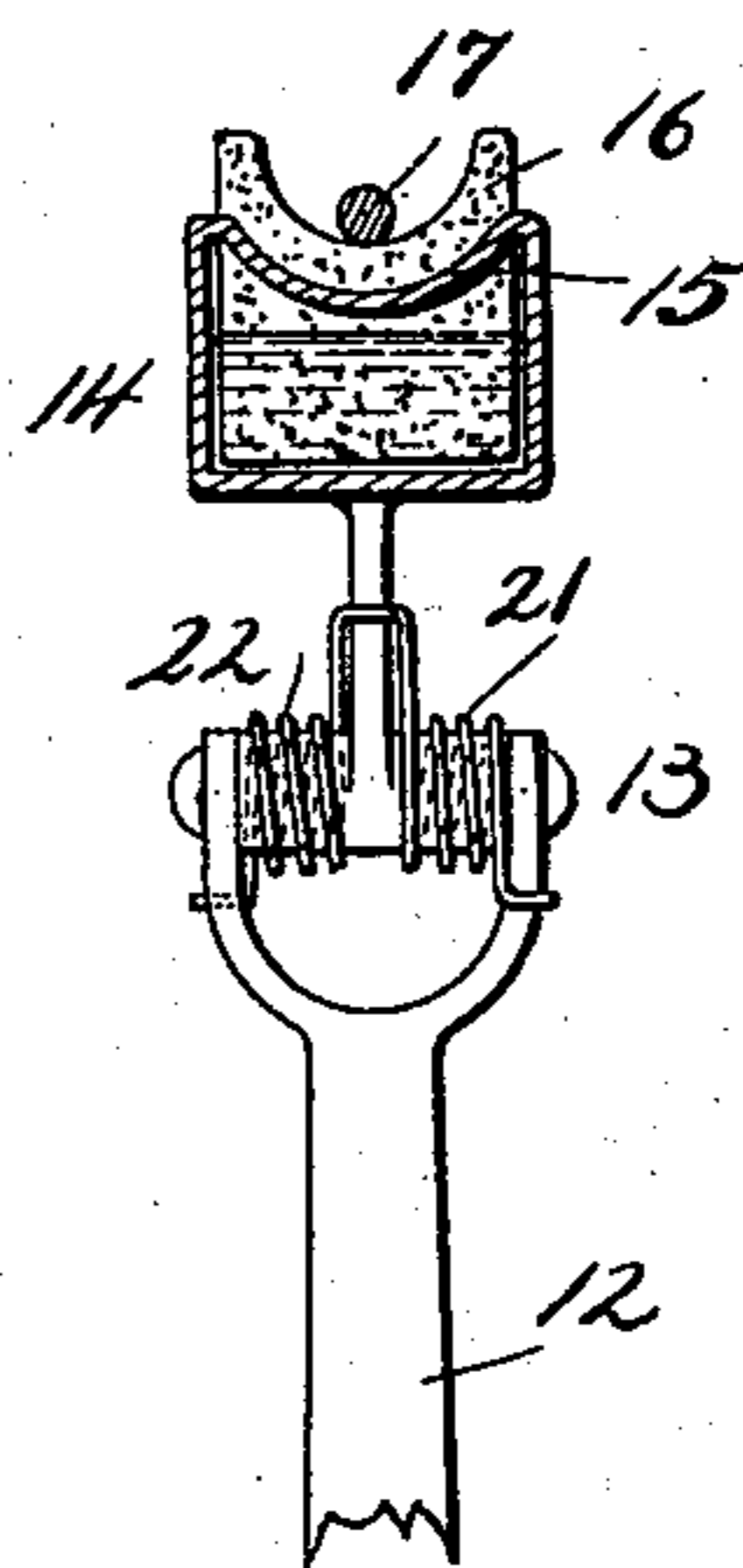


Fig. 5.

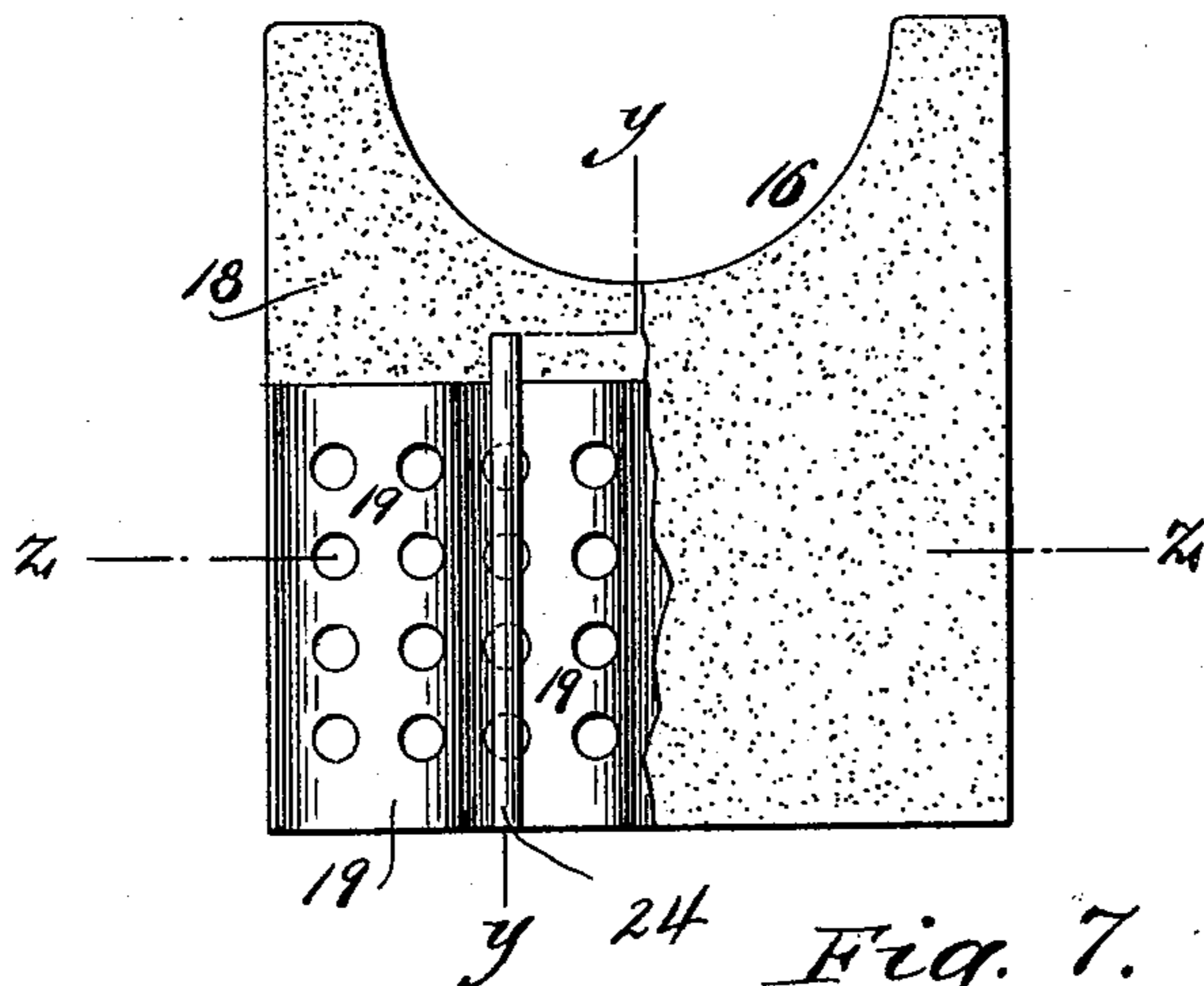


Fig. 6.

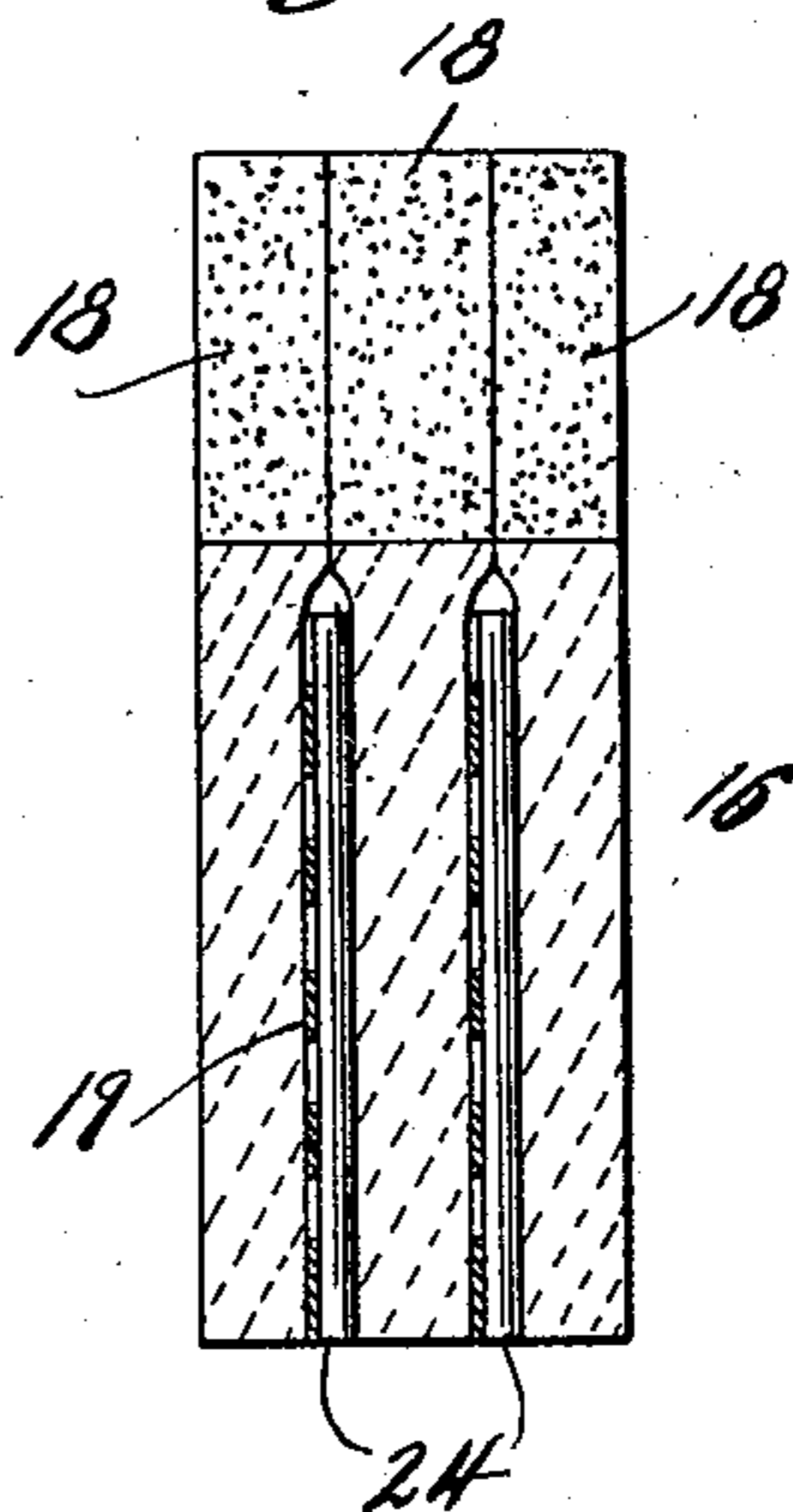
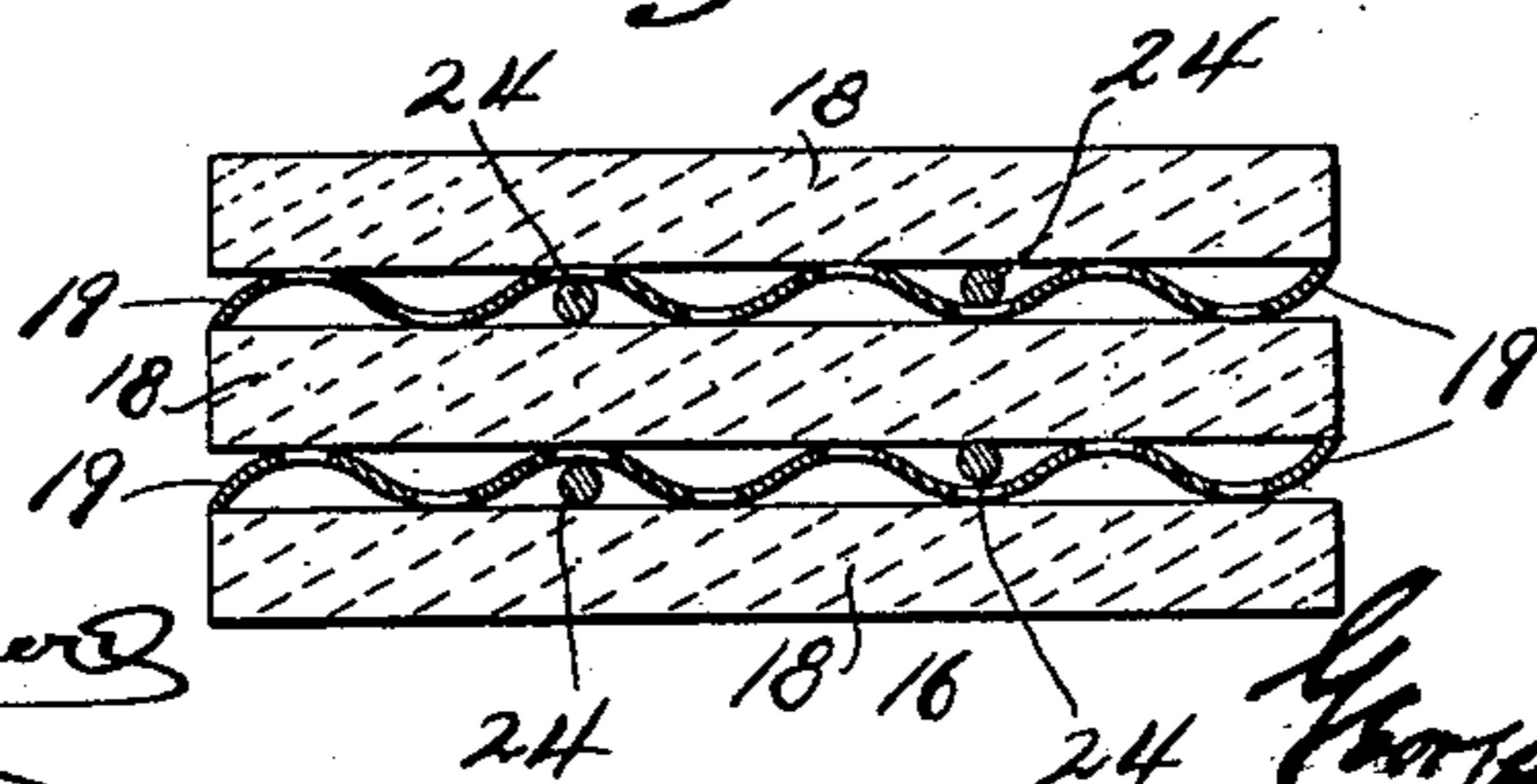


Fig. 7.



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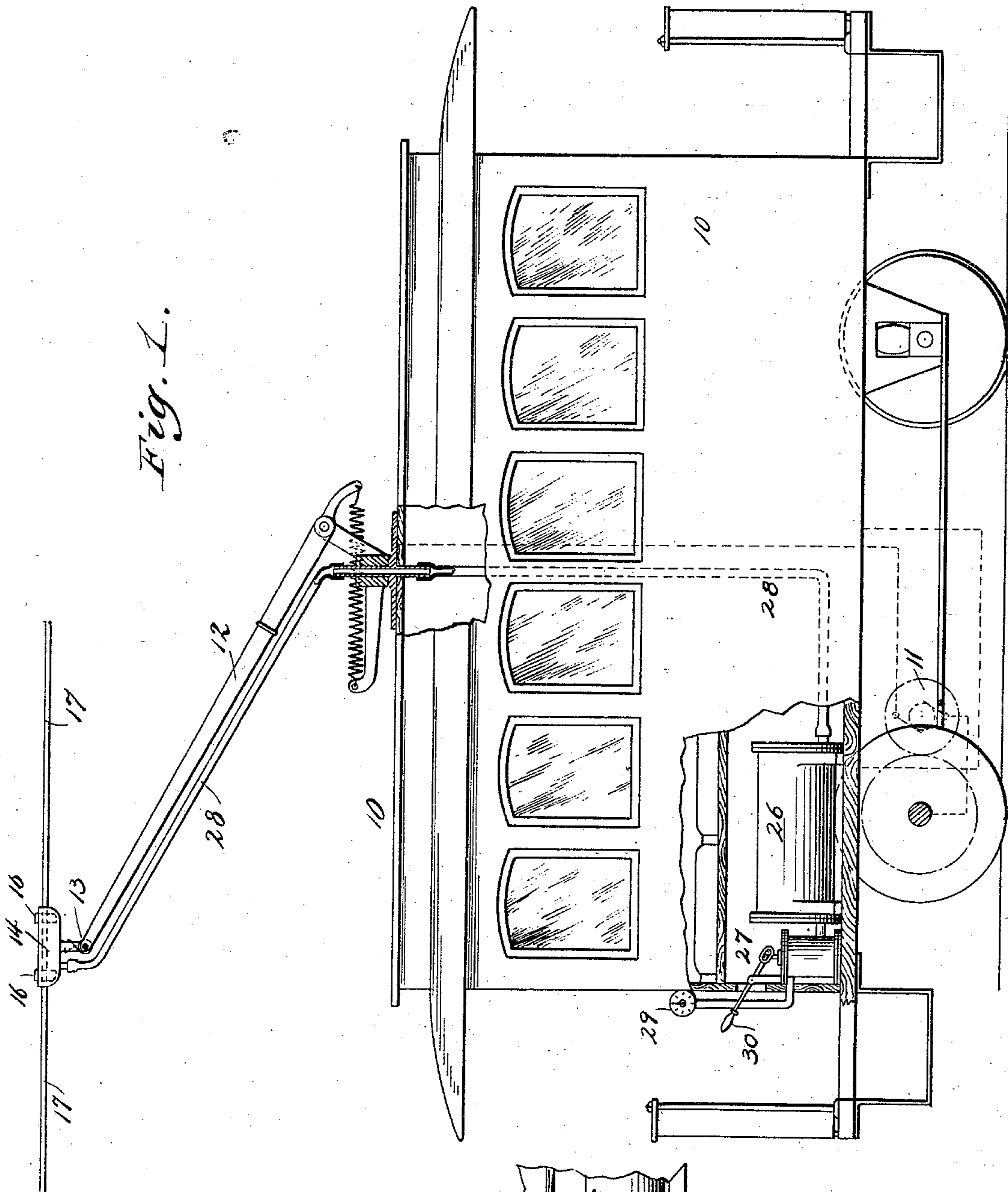
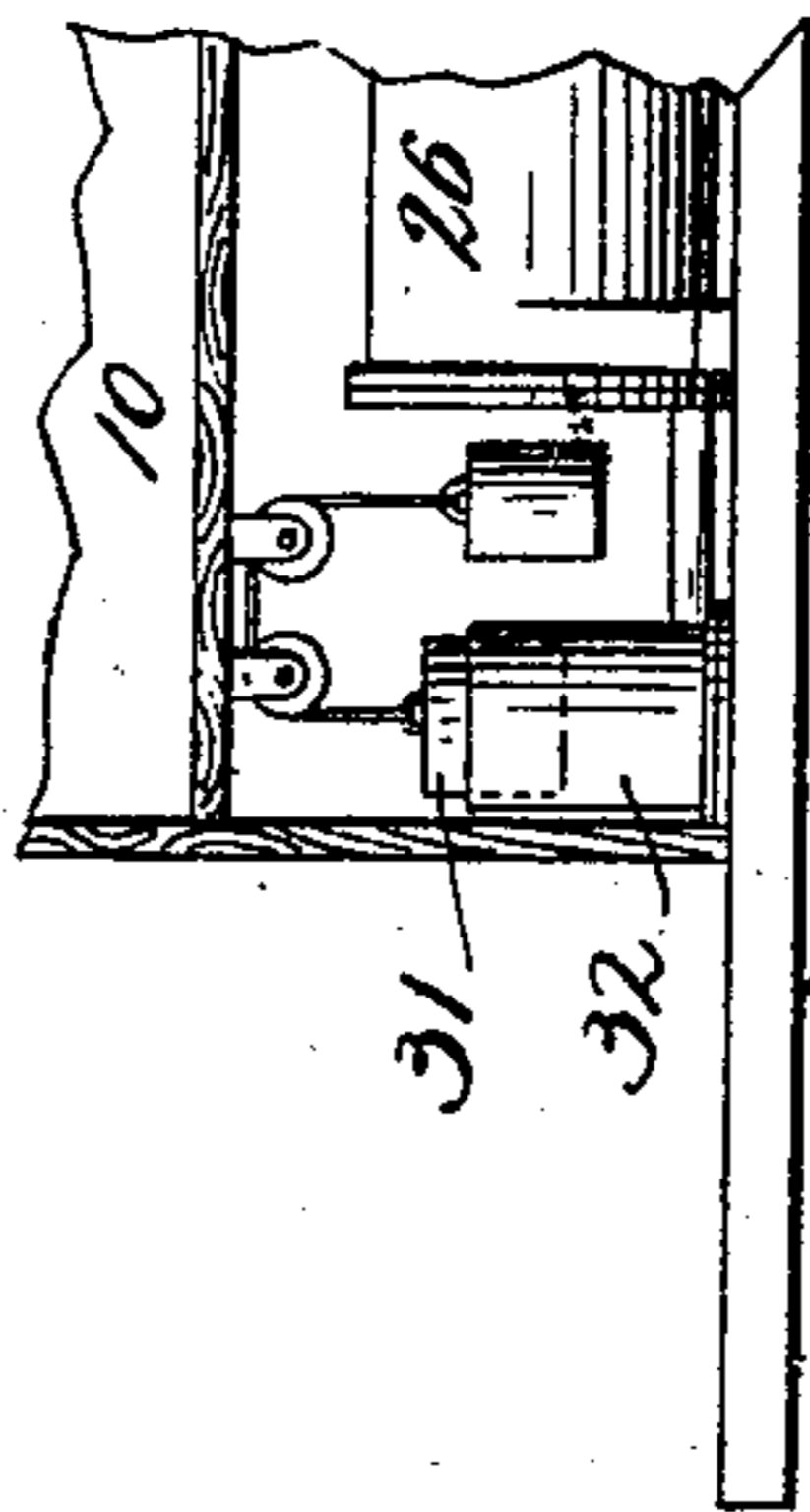


Fig. 2.



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UNITED STATES PATENT OFFICE.

GEORGE H. BENJAMIN, OF NEW YORK, N. Y., ASSIGNOR TO SIEMENS & HALSKE, OF BERLIN, GERMANY.

ELECTRIC-RAILWAY TROLLEY.

SPECIFICATION forming part of Letters Patent No. 506,463, dated October 10, 1893.

Application filed June 30, 1893. Serial No. 479,200. (No model.)

To all whom it may concern:

Be it known that I, GEORGE HILLARD BENJAMIN, a citizen of the United States of America, residing at the city of New York, county

5 and State of New York, have invented new and useful Improvements in Electric Railways, of which the following is a specification.

My invention relates to electric railways, and more especially to so-called "trolleys" as

10 carried by an electro motive vehicle and used for the purpose of establishing electrical connection between a conductor arranged in the vicinity of the line of rails on which the vehicle travels, and an electro motor upon the

15 vehicle.

In the operation of electric railroads at high speed, it has been practically demonstrated that all forms of contact trolleys at present in use are objectionable for various reasons. If

20 a contact trolley is employed which makes a rubbing connection with the working conductor, the heat caused by the frictional resistance has been found sufficient to draw the temper of the conductor and to effect its rapid

25 destruction. In the case of a trolley formed as a rotating wheel, the great rapidity of revolution of the wheel, which must necessarily be of small size, is productive of trouble at the wheel bearings, it being difficult to make

30 a bearing which will allow the wheel to be rapidly revolved without causing a great deal of heat.

The object of my invention is to provide a

35 contact device or trolley for electric railways,—especially those operated at high speed—which will collect the current from the working conductor and convey it to the motor upon the vehicle without the liability of the contact device itself being destroyed,

40 or without acting destructively upon the working conductor. To accomplish this result, I provide upon the outer end of the trolley arm or trailer, a contact device which in its preferred form carries a body or bodies

45 which are kept constantly saturated with a liquid. Thus, when the contact device is in relation with the working conductor, an electrical circuit is established through the instrumentality of the liquid which saturates the body. In connection with the contact device I provide means for maintaining a constant supply of liquid thereto, and means for

preventing freezing of the liquid to assure electrical conductivity from the working conductor to the vehicle motor in any or all kinds 55 of weather.

Referring to the accompanying drawings which illustrate my invention, similar reference numerals indicate corresponding parts.

Figure 1 is a view in sectional side eleva- 60 tion showing a railway car mounted upon a track-way, and a so-called trolley carried by the car and in contact with the working conductor. At the lower left hand corner the car is broken away in order to show a liquid 65 reservoir and air compressing apparatus for maintaining a constant supply of liquid to the contact device. Fig. 2 is a detail side elevation of a modified form of device for maintaining the liquid pressure in the contact device. Fig. 3 70 is an enlarged longitudinal section through the contact device; portions of the trolley arm and liquid feeding tube being shown in side elevation. Fig. 4 is a transverse section taken on the line x, x , in Fig. 3, through the working 75 conductor and contact device, and a rear elevation of the trolley arm, illustrating the means for maintaining the contact device in horizontal relation with the working conductor irrespective of the inclination of the trolley 80 arm. Fig. 5 is an enlarged side elevation, partly broken away, of the body I now prefer to employ in my contact device and which is brought into immediate relation with the working conductors. Fig. 6 is a vertical sec- 85 tional side view of said contact body, taken on the line y, y , in Fig. 5; and Fig. 7 is a plan view of said contact body, in horizontal section on the line z, z , in Fig. 5.

10 represents a railway car of any suitable 90 construction provided with an electro motor 11. Mounted upon the top of the car is a trolley arm or trailer 12, which is lifted at its outer end toward the conductor by spring pressure. 95

In carrying out my invention, any suitable form of trolley arm may be employed. Preferably I use such as shown, or one similar thereto and arranged on a rotatable base. It may also be advantageous to provide that the 100 trolley arm shall have a slight lateral swing. This feature is not shown in the drawings, and I have not considered it necessary to do so as it forms no part of my invention.

Connected by a pivot or other suitable joint 13 to the end of the trolley arm is my improved contact device 14. The contact device consists of a vessel which may be made of conducting or non-conducting material, as desired, and may be given any shape which would be found practicable. Generally, I prefer to make it with a transversely concaved upper surface 15, as shown in Fig. 3. Located within this vessel, near the opposite ends thereof, are what I call the "contact bodies" 16, which also preferably have a transversely concaved upper surface to enable them to more readily hold the working conductor 17, which is suitably connected in any approved manner to the source of energy. The contact bodies 16 project above the concavity of the vessel 15, so that when they are in contact with the working conductor 17, the vessel does not touch the conductor. The contact bodies 16 may be formed of any material which may be saturated with a liquid and kept moist. In practice I have found that these bodies can best be made by taking alternate layers 18 of hard felt and interpose between them layers 19 of corrugated and perforated material, such for instance as may be made from a flexible celluloid. Instead of using felt, I may use asbestos cloth and celluloid layers, or I may make the contact bodies wholly of felt, or I may make them of sponge rubber, or of any other material, as stated, which may be kept moist. The office of these contact bodies is to produce a cushion between the vessel or contact device proper and the working conductor, and to bring the liquid within the cavity of the vessel into contact with the working conductor. The contact bodies are fitted within their vessel in any approved manner allowing them to be readily renewed when worn out by action on the conductor.

Under certain conditions it is possible to construct a contact device in which the liquid within the vessel is brought directly into contact with the working conductor, without employment of what I have called the "contact bodies." But in practice and in order to prevent the liquid within the vessel from being thrown out, it is better to employ the contact bodies.

In effecting electrical contact between the working conductor and the motor by a liquid, I may use any liquid which is a conductor of electricity. For practical purposes I find that a solution of chloride of sodium twenty parts, and water eighty parts, is best adapted for the purpose, as the addition of the chloride of sodium makes the water a better conductor, and further acts to prevent the water from freezing even in the coldest weather. To fully provide however against the contingency of freezing, I make provision for moderately warming the liquid in the contact vessel and also the contact bodies themselves. This may be effected in any practicable manner, but I show for this purpose a conductive wire

coil 20, within the liquid in the vessel and connected to the trolley arm to convey an electric current for preventing congealing of the liquid.

In place of using a liquid such as that above described, I may use a body of mercury, in which case it is preferable that the mercury should be brought into direct relation with the working conductor, and that the contact at or near each end of the bath shall be provided with devices for wiping the mercury off of the conductor, and thereby prevent the loss of mercury. I have not illustrated this feature, as I consider it a mere modification, and within the intent of the invention as claimed herein.

I do not claim broadly the use of a liquid contact with a conductor, but a collector of electricity for use upon an electrically propelled vehicle to collect current from a working conductor to energize the electro-motive apparatus on the vehicle, said collection of current being accomplished through the medium of a suitable liquid in indirect contact with the working conductor.

As the trolley arm is sometimes drawn away from the working conductor and is caused to assume a vertical position, it is necessary to provide means for retaining the major or horizontal axis of the contact device perpendicular thereto. In order to accomplish this, I provide the springs 21, 22, each of which is connected at one end to the depending portion 23 of the contact vessel, and at the other end to the trolley arm 12, to which the said depending portion is pivotally connected. These springs exert their influence in opposite directions with the result to arrange the contact device at right angles to the trolley arm. However, as the arm commences to rise as soon as the contact leaves the wire, the said contact device will attain a perpendicular position with reference to the arm, approximately when the latter reaches its upright position. Instead of using these springs, I may use any other form of device for accomplishing the result, such for instance as a depending balance lever. The office of the springs 21, 22, is not to hold the contact device horizontal while bearing against the working conductor, at which time it is held in such position due to its pressure against the said conductor. This is not necessary however, but convenient in practice.

The current collected through the body of liquid may be conveyed to the motor through the liquid, but as this increases the resistance of the circuit, it is preferable to connect the trolley arm with suitable wires 24 embedded in the lower part of the contact body 16. In the case where the vessel is made of metal the wires 24 will be connected thereto, but when the vessel is made of insulated material these wires 24 will be connected through suitable wires 25 with the trolley arm, and as indicated by dotted lines in Fig. 3 of the drawings. By this means the only resistance

which is interposed in the circuit, other than that which is usual in the ordinary forms of metallic trolley contacts, is that due to the body of liquid included between the working conductor and the upper ends of the wires 24.

To maintain a fluid pressure within the contact vessel and thus keep the contact bodies 16 moist, I provide the reservoir 26, air pressure pump 27, and communicating pipe 28. 29 is a registering air pressure valve on the platform. When the car is started, the conductor manipulates the lever 30 until a certain definitely determined pressure is created in the reservoir 26, which forces the liquid through the pipe 28 into the cavity of the contact vessel and thence into the interspaces in the contact body 16, and by said body or bodies the liquid is brought into electrical contact with the working conductor 17. Instead of using this device, I may use that shown in Fig. 2 where the air pressure is maintained by means of a counter weighted piston 31, which falls by gravity within the air compressing cylinder 32, which connects with the liquid reservoir 26.

I have described my improved contact device as located on top of the vehicle. It will be evident to those skilled in the art to which this invention belongs, that the contact device may bear any relation to the vehicle. In case the contact device is carried below the vehicle, it will not be necessary to carry the air device for maintaining the requisite feeding pressure, as the liquid in that case will be supplied by its own gravity.

It will be observed that by the employment of my improved contact making device, I need only to provide means for establishing electrical relation between the working conductor and the motor, and that the contact is anti-frictional, self-lubricating and cooling; and that heating and the formation of sparks which act destructively are avoided.

Having thus described my invention, I claim—

1. In electric railways, the combination of a working conductor, an electro motive vehicle, and a liquid contact device carried by and moving with the vehicle and adapted to establish electrical contact between said working conductor and the electro-motive apparatus on the vehicle.

2. In electric railways, the combination of a working conductor, an electro motive vehicle, and a liquid contact device carried by and moving with the vehicle and adapted to make underneath contact with said conductor.

3. In electric railways, the combination of a working conductor, an electro motive vehicle, a contact device carried by the vehicle, comprising a conductor connected at one end to the motor on the vehicle and extending from the vehicle to the immediate proximity of the working conductor, a body of liquid interposed between said working conductor and the conductor from the motor, and in con-

tact with both, and a suitable device for carrying the liquid.

4. In electric railways, the combination of a working conductor, an electro motive vehicle, a trolley arm mounted on the vehicle, and a contact device on the end of said arm carrying a body of liquid adapted to be brought into electrical relation with and to establish electrical contact between the working conductor and the motor upon the vehicle.

5. In electric railways, the combination of a working conductor, an electro motive vehicle, a trolley arm mounted on the vehicle, means for imparting a constant inclination in one direction to the arm, and a liquid contact device upon the end of the arm adapted to establish electrical contact between the arm and the working conductor.

6. In electric railways, the combination of a working conductor, an electro motive vehicle, a trolley arm carried by the vehicle a contact device carrying a body of liquid on the end of the arm, and means for maintaining the major axis of the contact device in a determined position irrespective of the said working conductor.

7. In electric railways, the combination of a working conductor, an electro motive vehicle, a liquid contact device, and an electric heater bearing such relation to the contact device as to prevent congelation of the liquid contained therein at any temperature.

8. In electric railways, the combination of a working conductor, an electro motive vehicle, a liquid contact device carried by the vehicle, and means forming a portion of said device whereby the liquid therein is brought into indirect electrical relation with the working conductor.

9. In electric railways, the combination of a working conductor, an electro motive vehicle, a liquid contact device carried by said vehicle, and means for maintaining the body of liquid in said contact device.

10. A liquid contact device for electric railways, comprising a closed vessel, a body of liquid therein, and means communicating between the interior and exterior of said vessel and of such character as to be constantly saturated by the liquid contained in the vessel.

11. A contact device for electric railways, comprising a vessel, a body of liquid therein, and a renewable device adapted to be constantly saturated by said body of liquid and to take current from the working conductor.

12. A contact device for electric railways, comprising a closed vessel, a body of liquid therein, a device communicating between the interior and exterior of said vessel and adapted to be saturated by the said liquid, and means for maintaining said saturated portion of said contact device in electrical relation with a conductor from the source of energy.

13. In electric railways, the combination of a working conductor, an electro motive vehicle, and an anti-frictional current collecting

device carried by the vehicle and arranged to lubricate its bearing against the working conductor, through its contact points.

14. In electric railways, the combination of
5 a working conductor, an electro motive vehicle, a current collecting device carried by the vehicle, and means forming a part of said contact device for lubricating and cooling the
10 contact between said device and the working conductor.

15. In electric railways, the combination of a working conductor, an electro motive vehicle, and a liquid anti-freezing contact device carried by said vehicle.

16. The herein described method of establishing electrical connection between a fixed
15 conductor and the electro motive apparatus of an electrically propelled vehicle, which

consists in interposing and maintaining between the vehicle and the conductor, in contact with the conductor, and at rest with respect to its supporting vehicle a body of liquid.

17. As a new article of manufacture, a device for establishing a moving contact relative to a working conductor, and in which the electrical connection between said contact and conductor is formed by a body of liquid at rest with respect to its supporting vehicle.

In testimony whereof I affix my signature in the presence of two witnesses.

GEORGE H. BENJAMIN.

Witnesses:

EDW. B. HAWKINS,
ALVIN K. GOODWIN.