(No Model.) 4 Sheets—Sheet 1.

J. D. COLLIER & J. K. P. MILLER.

ELECTRIC CAR COUPLING.

No. 462,807. Patented Nov. 10, 1891.

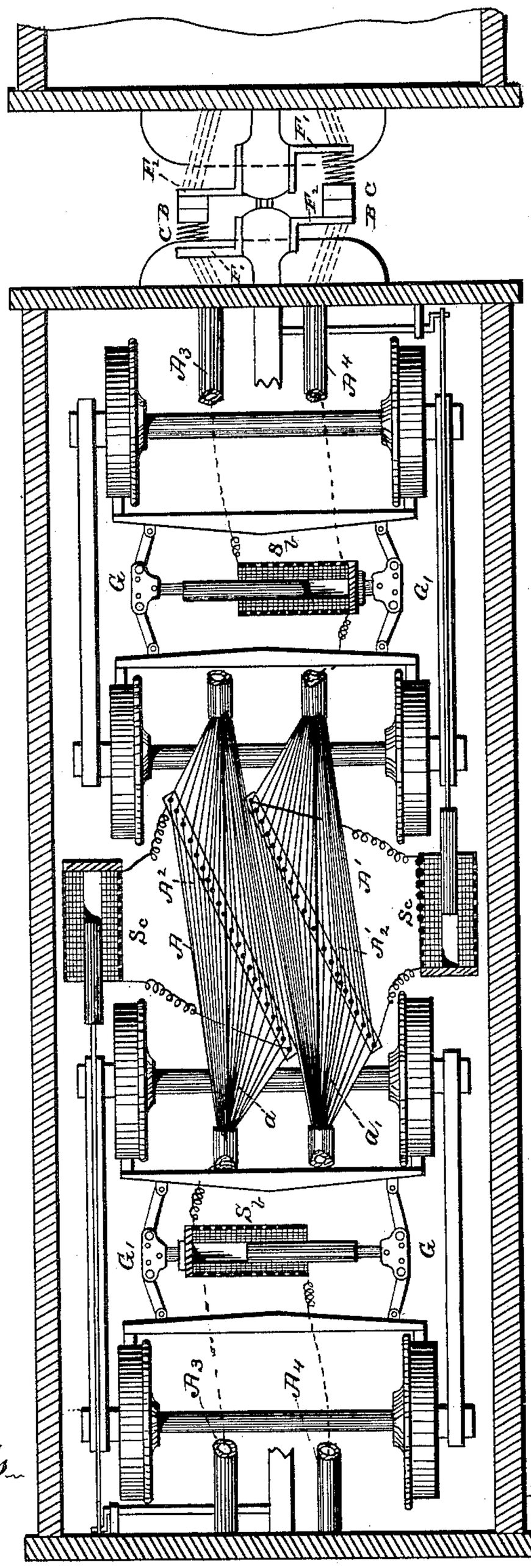

Fig. 1.

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ELECTRIC CAR COUPLING.

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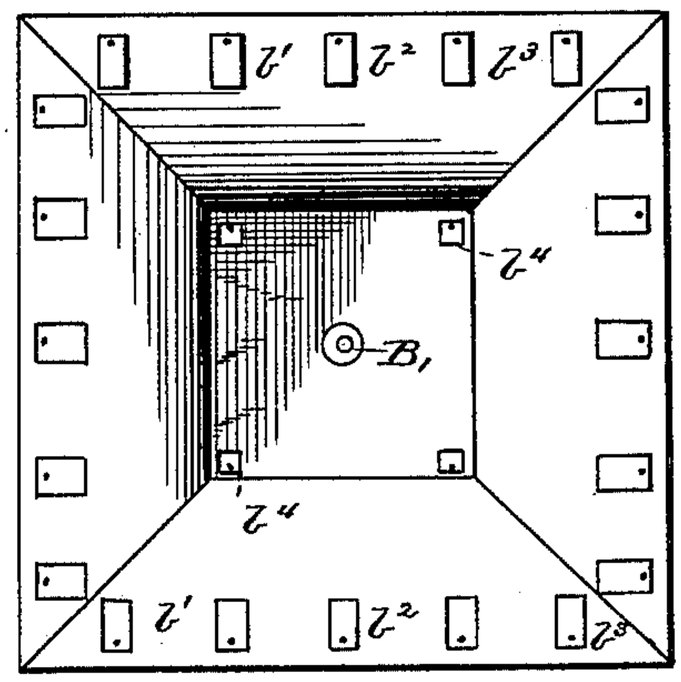

Fig. 2.

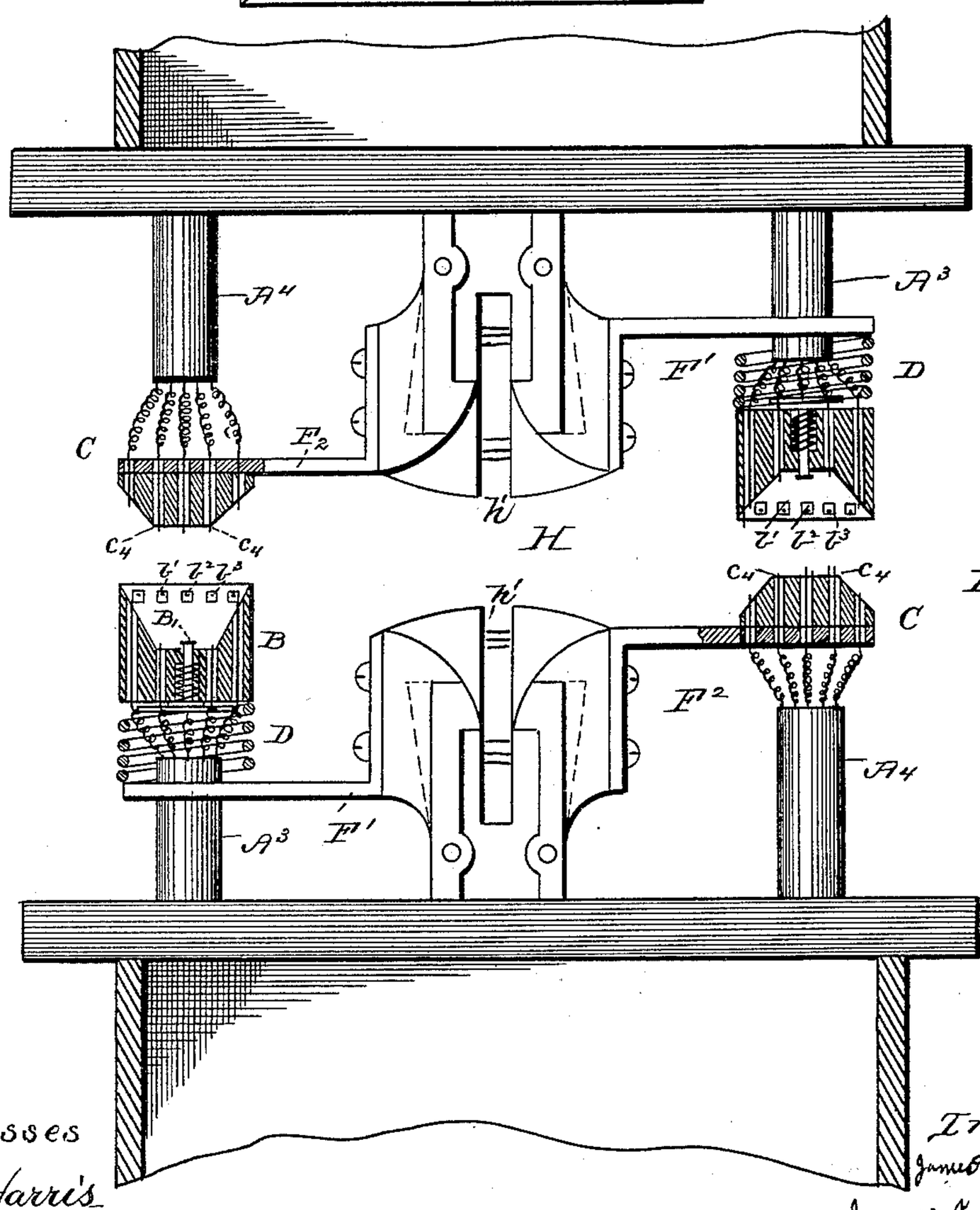

Fig. 3.

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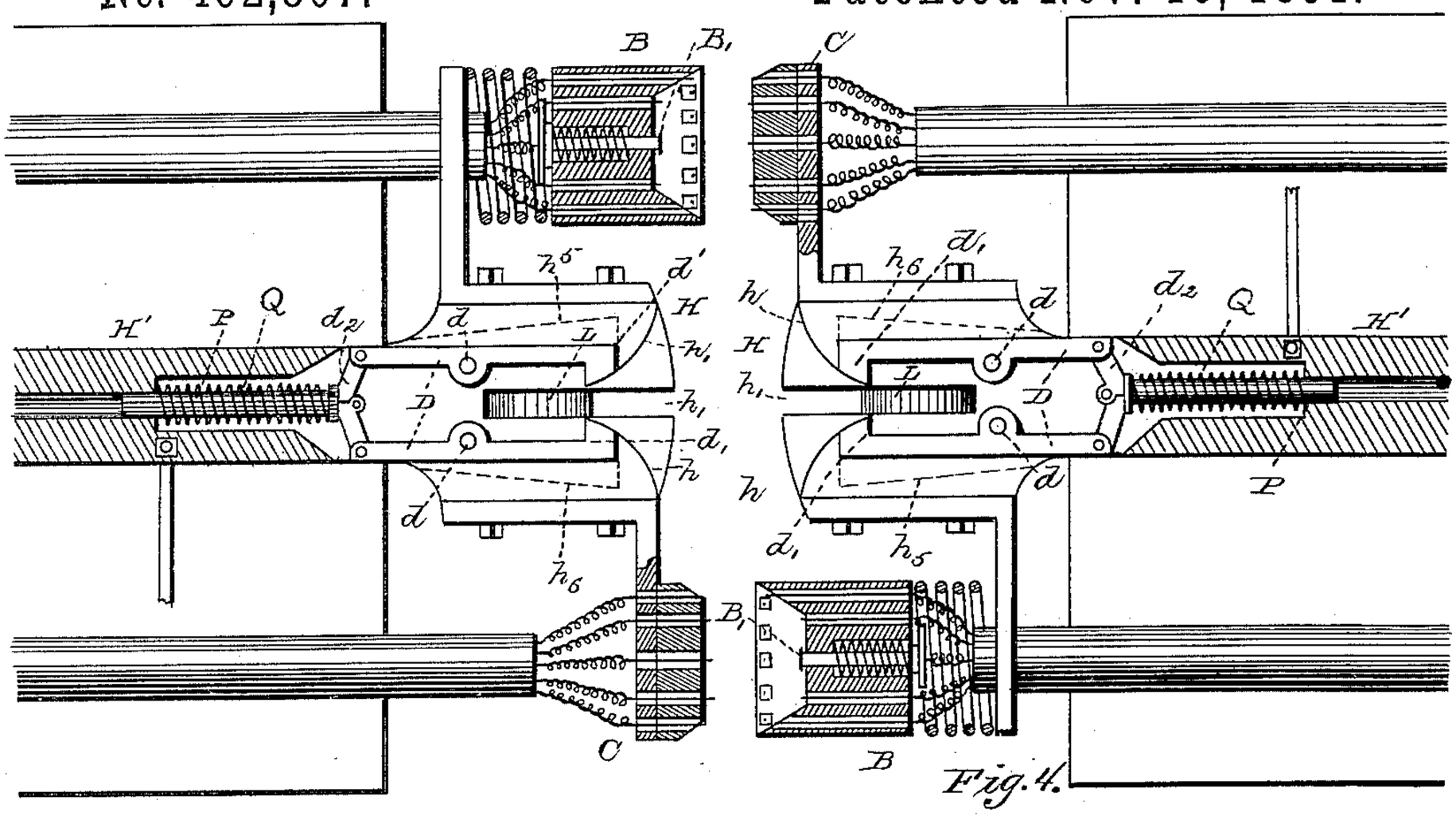


Fig. 4.

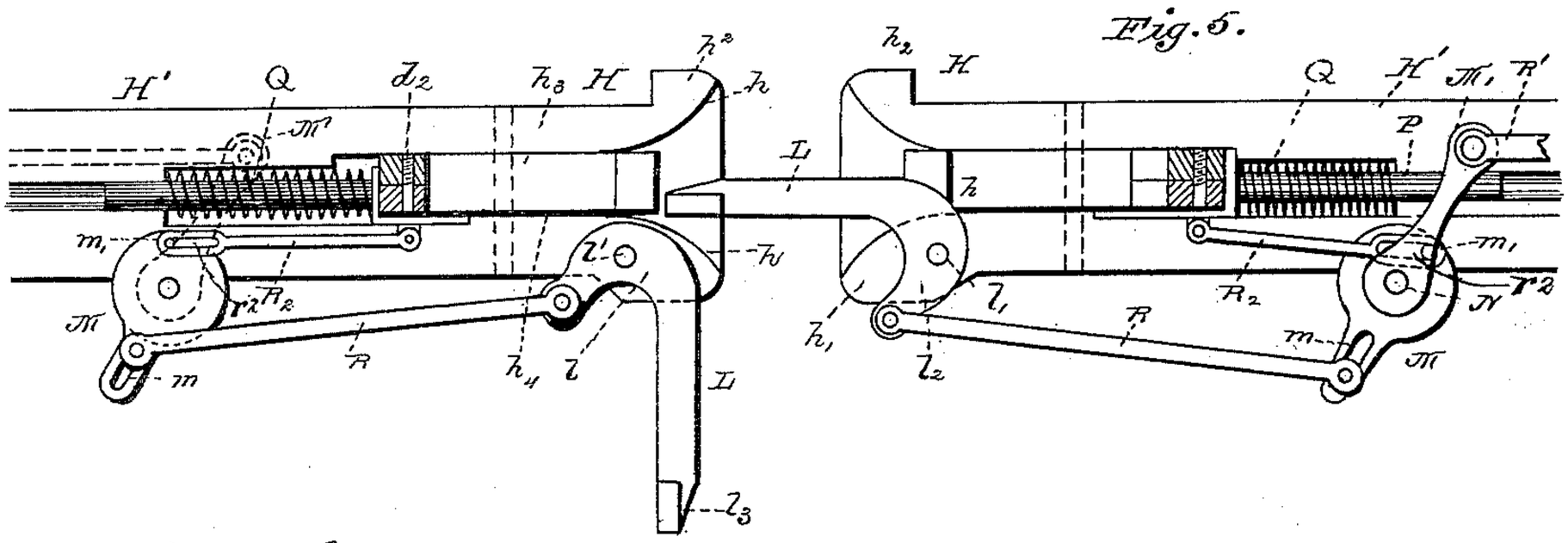


Fig. 5.

Fig. 6.

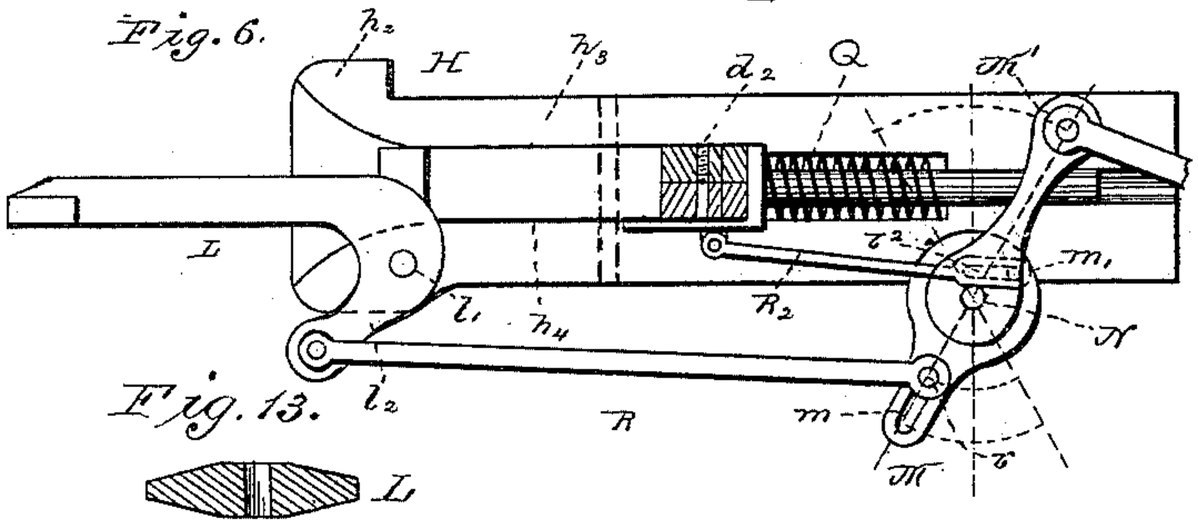
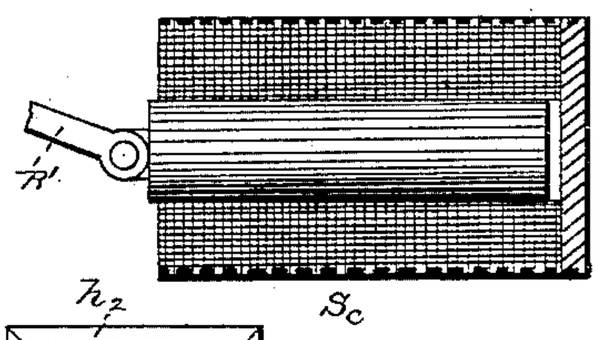


Fig. 13.



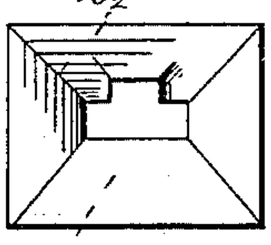
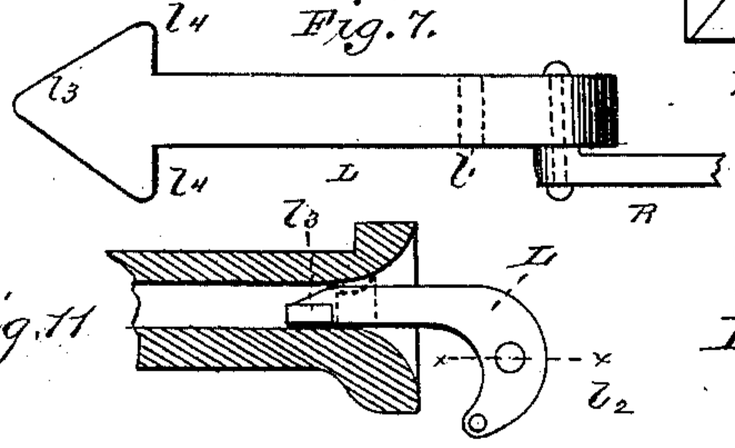


Fig. 12.

Fig. 7.



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(No Model.) 4 Sheets—Sheet 4.

J. D. COLLIER & J. K. P. MILLER.

ELECTRIC CAR COUPLING.

No. 462,807. Patented Nov. 10, 1891.

Fig. 8.

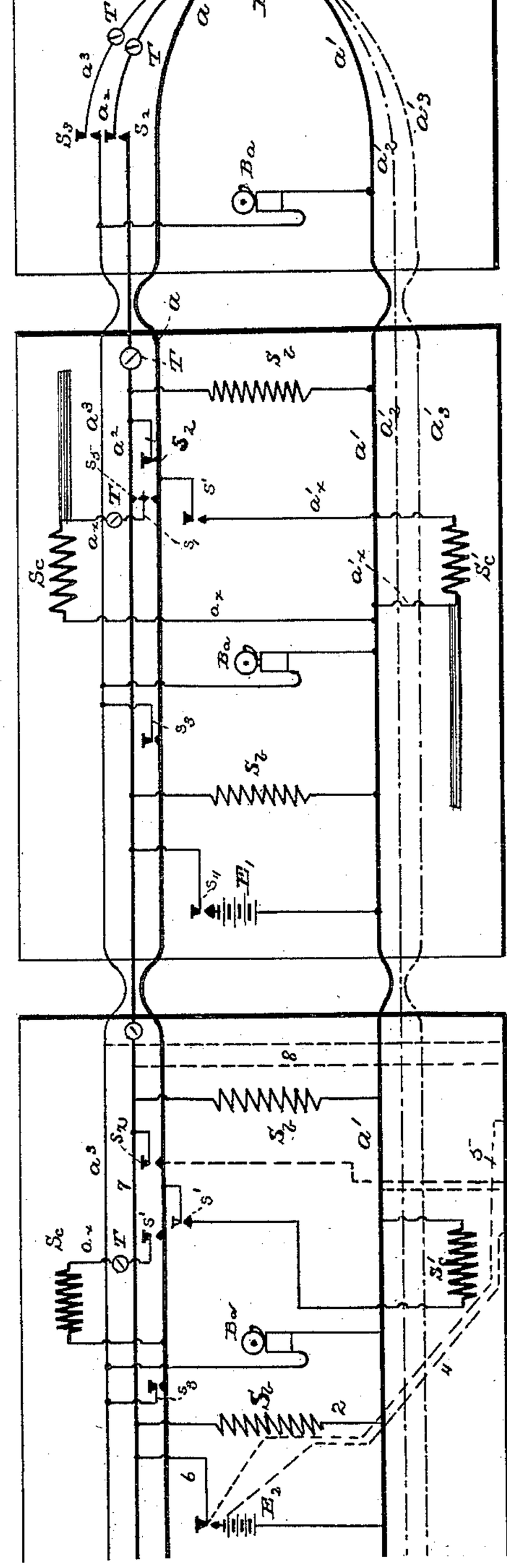


Fig. 10.

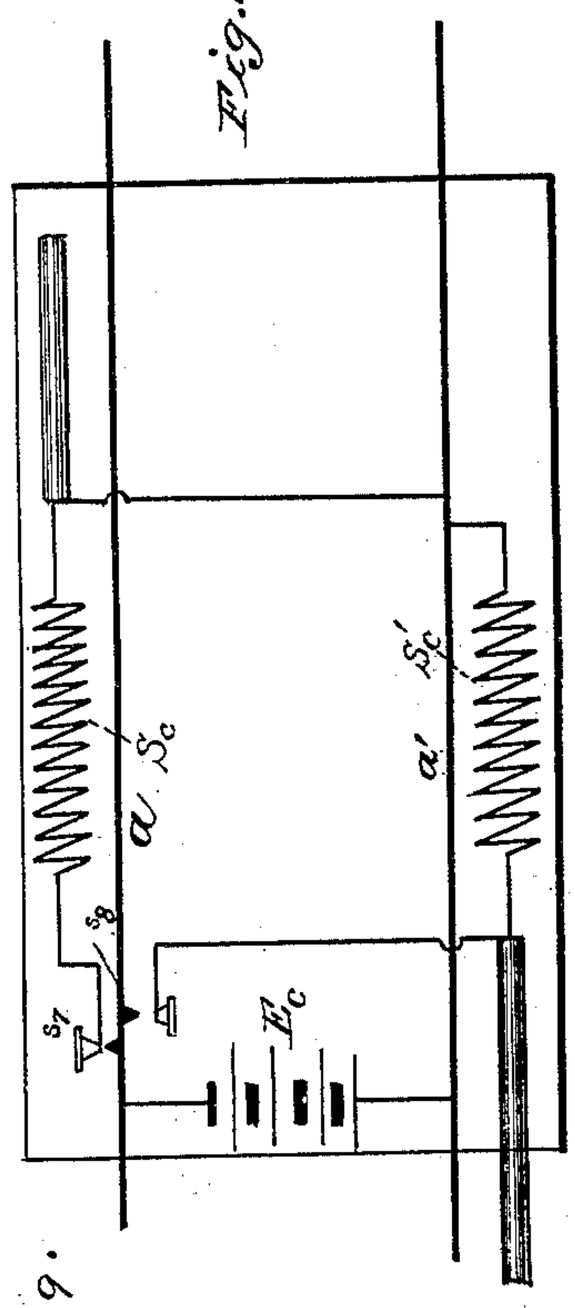
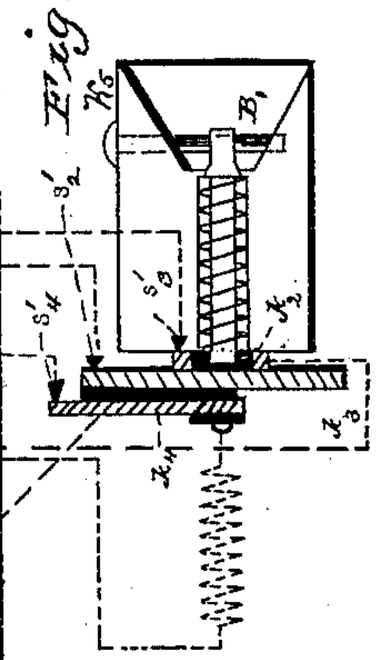


Fig. 9.



Witnesses
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UNITED STATES PATENT OFFICE.

JAMES DALLAS COLLIER AND JAMES K. POLK MILLER, OF WOODVILLE, TEXAS, ASSIGNORS OF ONE-THIRD TO JOHN H. KIRBY, OF SAME PLACE.

ELECTRIC CAR-COUPLING.

SPECIFICATION forming part of Letters Patent No. 462,807, dated November 10, 1891.

Application filed February 18, 1891. Serial No. 381,858. (No model.)

To all whom it may concern:

Be it known that we, JAMES DALLAS COLLIER and JAMES K. POLK MILLER, citizens of the United States, residing at Woodville, in the county of Tyler and State of Texas, have invented certain new and useful Improvements in Electrical Connections and Electrically-Controlled Couplings for Railway-Cars; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to the application of electricity to the various purposes of coupling and uncoupling, putting on and taking off brakes, signaling from car to car or from locomotive to cars, or vice versa, to lighting trains, and to such other purposes as it may be adapted.

The said invention consists in a suitably-controlled electric circuit extending throughout the train and in such other devices as will be hereinafter described and claimed.

Reference is had to the accompanying drawings, wherein the same parts are indicated by the same letters.

Figure 1 represents a plan view of the lower portions of a car, (parts being removed,) showing various applications of our invention. Fig. 2 represents an end view of one-half of our electric-circuit coupler. Fig. 3 represents a horizontal section through the car-coupler and the two sections of our electric-circuit coupler attached to the same end of the car. Fig. 4 is the same view as Fig. 3, but showing more of the uncoupling mechanism. Fig. 5 represents a vertical projection, partly in section, through two couplings as the cars come together. Fig. 6 represents a vertical projection, partly in section, of our coupling mechanism. Fig. 7 represents a plan view of our coupling-link detached. Fig. 8 is a diagram showing one method of making the various connections through the car-brakes, car-couplers, signal-bells, &c. Fig. 9 represents our method of applying brakes and sounding an alarm should any cars become uncoupled or break loose. Fig. 10 represents a simple form of circuit for coupling by electricity. Fig. 11 represents a modification of the car-coupler and draw-head. Fig. 12 represents a front view of the draw-head shown in Fig. 11. Fig. 13 represents a horizontal section of the link through the pivot, the hole for the pin being somewhat larger than the said pin and allowing the forward end of the link some lateral play.

Although a number of broken circuits connected to one single return-wire would ordinarily be sufficient, yet to make connections adapted to the condition that either end of the car may be shifted next to the locomotive or to the source of electricity we have found it necessary to employ either one electric-wire coupler in the center of the car, in which case the mechanical difficulties as well as the danger of short-circuiting would be great, or two electric-wire couplers on either side of the car with the current passing through one and returning *via* the other. In this case will be necessary either an automatic means of shifting the current or a double system of wires in each car.

We prefer the double system of wires, as shown in the drawings. A and A′ represent two such systems of wires connected to key-boards A^2 and A'^2, arranged in each car. The central wire *a* or *a′* of each group is much larger than the others. All the wires are well insulated, and after leaving their respective key-boards the two groups of wires are gathered together in flexible tubes A^3 and A^4, preferably soft-rubber pipes, leading to the electric couplings B and C. Here each wire is connected to its own proper contact-piece, by which it is connected to a corresponding wire in the car next ahead or next behind.

In Fig. 1 we have shown twenty-one wires in each group; but the number of these wires may be less or greater, as may be desired.

The electric circuits are completed from car to car by means of male and female couplers C and B, respectively. These circuit-couplers may be secured to the body of the car in any way; but we prefer to connect them to the draw-head H of the car-coupler by angle-irons or brackets F′ and F^2, to which said brackets are secured. By this means the spring attached to the base of the car-coupler co-operates with the springs on the circuit-

couplers to lessen the effect of vibrations in the cars. The body of these circuit-couplers is of insulating material and the two faces in contact have a number of contact-strips b' b^2 b^3 b^4, made of elastic metal, &c., each connected to its proper wire. These contact-strips are pressed together by bending the metal sufficiently in either one of each pair to make a spring of it, or by placing a small spring under one of each pair. Moreover, the two parts of the coupler are kept in close contact by means of a spiral spring D, attached to the base of either half of the circuit-coupler, (we have shown it as attached to the base of the female portion,) or to both equally well.

We preferably make the male circuit-coupler in the form of the frustum of a truncated quadrangular pyramid. Owing to the wedge shape of C it will slide into and be centered by B. At each corner of the top of C we have four metallic contact-strips c^4, which press against the contact-strips b^4, similar in other respects to b' b^2 b^3, &c., both c^4 and b^4 being connected each to a corresponding wire adds four circuits to our system.

In the center of all the female couplers we have a metallic plunger B', pressed out by a spiral spring at its base and making contact with a plate we have connected to the large central wire of each group, and this connection forms the return circuit for all the wires of the opposite group. Attached to the base of this plunger we have three contact-makers k^2, k^3, and k^4, (see Fig. 9,) which complete the circuit, sounding an alarm and applying the brakes when any of the cars become uncoupled or break loose; or the supply of electricity may be obtained from a number of storage-batteries, one or more in each car, suitably connected throughout the train.

H represents the draw-head of the car-coupling. H', the draw-bar, is arranged with rear spring, &c., according to methods now in use. The draw-head is hollow with the usual flaring lips. The upper shell h^2 is solid, while the lower has a rectangular slot h' for the shank l of the arrow-head link L. This link is pivoted at l' in the said draw-head and has a short lever-arm l^2, connected by the rod R and stud r to the arm M, attached to the rod R', connected to the armature of the coupling-solenoid S^c. In the cavity of the draw-head, limited by the horizontal walls h^3 and h^4 and the vertical walls h^5 and h^6, I have two dogs D, pivoted in the draw-head at d and having their front ends d' bent in the form of a hook, while their rear ends are pivoted to a toggle-joint d^2, secured to a plunger P, pressing forward by a spring Q, fitting in suitable recesses in the draw-bar. The wall h^3 may be cut with a groove or recess to register with a lug or tongue on the upper portion of the link and so center the same in uncoupling, as shown in Figs. 11 and 12; but since the hooks d' will be inclined outward when the dogs are opened they will then act as centering devices, and hence the groove or lug will hardly be necessary. The toggle-joint d^2 is so arranged that the spring and plunger may never press it beyond a certain angle, for should it be straight when the link enters some of the parts would be carried away. This plunger P is connected by the rod R^2 to the stud m' on the arm M', attached to the rock-shaft N. This stud m' is so placed that the jaws d' may be opened sufficiently to allow the opposite link-head to be withdrawn before its own link is horizontal. The arm M and rod R^2 have slots m and r^2 therein to ease the parts when the electric current is turned off from the coupling-solenoid. The links hang normally, as shown in the left coupling of Fig. 5; but when it is desired to hook on a new car or a new section of a train the circuit is completed through the coupling-solenoid at the rear of the last car. By a proper system of conductors this may be done either from the locomotive or from the car itself. Its armature is then drawn in, (see Fig. 6,) hauling with it the rod R' and arm M'. The arm M and rod R then force the link L up into a horizontal position. Then as the cars come together the head of the link forces apart the jaws d' of the dogs D, bending the toggle-joint d^2 against the action of the spring Q, and as soon as the angles l^4 of the link pass the jaws of the said dogs the spring forces them together, firmly clasping the head of the link. The face of the draw-head prevents the link from entering too far. After the cars are coupled together the coupling-circuit is broken and the link is held up in the draw-head by the arms l^4. We may use any intermediate gearing for increasing the power of the coupling-solenoid.

When it is desired to uncouple any car, the coupling-circuit in that car is completed, the armature of the coupling-solenoid is drawn in, and the link rises from its vertical position, as in coupling; but before the said link becomes horizontal the rod R^2 will have drawn back the plunger P and toggle-joint d^2, opening the jaws d' of the dogs D and allowing the link from the car ahead to be withdrawn. As soon as the cars are uncoupled the circuit is broken and the link on the detached car falls into its normal vertical position.

The coupling-circuit may be completed from a switch-board on the tender of the locomotive or from the car itself which is to be uncoupled.

Our method of making the various electrical connections necessary for the foregoing will be better understood by reference to Fig. 8, where three sets of connections are shown. Since it will ordinarily be necessary to use brakes in coupling and uncoupling, I have shown brake-circuits as well as coupling-circuits.

G and G' (see Fig. 1) represent the brakes, consisting of two toggle-joints connected at each end to the brake-beams and at their

centers to the solenoid and to the armature, respectively. By passing a current through the solenoid the armature is powerfully attracted, and the two parts tend to straighten their respective toggle-joints and so press the brakes against the wheels; but any other equivalent mechanical device would operate equally well. Both sections of the solenoid should, preferably, be wound and in opposite directions, when to remove the brakes a switch may be arranged to throw the current through the two sections of the solenoid in the same direction; or a withdrawing-spring may be secured to the two parts of the solenoid. When the current is cut off, the spring will force the two portions apart, thus removing the brakes. These mechanical features, which may easily be arranged by any one skilled in the art, are shown in our application, Serial No. 380,150, filed February 4, 1891, but for the sake of clearness in the drawings are omitted from the drawings of the present case.

Three sets of connections are shown in Fig. 8. There a and a' represent the two large central wires of each group connected to the positive and negative poles, respectively, of the source of electricity. a^2 and a'^2 represent the two wires connected to the brake-circuit. a^3 and a'^3 represent the wires connected to one of a system of signal bells or alarms, and $a^\times$ and $a'^\times$ represent the wires connected to the various coupling-solenoids.

The number of the various circuits may be increased or diminished, as may be required, and also various combinations of the different wires may be made.

Since the wires on one side of the car are symmetrical with those on the other side, we shall only describe the connections on one side of the car. The use of the duplicate system of wires may be avoided by having one central electric coupling with all the wires passing therethrough; but in this case the danger of short-circuiting would be greater. Having two systems of wires, a double series of contact-makers will be necessary; but we will describe those on one side of the car only. The two large wires a and a' are connected to each pole of the battery and are each in unbroken electrical connection throughout the train. We have one end of the wire from each of the coupling-solenoids connected to the wire a', and the other end capable of being brought by a switch or any suitable circuit-closer S′ into connection with the wire a. The current then passes from E through a to the solenoid-wire, and after passing through the solenoid returns to the opposite pole of E by the wire a'.

Should it be desired to work only with the storage-battery in each car, as E, Fig. 8, by closing S^4 and S^5 the current from E′ will be divided, part passing through the coupling-solenoid and either raising the link or opening the jaws of the dogs and the remainder passing through the brake-solenoids and applying the brakes. This could be accomplished without any connection from car to car by the simple device shown in Fig. 10, where a and a' represent the wires connected to the poles of the battery E^c. S^c and S'^c represent the coupling-solenoids, and s^7 and s^8 represent the circuit-closers. While with our apparatus the cars may be uncoupled running at full speed, still it will generally be necessary to put on brakes before either coupling or uncoupling, and for this reason we will describe our brake system in connection with our car-coupling system.

The brake-solenoids S^b have one end of the wire of each connected to the wire a' and the other end connected to the wire a^2, which should be of small resistance. A contact-maker s^2 in each car is arranged to connect the wire a^2 with the wire a, and so complete the circuit through all the brake-solenoids whenever it is desired to put on brakes. Now, if connection be made through any one of the said contact-makers in any car, the current coming from the positive pole of E will follow along a to the point of contact, whence it will travel to the wire a^2, and, dividing, a portion of said current will pass through each one of the brake-solenoids, returning to the source of electricity by the wire a'. A galvanometer T or other indicator is added to inform the engineer that the circuit is completed and that the brakes are on. We may also place a galvanometer or other indicator on each wire in each car should that be deemed advisable. A bell-circuit of high resistance connected to the wire a^3 may be used to indicate when any one or more of the cars become uncoupled. It will be evident that the number of circuits may be multiplied indefinitely. The wires on the opposite side of the car (shown in broken lines) have similar connections. (Not shown.)

In the device shown in Fig. 9, k^2 and k^3 represent two metallic cross-bars attached to but insulated from the metal plunger B′ and electrically connected to the wire a. It will readily be seen that one cross-bar would do for both contacts. k^4 is another metallic contact-strip insulated from the two cross-bars k^2 and k^3 and also from the plunger B′. When the cars are coupled together, the plunger is pushed in, keeping the cross-bars k^2 and k^3 clear of the contact-points s'^2 and s'^3, which are connected to the wires a^2 and a^3, respectively. Should a part of the train become uncoupled, the plunger B′ on the last car remaining on the train and the first car of those broken loose will be released, and the cross bar k^2 will strike s'^2 and k^3 will strike s'^3. When k^2 strikes s'^2 the circuit will be completed through the brake-solenoids, and when k^3 strikes s'^3 the circuit will be completed through the alarm-bells B^a. This is apparent for the part of the broken train next the main source of electricity; but to apply the brakes and sound the alarm for the other portion of the train connection is made with the storage battery or cell in each

car. This connection may be readily made in a great variety of ways. For example, we may provide a contact-piece k^4, connected to one pole of E^2 and secured to but insulated from B′, said piece pressing against a contact-piece s'^4 when the plunger B′ is released. The current from the secondary battery E^2 then goes through the wires 4 5 6 7 and thence through the solenoid S^b to the wire a', connected to the opposite pole of the said secondary battery. It is evident that all the secondary batteries may be connected to the wire 4, and hence the combined effect of all the said batteries may be obtained and all the brakes be applied on the broken-off section of the train. To prevent the last car of a train from keeping on brakes by this automatic device just described, it will be necessary to have some locking device k^5 (see Fig. 9) to keep the plunger B′ from springing forward. A switch to open the circuit would effect the same result. It will also be evident that the various secondary batteries may be so connected together and to the principal source of electricity that the combined effect of any number of said sources of electricity may be simultaneously obtained. Moreover, it will be evident that we may actuate our couplings and brakes from a source of electricity external to the car or the train—as, for instance, the trolley used in electric railways. Since the variety of combinations and the arrangements possible with a limited number of wires connected from car to car as described by us is very great, we do not mean to limit ourselves to any particular means of performing a given function where numerous equivalents would readily suggest themselves to one skilled in the art; but

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

1. In a system of car-couplings actuated by electricity, the combination, with the source of electricity, of a conductor leading from one pole thereof connected from car to car, a second conductor leading from the opposite pole of the source of electricity and also connected from car to car, an electro-magnet and circuit-closer between the said conductors, and an armature adapted to be drawn to said magnet, a link connected to the draw-head and having an arm protruding therefrom, a rod or rods connecting said arm and said armature to raise the link, and means for engaging said link in the opposite draw-head, substantially as described.

2. In a system of car-couplings actuated by electricity, the combination, with the source of electricity, of a conductor leading from one pole thereof connected from car to car, a second conductor leading from the opposite pole of the source of electricity and also connected from car to car, an electro-magnet and circuit-closer between the said conductors, and an armature adapted to be drawn to said magnet, an arrow-head link pivoted in the draw-head and having a lever-arm connected thereto, a connecting rod or rods joining said lever-arm to said armature for raising the said link, and pivoted dogs in the opposite draw-head for engaging said link, substantially as described.

3. In a car-coupling, the combination of a source of electricity, an electro-magnet actuated thereby, a circuit-closer for making and breaking the circuit through the said electro-magnet, an armature adapted to be drawn to the said electro-magnet, a rock-shaft pivoted beneath the car, and a link pivoted in the draw-head, a plurality of arms on the said rock-shaft, and an arm on the said link, a connecting-rod between one of said arms on the rock-shaft and the armature, and a connecting-rod between another of said arms on the rock-shaft and the arm on said link, substantially as decribed.

4. In a car-coupling, the combination, with a source of electricity, of an electro-magnet actuated thereby, a circuit-closer for making and breaking the circuit through the said magnet, an armature adapted to be drawn to the said magnet, a rock-shaft pivoted beneath the car, a link pivoted in the draw-head and having an arm extending to the rear, an arm on the said rock-shaft, and a connecting-rod connecting said arm to the armature, a slotted arm on said rock-shaft, a connecting-rod pivoted in said slot and connecting said arm to the arm on the link for lifting the link, and means of engaging said link in the opposite draw-head, substantially as described.

5. In a car-coupling, the combination, with a source of electricity, of an electro-magnet actuated thereby, a circuit-closer for making and breaking the circuit through the said magnet, an armature adapted to be drawn to the said magnet, a rock-shaft pivoted beneath the car, a link pivoted in the draw-head and having an arm extending to the rear, an arm on the said rock-shaft, and a connecting-rod connecting said arm to the armature, a slotted arm on said rock-shaft, and a connecting-rod pivoted in said slot and connecting said arm to the arm on the link for lifting the link, two dogs pivoted in each draw-head, a spring-joint normally holding said dogs closed, a crank-pin on one of the arms of said rock-shaft, and a connecting-rod connecting said spring-joint to said crank-pin and said armature, substantially as described.

6. In a car-coupling, the combination, with a source of electricity, of an electro-magnet actuated thereby, a circuit-closer for making and breaking the circuit through the said magnet, an armature adapted to be drawn to the said magnet, a rock-shaft pivoted beneath the car, a link pivoted in the draw-head and having an arm extending to the rear, an arm on the said rock-shaft, and a connecting-rod connecting said arm to the armature,, a slotted arm on said rock-shaft, and a connecting-rod pivoted in said slot and connecting said arm to the arm on the link for lifting the link,

two dogs pivoted in each draw-head, a spring-joint normally holding said dogs closed, a crank-pin on one of the arms of said rock-shaft, and a connecting-rod having a slot in one end thereof engaging said crank-pin and connecting said spring-joint to said crank-pin and said armature, substantially as described.

7. In a car-coupling, a hook-shaped arrow-head link pivoted near its base to the under side of the draw-head and having an arm below the said draw-head, an electro-magnet, and an armature adapted to be drawn thereto, a rock-shaft having a plurality of arms thereon, a connecting-rod connecting the said armature to an arm on the said rock-shaft, and a connecting-rod connecting the said arm on the link to an arm on the said rock-shaft, substantially as described.

8. In a car-coupling, the combination of the dogs D, pivoted at d and having hooked jaws d', with the bent toggle-joint d^2, and the spring-plunger P, tending to straighten the same, the rock-shaft N, having a plurality of arms thereon, the stud m' on one of said arms, and a connecting-rod joining said arm to said spring-plunger, an electro-magnet carried by the car, an armature adapted to be drawn to said magnet, and a connecting-rod connecting said armature to an arm on said rock-shaft, substantially as described.

9. In a car-coupling, the combination of a hollow draw-head having a longitudinal slot in the base thereof with an arrow-headed link pivoted in the said slot, said link having an arm protruding to the rear thereof, a rock-shaft having a plurality of arms, an electro-magnet having an armature adapted to be drawn thereto, a connecting-rod connecting the said arm on the link to an arm on the rock-shaft, and a connecting-rod connecting the armature of the electro-magnet to an arm on the rock-shaft, substantially as described.

10. In a car-coupling, the combination of the draw-head H, having a slot h' in the base thereof, with the arrow-headed link L, pivoted therein, said link having a short arm l^2, the connecting-rod R, connecting the said arm on the link to an arm on the rock-shaft, the slotted arm M on the rock-shaft N, the dogs D, pivoted at d and having hooked jaws d', the bent toggle-joint d^2, and the spring-plunger P, tending to straighten the same, the connecting-rod R^2, connected to the said spring-plunger and slotted and engaging the stud m', attached to an arm on the rock-shaft N, the arm M', also on the said shaft, the connecting-rod R', joined to the armature of the electro-magnet actuating the car-coupling, the electro-magnet S^c, and the armature thereof, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

JAMES DALLAS COLLIER.
JAMES K. POLK MILLER.

Witnesses:
W. E. ADAMS,
JAS. L. KIRBY.