(No Model.)

2 Sheets—Sheet 1.

W. E. BADGER.

ELECTRIC CAR MECHANISM.

No. 458,800. Patented Sept. 1, 1891.

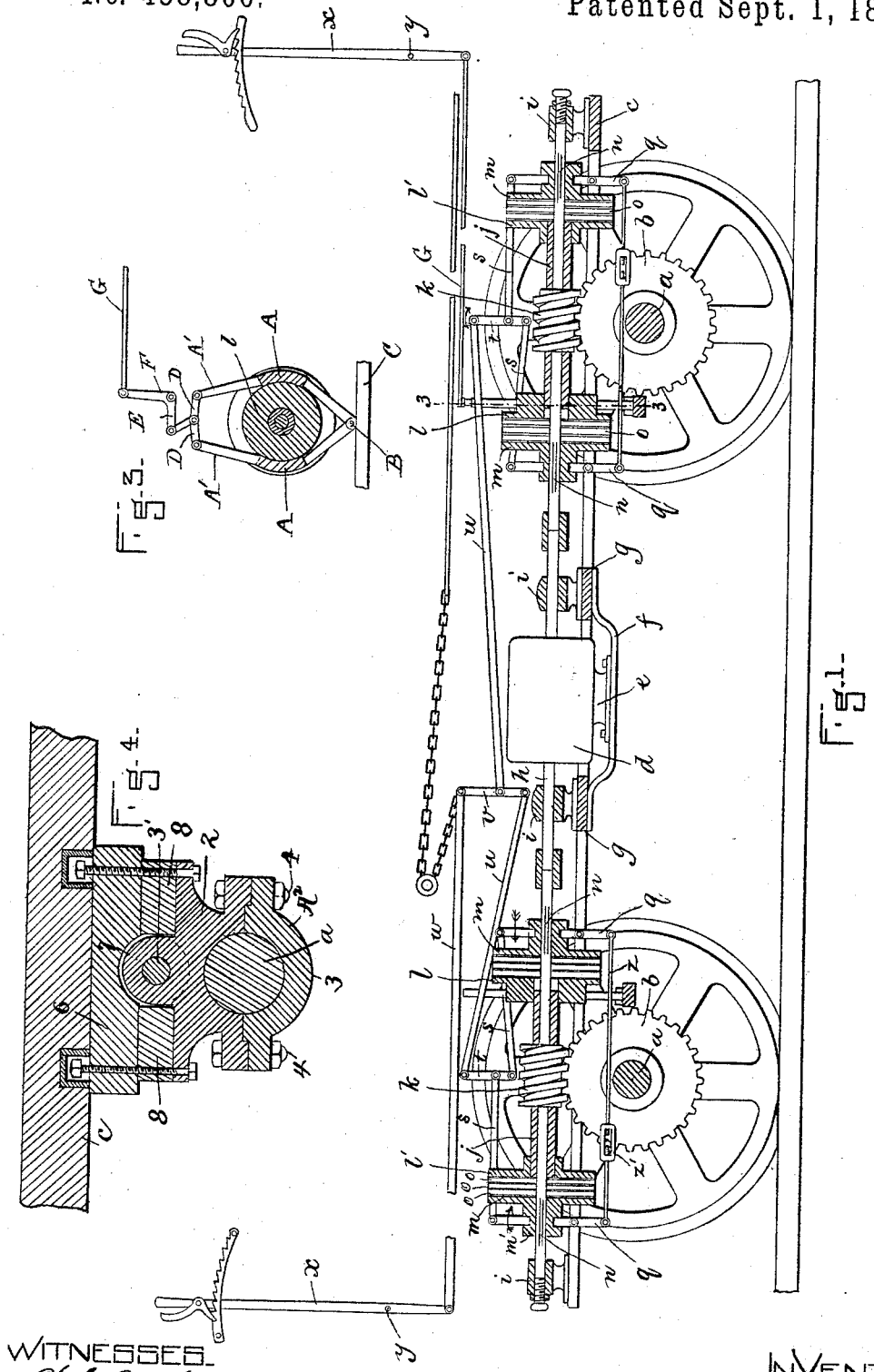

Fig. 1.

Fig. 3.

Fig. 4.

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(No Model.)

2 Sheets—Sheet 2.

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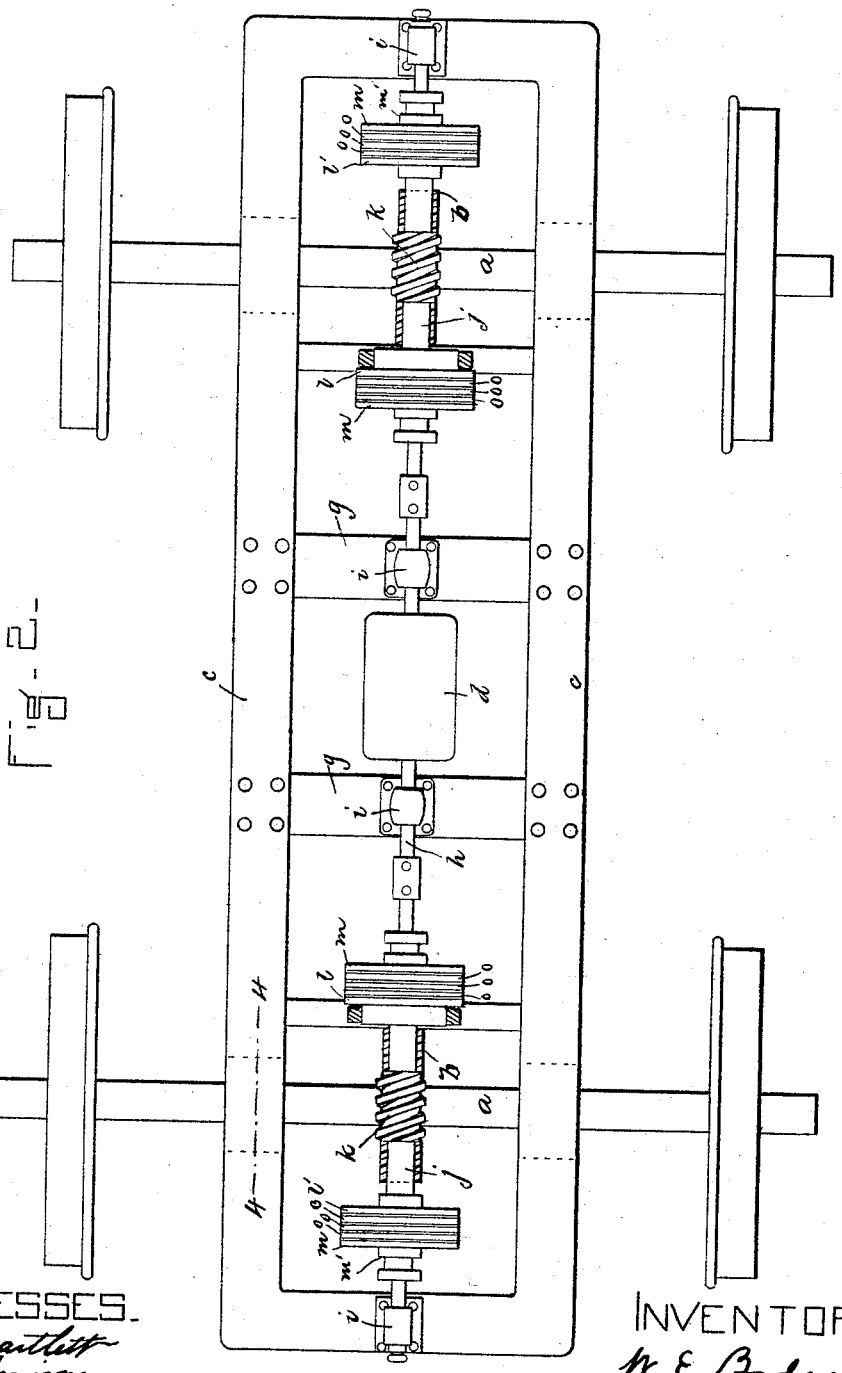

FIG. 2.

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UNITED STATES PATENT OFFICE.

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ELECTRIC-CAR MECHANISM.

SPECIFICATION forming part of Letters Patent No. 458,800, dated September 1, 1891.

Application filed October 17, 1890. Serial No. 368,381. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. BADGER, of West Quincy, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Electric-Car Mechanism, of which the following is a specification.

This invention relates to electric-motor cars in which the motor and its shaft are driven continuously, the car being started and stopped by connecting its axles with and disconnecting them from the shaft driven by the motor; and it has for its object to provide simple and efficient mechanism, including a continuously-rotated motor-driven shaft and clutches adapted to operatively connect the same with and disconnect it from the axles of the car.

To this end the invention consists in the improvements which I will now proceed to describe and claim.

In the accompanying drawings, forming a part of this specification, Figure 1 represents a longitudinal section of my improved mechanism embodying my invention, taken on a plane extending lengthwise of the car, the body of the car being removed. Fig. 2 represents a top plan view of the wheels and axles, the supporting-frame resting on said axles, and the motor-shaft and clutch mechanism embodying my invention. Fig. 3 represents a section on line 3 3 of Fig. 1. Fig. 4 represents a section on line 4 4 of Fig. 2.

The same letters and numerals of reference indicate the same parts in all the figures.

In the drawings, *a a* represent the axles of a car, to which are affixed worm-gears *b b*.

c represents a frame, which is supported by boxes mounted on the axles *a a*, and which supports the body of the car through suitable springs and other well-known appliances which are not here shown, because they form no part of the present invention. Supported by said frame at a point between the axles or at any other suitable point is an electric motor of any suitable construction. I have shown in the drawings only the casing *d* of said motor and have not represented the acting portion of the motor. Any suitably-constructed motor adapted to be operated by an electric current transmitted through a conducting-wire and trolley-arm to the motor or in any other suitable way may be employed. The base *e* of the motor is here shown as bearing on a support *f*, suitably attached to the cross-bars *g g* on the frame *c*.

h represents a shaft, which is so connected to the motor as to be rotated thereby when the motor is in operation. Said shaft extends lengthwise of the car and is journaled in bearings *i*, supported by the frame *c* and cross-bars *g*.

j j represent sleeves, which are mounted loosely on the shaft *h* at points over the axles. To said sleeves are affixed worms *k k*, which engage the worm-gears *b b* on the axles *a a*. To the ends of said sleeves are rigidly affixed disks or flanges *l l'*, each sleeve having two flanges *l l'*, one at each end, said flanges being so connected to the sleeves as to rotate therewith.

m m m m represent flanges similar in diameter to the flanges *l* and *l'* and arranged both to rotate with and slide upon the shaft *h*, said flanges *m* being provided with hubs *m'*, which have grooves engaged with feathers *n* on the shaft *h*, this connection causing the flanges *m* to rotate with the shaft and at the same time permitting them to move lengthwise of the shaft. The sliding flanges *m* are located in comparatively close proximity to the flanges *l l'*, as shown in Figs. 1 and 2, each flange *m* being separated from the adjacent flange *l* or *l'* by a series of loose disks *o o o*, which may be of any desired number. Some of the disks *o* are made of a suitably-compressible material—such as rawhide or leather—and others of a suitable metal—such as steel—the metallic and the compressible disks alternating. The disks *o* are mounted to turn loosely upon the shaft *h* and constitute, with the sliding flanges *m* and the flanges *l l'*, clutch devices whereby the sleeves *j* may be either connected with or disconnected from the continuously-rotating shaft *h*. Means are provided for moving the flanges *m* toward and from the flanges *l l'*, and thereby exerting compressive force upon the interposed disks *o* and pressing the inner disk of each series against the flange *l* or *l'*, which it adjoins.

It will be seen by reference to Figs. 1 and 2 that there are two sets of the above-described clutch devices for each sleeve *j*, there being a flange *m* and a set of disks arranged

to co-operate with the flange *l* at one end of each sleeve and another flange *m* and series of disks *o* arranged to co-operate with the flange *l'* of the same sleeve. The two flanges *m m* are operated simultaneously, so that both are moved at the same time toward the two flanges *l l'* upon the application of power through the power-applying devices next described. Said power-applying devices comprise levers *q q*, which are engaged with the flanges *m m*, and a system of rods and levers *s s t u v w*, through which the levers *q q* are connected with a hand-lever *x*, which is pivoted at *y* to the platform or other suitable part of the car-body and is arranged to be operated by an attendant on the car. I prefer to employ two levers *x*, one at each end of the car, so that the clutch mechanism can be operated by an attendant from either end. The connections between said lever and the clutch mechanism may of course be variously modified; and I do not desire to limit myself to the system of rods here shown, but may employ any other system of rods and levers or other connecting devices which may be found advisable. The levers *q q* are engaged with grooves in the hubs of the flanges *m m*, and their lower ends are connected by rods *z*, which are made adjustable by means of turn-buckles *z'*.

It will be seen that the application of force exerted through the described devices in the direction required to move the levers *q q* in the direction indicated by the arrows in Fig. 1 will cause the flanges *m m* to press the disks *o o* toward the flanges *l l'*, thereby compressing said disks and causing them to exert pressure forcibly on the flanges *l l'*. A frictional connection is thus established between the flanges *m*, which are continuously rotated with the shaft *h* and the flanges *l l'*, which are secured to the loose sleeves *j*. Said frictional connection causes the flanges *l l'* and the sleeves *j* to rotate with the shaft. The loose disks *o*, interposed between said flanges, enable the described frictional connection to be a yielding one at the commencement, each disk slipping somewhat upon the surfaces upon which it bears, and thus making the starting of the rotary movement of the sleeves *j* gradual, so that there will be no liability of injury to the gears *k b* as there would be if the sleeves *j* were positively connected at the outset with the driving-shaft *h*. The yielding nature of the connection depends somewhat, of course, upon the degree of force applied to the operating-lever *x*. In case the operator desires to start the car quickly he applies considerable force to the lever *x*, so that the disks *o o* will have only a minimum slip in making connection between the flanges *m* and *l l'*. When the car is to start more slowly, the pressure applied to the lever *x* is lighter. It will also be seen that the adjustment of the sliding flanges *m m* may be such that there will be a continuous slip of the disks *o* upon each other and upon the flanges *l l'*, the extent of the continuous slip depending upon the adjustment of the lever *x*. The speed of the car is therefore adapted to be varied, it being at the maximum point when the lever is adjusted, so that there will be practically no slip of the disks, and at the minimum when the lever is adjusted, so as to permit the utmost freedom of slipping motion of the disks consistent with the transmission of any rotary motion to the flanges *l l'*. It will be observed that when flanges *m m* are moved away from the flanges *l l'* to disconnect the sleeves *j* from the driving-shaft the said sleeves will rotate idly until their momentum and that of the car is checked.

To provide for an immediate stoppage of the rotation of the sleeves *j* and of the motion of the car, I provide each sleeve with a brake mechanism whereby its rotation may be quickly stopped. I have shown as the brake mechanism two brake-shoes A A, arranged at opposite sides of the flanges *l l* and adapted to bear on the peripheries of said flanges, the latter being made wider than the flanges *l' l'* to afford seats or bearings for said brake-shoes. The brake-shoes are connected to or form parts of levers A' A', which are pivoted at B to fixed bars C, rigidly attached to the supporting-frame *c*. The upper ends of the levers A' A' are connected by links D D with a bell-crank lever E, which is pivoted at F to a suitable support, and is connected by a rod G with a hand-lever adapted to be operated by an attendant on the car. A movement of the lever in one direction causes the bell-crank lever E to move the levers A' A' inwardly, and thus press the shoes A A against the flanges *l l*. Any other suitable brake mechanism or devices may be used for this purpose.

It will be observed that the combination of the sleeves adapted to be operatively connected with and made loose upon a motor-driven shaft and geared to the axles of a car, with devices controlled by an attendant, whereby the rotation of said sleeves, when they are disconnected from the motor, may be stopped, constitutes a new and effective mechanism for quickly stopping the motion of the car, the loose sleeves being adapted to be rigidly held or prevented from rotating by the brake devices, and to lock the axles through the gearing connecting the sleeves with the axles, the mechanical principle involved being such that the operator can without difficulty immediately set or lock the wheels and axles of the car, if desired.

While I have described the preferred construction of the clutches whereby the gear-carrying sleeves are connected with and disconnected from the motor-driven shaft, I do not limit myself to said construction, but may use any suitable clutch devices which will permit of the connection of the said sleeves with and their disconnection from the motor-shaft by power applied by an attendant.

I prefer in all cases, however, to use two clutches for each sleeve, each composed of a member affixed to the sleeve and a member movable toward and from the sleeve, the two movable members moving in opposite directions, so that in applying the power that brings said members into operative connection there will be no end-thrust in either direction in the parts that support the clutches, the pressure of each movable member in one direction being neutralized as to end-thrust by the pressure of the other movable member in the opposite direction. The frame-pieces *c*, running lengthwise of the car and rigidly attached to the upper parts of the boxes or bearings which are mounted on the axles *a a*, would, in the event of any lateral movement of the axles caused by inequalities of the road-bed, sudden stoppages, or action in making curves with the play of boxes on the axles, be subjected to a motion on each end which would tend to raise or depress the center or other portions of frame, and therefore the shaft with its sleeves and bearings and so throw the whole out of alignment. To guard against and obviate this tendency, I arrange on each end of one axle a box A^2 of the construction shown in Fig. 4, said box being composed of three parts—viz., the cap 3, secured by bolts 4 4 to the body 2 of the box, which body has an upwardly-projecting ear 7 on its upper side at the center portion connected by a pivot 3′, with similar downwardly-projecting ears on the third part 6 of the box, said ears and pivot constituting a hinge-joint. On each side of said joint are placed rubber cushions 8 8 or other suitable springs to keep the whole box A normally in a parallel position with the frame, to which the third or upper part 6 of box is bolted or rigidly attached in any suitable manner. The bolts shown permit a swinging motion of the lower part of box sufficient for the purpose intended. Thus it will be seen that when the axles have a tendency to move laterally either toward or from each other the springs will yield enough to allow the motion without altering the position of the frame or inducing any strain thereon. At any time the motion would be but slight.

The described hinged or laterally-movable boxes will be required only on one axle, and the boxes of the other axle may be rigidly attached to the frame *c*.

I claim—

1. The combination of a motor-driven shaft, a sleeve loosely mounted on said shaft and geared to an axle, two clutches, each composd of a member attached to said sleeve and another member which is adapted to slide on the shaft and rotatively engaged therewith, and means for moving the said movable members simultaneously in opposite directions toward and from the members on the sleeves, whereby the connection of the sleeve with the motor-driven shaft may be effected without end-thrust on the supports of the clutches, as set forth.

2. The combination of a motor-driven shaft, a sleeve loosely mounted on said shaft and geared to an axle, clutch mechanism whereby said sleeve may be connected with and disconnected from the shaft, and a brake mechanism whereby the rotation of the sleeve may be arrested when the sleeve is disconnected from the shaft, as set forth.

3. The combination of a motor-driven shaft, a sleeve loosely mounted on said shaft and geared to an axle, a flange rigidly affixed to said sleeve, a flange adapted to slide on the shaft and rotatively engaged therewith, a series of disks or plates loosely mounted on the shaft between the two flanges, and means for forcing the sliding flange on the shaft toward the flange on the sleeve and thereby compressing the intermediate loose disks or plates and establishing a frictional connection between the shaft and sleeve, as set forth.

4. The combination of a motor-driven shaft, a sleeve loosely mounted on said shaft and geared to an axle, said sleeve having two flanges, one at each end, two movable flanges adapted to slide on the shaft and rotatively engaged therewith, two series of disks or plates loosely mounted on the shaft between the said flanges, and means for moving the said sliding flanges simultaneously in opposite directions toward the flanges on the sleeve, substantially as and for the purpose specified.

5. The combination of a motor-driven shaft, a sleeve loosely mounted on said shaft and geared to an axle, two clutch members on said sleeve, two movable clutch members adapted to slide on the shaft and rotatively engaged therewith, the levers *q q*, engaged with said movable members, a hand-lever, and connections between said hand-lever and the levers *q q*, whereby a movement of the hand-lever is caused to move the levers *q q* and the clutch members connected therewith simultaneously in opposite directions, as set forth.

6. The motor-driven shaft, the movable clutch members rotatively engaged with and adapted to slide on said shaft, the sleeve loosely mounted on the shaft between said movable members and provided at its ends with clutch members having no endwise movement, the levers *q q*, engaged with the sliding clutch members, the rod *z*, connecting said levers at their lower ends, and means for applying power to the opposite ends of said levers, all combined substantially as set forth.

7. The combination of the motor-driven shaft, the sliding flanges engaged therewith, the loose sleeve between said flanges provided at its ends with flanges having no endwise movement, the loose disks or plates between the flanges, means for forcing the sliding flanges toward and from the flanges on the sleeve to engage the latter with and disengage it from the shaft, and a brake and mechanism to operate it, whereby the rotation of the

sleeve may be stopped after its disengagement from the shaft, as set forth.

8. The combination of the motor-driven shaft, the sliding clutch members engaged therewith, the loose sleeve between said movable chambers provided at its ends with clutch members having no endwise movement, means for forcing the sliding clutch members toward and from the clutch members on the sleeve to engage the latter with and disengage it from the shaft, the brake-shoes arranged to bear on a flange on the sleeve, a hand-lever, and connections between said hand-lever and the brake-shoes, whereby the latter may be operated to arrest the rotation of the sleeve, as set forth.

9. The combination, with the supporting-frame *c* and the axles *a a*, of boxes for one of said axles, connected to said frame by hinge-joints arranged to permit a lateral motion of said axle, and yielding cushions or springs arranged to yieldingly hold said hinged boxes in their normal position, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 14th day of October, A. D. 1890.

WILLIAM E. BADGER.

Witnesses:
C. F. BROWN,
A. D. HARRISON.