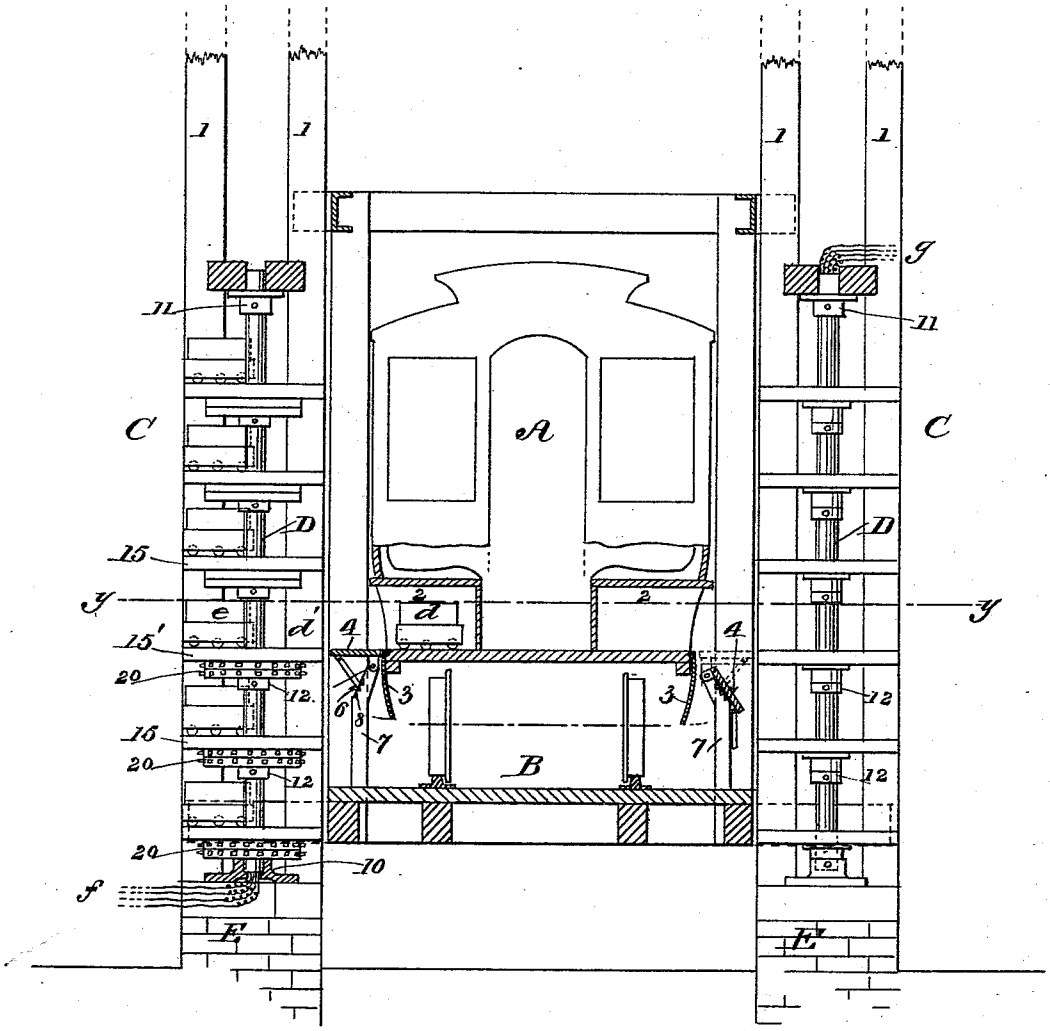
(No Model.) 3 Sheets—Sheet 1.

F. G. CORNING.

APPARATUS FOR TRANSFERRING ELECTRIC CAR BATTERIES.

No. 439,237. Patented Oct. 28, 1890.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

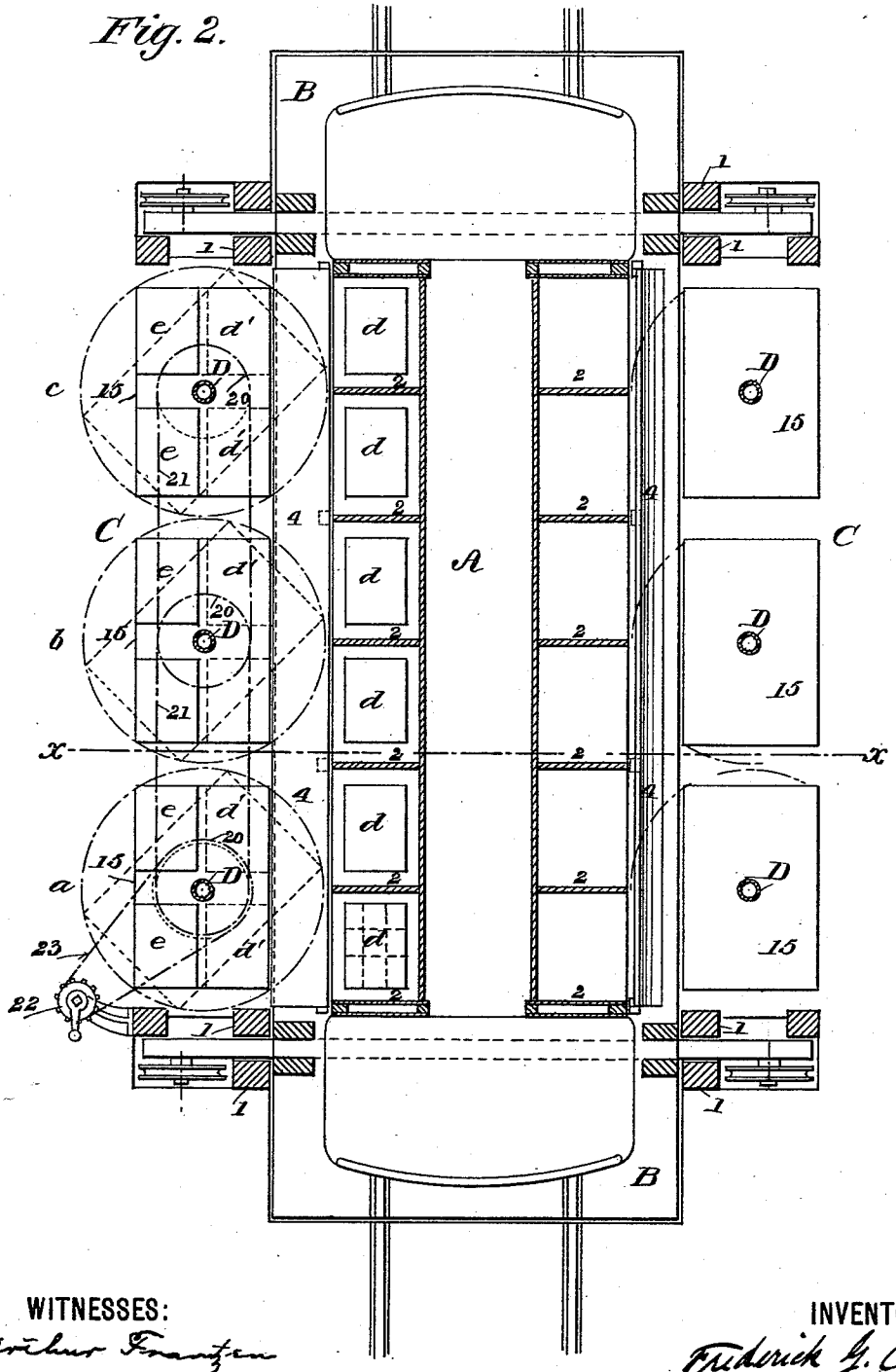

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Fig. 3

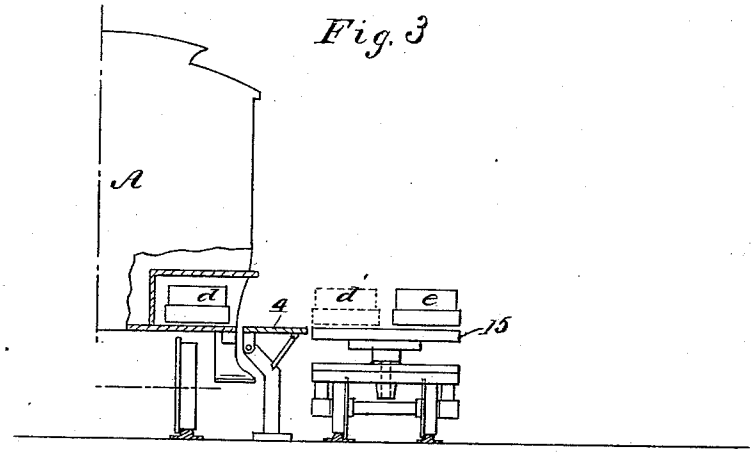


Fig. 4

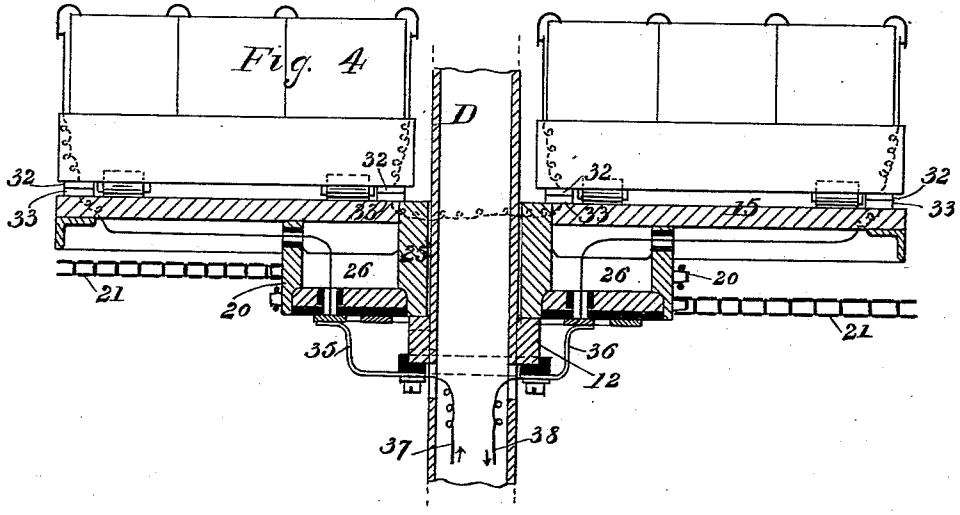
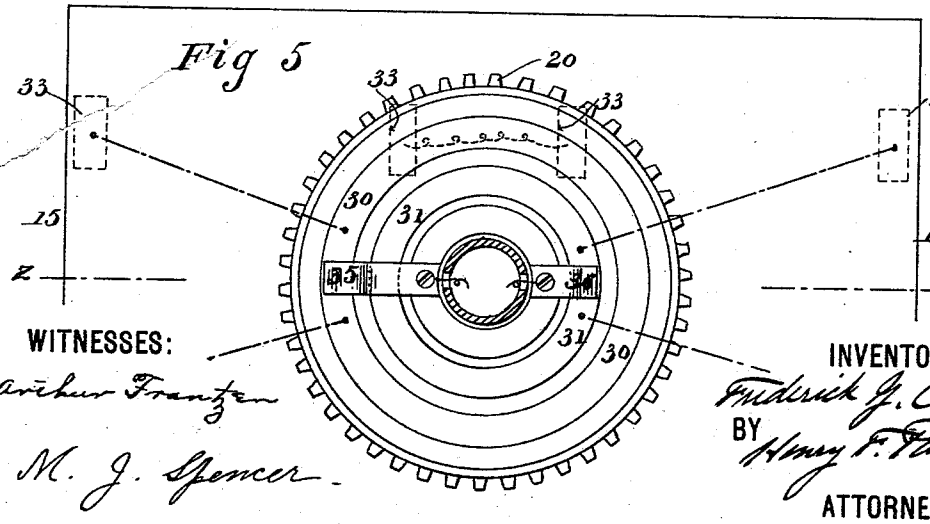


Fig 5



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UNITED STATES PATENT OFFICE.

FREDERICK G. CORNING, OF NEW YORK, N. Y.

APPARATUS FOR TRANSFERRING ELECTRIC-CAR BATTERIES.

SPECIFICATION forming part of Letters Patent No. 439,237, dated October 28, 1890.

Application filed August 5, 1890. Serial No. 361,102. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK G. CORNING, a citizen of the United States, residing at the city, county, and State of New York, have invented certain new and useful Improvements in Apparatus for Transferring Electric-Car Batteries, of which the following is a specification, reference being had to the accompanying drawings, in which similar characters of reference indicate corresponding parts, and in which—

Figure 1 is a cross-sectional elevation taken on the line *x x* of Fig. 2, showing a car, an elevator therefor, and my improved battery charging or shifting benches flanking the stall in which the car is moved at the charging-station. Fig. 2 is a horizontal section of Fig. 1, taken on the line *y y*. Fig. 3 is a diagram showing a modified application of my invention. Fig. 4 is an enlarged sectional detail-view of one rotary section of the charging-benches, taken on the line *z z* of Fig. 5; and Fig. 5, a partial inverted plan view of Fig. 4.

My invention relates to improvements in apparatus of the character described in my patent applications, Serial No. 352,638 and No. 353,272, in which secondary batteries or "accumulators" pertaining to an electro-motive car are charged upon shelves or benches located in proximity to the position occupied by the car when run into the stall, and are shifted directly from the bench to the car, or vice versa, the car being elevated to different levels coincident with those of the said benches.

My invention is also applicable to apparatus wherein an interposed battery-hoist is employed between the car and the charging-racks to bring the batteries to the level of the car, the latter being vertically stationary.

My invention may furthermore be applied to apparatus wherein the car is vertically stationary, and there is but one level or bench whereon the batteries are charged.

My invention is more especially applicable to charging the batteries in double series, as illustrated in my said patent application, Serial No. 353,272; and the object of my invention is to facilitate bringing the gang of batteries in the side of such double shelf farthermost from the car into a position adjacent the car, when both sides of said shelves are filled, the substitution of batteries being thereby effected without change of level of the surfaces to or from which they are transferred.

To this end my invention consists in a sectional charging-bench, the several sections whereof are rotary upon vertical axes, whereby to reverse the positions of the battery-trays, as hereinafter described.

My invention also consists in the assemblage of a vertical series of such rotary sectional battery-benches, each series of sections composing a bench being independently reversible.

My invention also consists in mechanism for automatically rotating the several sections of a bench simultaneously in a common direction. A single rotary battery-stand is comprehended within the meaning of my invention, irrespective of any particular mode of assembling a plurality of the same.

My invention also consists in certain auxiliary features of construction in the apparatus and means of effecting the electrical connections, to be hereinafter described in detail.

In Figs. 1 and 2, A represents the car; B, the car-elevator moving upon vertical ways 1 1, and C the sectional battery-rack. 2 2 represent the battery-receptacles in the sides of the car; 3 3, the removable exterior panels for said receptacles hinged to the bed-sills of the car, the same being shown in their open position in the drawings, and 4 4 represent transferring-bridges between the car and the battery-benches, which bridges are hinged at 5 and supported by means of braces 6 upon the standard 7, attached to the elevator, whereby said bridges are dropped or swung down in order to clear the sections of the battery-benches when rotated. The braces 6 are adjustable in notches 8 upon the standards 7, whereby to vary the vertical position of the outer edge of the bridges 4 nearmost the battery-benches and accommodate any slight variation between the levels of the car-floor and the battery-bench opposite which the car is moved.

D represents vertical pillars, which are fixed in the steps 10 upon the foundations E, supporting the racks, and in the collars 11 on the

supporting frame-work of the superstructure. The pillars D are themselves non-rotative and bear collars 12. The shelves 15 are rotative upon the pillars, whereby to be moved independently of one another, and the weight of each shelf-section is supported by the said collars 12. I prefer to construct the pillars D of wrought-iron tubing, whereby to pass the electrical connections through them, as hereinafter described.

The bench-sections may be rotated severally by hand; but in order to economize time I prefer to swing the sections of a given level simultaneously. In order to accomplish this, I may employ any suitable or well-known mechanical device. That which I illustrate consists in sprocket-wheels 20, attached to each rotary section, and sprocket-chain belts 21 engaging with them.

In Fig. 2 I illustrate a small sprocket-wheel 22, rotated by a suitable crank or otherwise, belted by a chain 23 to one of the main sprocket-wheels 20, whereby the whole series of sections *a b c* of a given bench may be rotated simultaneously from a single point by the crank. Each shelf or level is thus provided with a separate propelling-wheel 22, the operator having access to each one by an independent elevator or by an auxiliary platform extended from and attached to the main elevator B.

It will be seen by the circles indicated in broken lines in Fig. 2, that the arcs described by the corners or extremities of the trays upon the shelf-sections require the normal position of the shelf-sections to be at a distance from the side of the car, wherefore the bridges 4 are employed, as hereinbefore described.

The electrical connections for charging the batteries while in the shelves may be made in various ways. Among others, I may employ the hollow pillars D as conduits for the wires, as more fully illustrated in Figs. 4 and 5. The wires for charging each rotary section or stand on a given pillar are passed into the pillar through its lower end, as at *f* in Fig. 1, or through its upper end, as at *g*. The stand illustrated in Figs. 4 and 5 consists of a rotary platform 15, a rim 20 supporting it and composing the sprocket-wheels before referred to, said rim being attached to the hub 25 by spokes 26, and the hub resting on the collar 12, secured to the pillar D. On the under surface of the sprocket-wheel disk there are circular conductors 30 31, insulated from one another and from the disk. The opposite poles of the batteries are connected through contacts 32 on the trays and 33 on the stand, when the trays are moved on the stand and connected with the respective circular conductors 30 31, as indicated. Through openings in the hollow pillar D the insulated wires therein connect with contacts or brushes 35 36, secured to and insulated from the collar 12, which brushes, respectively, bear on the said conductors 30 31. The wires 37 38, after passing out of the pillar, connect with corresponding wires of each adjacent pillar, the different bench-levels having independent circuits connected with a suitable generator. When a gang of batteries are shifted in place on either side of the sections of a bench, the circuit is closed automatically and continued so irrespective of the rotative position of the stands.

The operation of my invention is as follows: The car is first run into the stall upon the elevator B, the panels 3 having been opened previously. The car is then vertically moved by means of the elevator to a level in which its floor coincides horizontally with a battery-shelf to be operated on, one side of the shelf-section being vacant, as indicated in the instance of the shelf 15′ in Fig. 1. Such vacant side being opposite the car, and the bridge 4 raised to the level of said shelf, the exhausted battery *d* is shifted by hand or otherwise to occupy the position *d′*. The series *a b c* of sections of the bench 15′ are then reversed by rotation, the bridge 4 being swung down to clear them. The charged gang of batteries *e*, being thereby brought opposite the car, are then moved therein to take the place of the original gang of batteries *d*. The same operation is simultaneously performed on the opposite side of the car by operators suitably stationed. The rotary bench-sections may be applied to a transferring or charging truck, as illustrated in Fig. 3, showing the truck in end view. The quick substitution of batteries is effected without requiring a substitution of trucks during each operation. At the position shown the exhausted battery *d* in the car is first moved to *d′*, the bridge 4 then dropped, the bench-sections 15 on the truck rotated a half-turn, the bridge 4 then raised, and the charged batteries moved to the car.

As a merit of my present invention it will be seen that the reversible stands, as operated in the manner described with reference to Figs. 1 and 2, dispense with the necessity of moving the car twice from one level to another, as is necessitated in the instance of my aforesaid patent application, Serial No. 352,638, and also dispenses with the necessity of employing movable panels for the battery-receptacles in the car, as described in my aforesaid patent application, Serial No. 353,272, the car being elevated from the normal or street level to the desired level of charging-benches, the substitution of batteries effected at one level, and said car returned directly to said normal level and removed from the stall.

It is to be understood, however, that the present invention is applicable to double shelves, wherein both sides are always filled, (with the exception of one vacant half-shelf in the series,) the object then sought being to economize vertical space, as mentioned in my said application, Serial No. 353,272, the car being stopped at two different levels.

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

1. The combination, in a battery-transferring apparatus, with a horizontal surface or way upon which the batteries are moved, of a revolving bench at a level with said surface upon which the batteries are received and their positions reversed with reference to a given direction of travel, substantially as and for the purpose described.

2. The combination, in a battery-transferring apparatus, with a horizontal surface or way upon which the batteries are moved, of a bench composed of a series of revolving sections adapted to receive two gangs of batteries and to reverse the positions thereof with reference to a given direction of travel by the half-rotation of said sections upon their several axes.

3. In an apparatus for transferring electric-car batteries, the combination of a vertically-movable car-hoist or battery-hoist, of several benches composed of revolving sections assembled in vertical series or different levels, each thereof adapted to receive two gangs of batteries and reverse the positions of the same with reference to the car or hoist, for the purpose described.

4. In an apparatus for transferring and recharging electric-car batteries, the combination, with a charging-bench composed of rotary sections, of electrical conductors in each section connective to the opposite poles of the batteries when received thereon and connected to the opposite poles of a generator irrespective of the rotative position of said sections.

5. In an apparatus for transferring and recharging electric-car batteries, the combination of a car-hoist or battery-hoist, of several charging-benches assembled in vertical series or at different levels composed of rotary sections and electrical conductors in each section connective to the opposits poles of the batteries when received thereon and connected to the opposite poles of a generator irrespective of the rotative position of said sections.

6. The herein-described rack for recharging secondary batteries, consisting in several benches composed of rotary sections ranged in vertical series and vertical pillars or shafts supporting the rotary sections forming their axes of rotation.

7. The herein-described rack for recharging secondary batteries, consisting in several benches composed of rotary sections ranged in vertical series and vertical pillars or shafts supporting the said bench-sections forming axes of rotation upon which they are independently movable.

8. The combination, in a reversible battery-receiving bench, of several sections thereof revolving in horizontal planes and mechanism for connecting the same and rotating each said section of the bench simultaneously, as herein specified.

9. The combination, with the battery-bench composed of rotary sections and a car or other receiving-surface whereon the batteries are to be shifted to or from the said sections, of a removable transferring-bridge interposed between the said car or surface and the sections, for the purpose specified.

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