(No Model.)

F. O. BLACKWELL.

ELECTRIC RAILWAY MOTOR.

No. 470,817. Patented Mar. 15, 1892.

FIG. 1

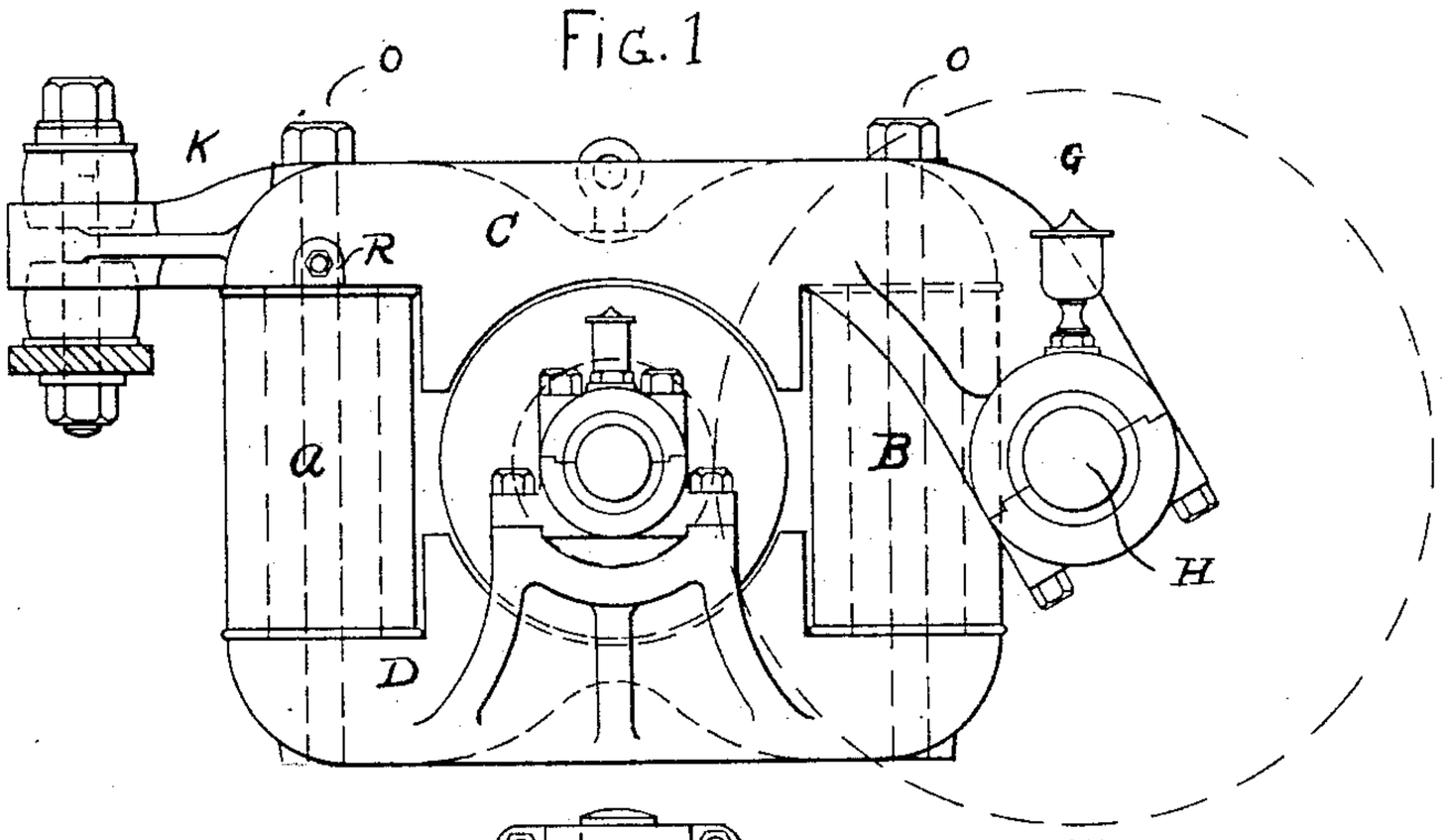
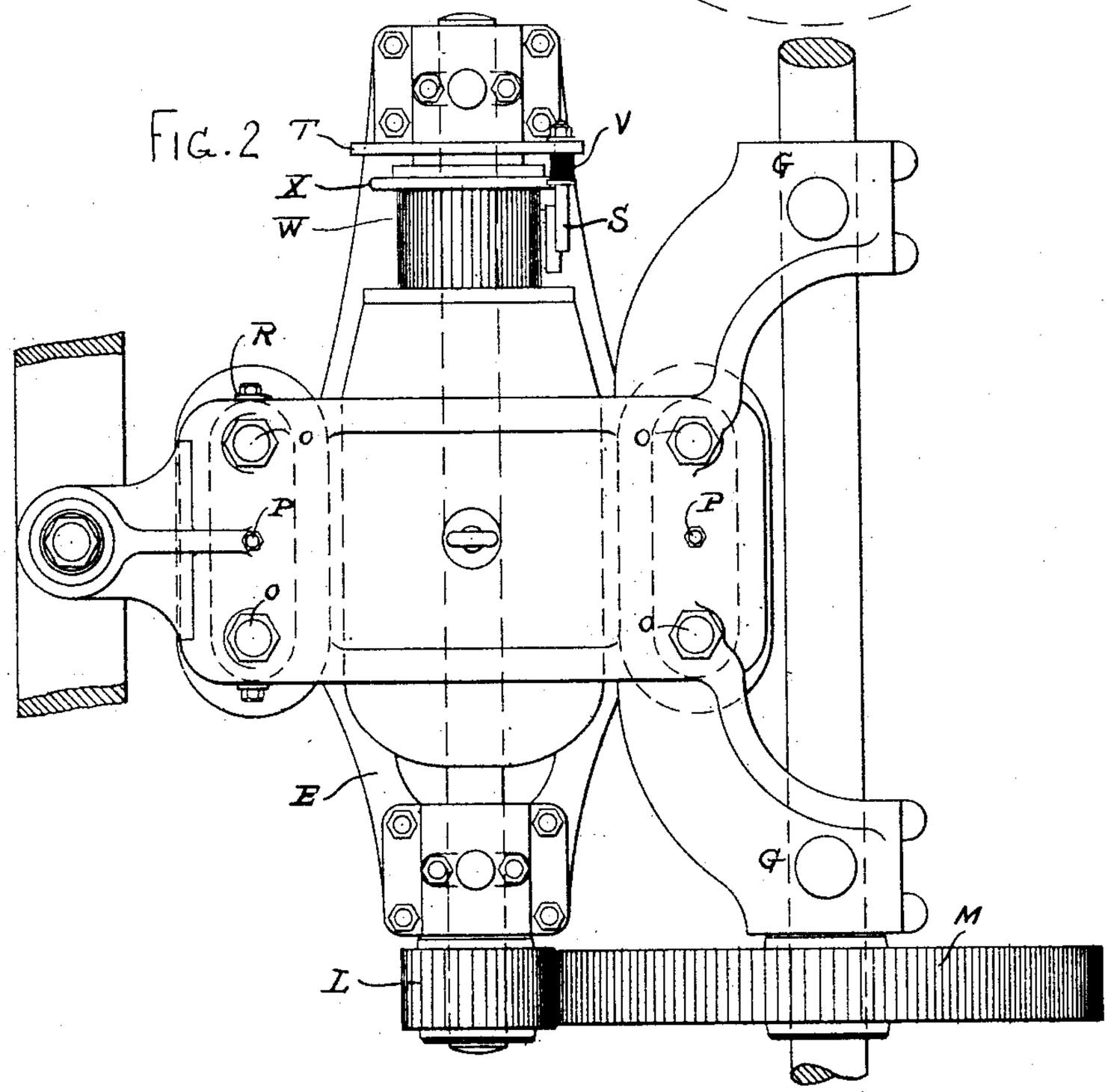


FIG. 2



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ELECTRIC-RAILWAY MOTOR.

SPECIFICATION forming part of Letters Patent No. 470,817, dated March 15, 1892.

Application filed August 31, 1889. Serial No. 322,634. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS O. BLACKWELL, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Railway-Motors, of which the following is a specification.

My invention relates to electric motors, which have a special adaptation to the requirements of railway-work. In the disposition of motors previously employed for electric railways it has been customary to employ a counter-shaft and an intermediate set of gearing between the armature and the axle, and it has been extremely difficult to design a motor that with the ordinary proportions of street-railway vehicles would have sufficient power to operate a vehicle without an intermediate shaft. This necessitates not only extraordinary wear upon the gears, but also an armature speed which is very detrimental to the durability of the machine.

My invention consists in a motor which may be journaled directly upon the axle of a vehicle between the wheels and gear without the intervention of a counter-shaft and which will at the same time have sufficient torque to propel the vehicle under all circumstances.

It further consists in certain details of construction which enable it to be readily taken apart and which insure a substantial addition to the permanence of the motor.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation, and Fig. 2 a plan, of my motor.

It will be seen that the motor is provided with field-magnets having their cores and coils vertically disposed perpendicular to the axis of the armature and placed adjacent to it. By the latter expression I mean that the wound portions of the field-magnets are close to the side of the armature and do not extend away from it, as in the form of motor usually employed in this situation. This permits bringing the armature sufficiently close to the axle to render feasible the use of only a single set of reduction-gears, and at the same time brings the coil or coils between the top and bottom pole-pieces, where they are protected from wear and moisture.

In the example shown I have illustrated a machine which has two magnet-coils; but it will be readily understood that in many circumstances one of the coils may be dispensed with and the necessary magnetism obtained from the remaining one. A and B represent these two cores and coils. C is the upper pole-piece, and D the lower one. Upon the lower pole-piece D is a horizontal extension E at each end for supporting the armature-bearings. These extensions E may be of brass; but in the instance shown they are cast integral with the pole-piece, and an intermediate block F is used under each bearing. By this means none of the magnetism will be short-circuited through the armature. The upper pole-piece C has at one end two extensions G, which come down and rest upon the axle H, and at the other end a supporting-extension K, which may be upheld from the framing of the truck or from the car-body in any well-known manner. L is the armature-pinion, and M is a gear on the axle engaging with it. On either end of the armature is a washer and nut for limiting the end-play.

For removing the armature it will not be necessary to unhang the motor, but simply to unscrew the main bolts O from above, when the lower pole-piece D will drop, carrying the armature with it. The cores of the field-magnets will still be upheld by means of small screws P, and the magnet-spools will be upheld by lugs R, through which a screw passes into pole-piece C. The armature-brushes are supported upon studs S, which pass through a flange T, extending from the cap of the bearing. In this type of motor there is no waste metal in the yoke, so that a motor with a much larger field-magnet and a correspondingly-greater torque may be employed within the same compass as the present style of motor, which is usually so small as to require a counter-shaft and high armature speed. In this form, moreover, the bearings are all rendered accessible and the armature and other parts are easily detachable, since the main support of the motor is from points above the armature and its standards. The armature

and the magnet-coils A and B are, moreover, placed in positions much less exposed to the mud and water of the streets, only the pole-piece D, which cannot be injured, being thus exposed. The studs S, carrying the commutator-brushes, are insulated from flange T by wide washers V, of fiber or hard rubber, and on the end of the armature between the commutator-bars W and metallic cap Y is a wide flange X, of fiber or similar insulating material, which prevents an arc from passing under any circumstances between the commutator and the cap Y.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a driven axle of a vehicle, of an electric motor journaled thereon, having its field coil and core arranged vertically between the armature and axle, as set forth.

2. The combination, with a driven axle of a vehicle, of an electric motor at one side thereof and geared directly thereto, having pole-pieces above and below the armature, and field-magnet coils between the said pole-pieces and protected thereby.

3. The combination, with a driven axle of a vehicle, of an electric motor at one side thereof and geared directly thereto by a single set of reduction-gearing, the said motor having its pole-pieces above and below the armature, and intermediate field-magnet coils protected thereby and divided on a horizontal line, one part being supported on the car-axle and the other carrying the armature-bearings.

4. The combination, with a vehicle, of an electric motor journaled on the axle having top and bottom pole-pieces, a field coil and core arranged vertically between the pole-pieces, and a single set of reduction-gears between armature and axle.

5. The combination of a driven axle of a vehicle with a motor between the wheels, having armature parallel with the axle and geared thereto by a single set of reduction-gears, its field-coil vertically disposed between armature and axle, and a pole-piece having a bearing on the axle, as set forth.

6. The combination, with a driven axle of a vehicle, of a motor having top and bottom pole-pieces, an armature supported by an extension from the pole-piece, a vertically-disposed field coil and core between armature and axle, and a bearing on the pole-piece by which the motor is journaled on the axle.

7. The combination, with a driven axle of a vehicle, of a motor having bearings on the axle and a supplementary support holding it in position, and an independent detachable armature-support permitting the ready removal of the armature without unhanging the motor from the truck.

8. The combination, with an axle of the vehicle, of a propelling-motor supported near the axle and geared thereto and having its armature supported in bearings from the lower pole-piece, and means for removing or dropping down the said pole-piece without unhanging the motor from the truck, whereby the armature may be taken out from beneath.

9. The combination, with an electrically-propelled vehicle, of a motor having top and bottom pole-pieces, the former provided with bearings hanging the motor on the truck and the latter with bearings for the armature, and means for readily detaching the bottom pole-piece from the remainder of the motor.

10. The combination, with an electrically-propelled vehicle, of a motor having a horizontally-arranged armature, top and bottom pole-pieces, two vertical field-magnet cores and coils between the pole-pieces, and a single set of reduction-gears between motor and axle.

11. The combination, with a driven axle, of a motor geared thereto, having its armature supported from one pole-piece and the motor itself supported from the opposite pole-piece.

12. The combination, with a driven axle of a vehicle, of a propelling-motor beneath it journaled and geared to the axle, having a pole-piece or other unwound portion next the street-surface and beneath its coils or wound portion, whereby the latter are protected, as set forth.

13. The combination, with a commutator of an electric motor, of a brush and a support therefor attached rigidly to a flange on the cap of the bearing.

14. The combination, with an electric motor geared to the axle of the vehicle, of a vertically-disposed field-core attached to the upper pole-piece, and a readily-detachable lower pole-piece, as described.

15. The combination, in an electric-railway motor, of a vertically-disposed field core and coil A, fastened to the upper pole-piece, and a lower pole-piece detachable from said core.

16. The combination, with axle H, of a motor having its armature geared directly thereto without the intervention of a countershaft, having upper and lower pole-pieces C D, the latter supporting the armature, and an upright field coil and core A between the two pole-pieces.

17. The combination of a driven shaft or axle with a motor journaled thereon and having its armature geared thereto, a field coil or core between the armature and shaft with its axis perpendicular to the axis of the armature, and pole-pieces extending from the core around the armature.

18. The combination, with a driven axle, of a motor having an upright field coil and core between armature and axle, a bearing for the pole-piece on the axle, and a support for the opposite end of the motor.

19. An electric-railway motor having its armature mounted on suitable journal-bearings carried by a support movable downwardly away from the main portion of the

motor without disturbing the latter and provided with suitable means for attaching and detaching it at pleasure, so that the armature may be lowered from its position, leaving a greater or less portion of the field-magnet in place.

20. In an electric-railway-car motor, a bisected field-magnet frame sleeved on the car-axle, in combination with an armature mounted on said frame parallel to the car-axle and having both parts of its journal-bearing carried by a detachable portion of the frame, as and for the purpose described.

Signed and witnessed this 20th day of August, 1889.

FRANCIS O. BLACKWELL.

Witnesses:
GEORGE BAUMANN,
HUBERT HOWSON.