(No Model.)

4 Sheets—Sheet 1.

F. L. McGAHAN.

ELECTRIC MOTOR.

No. 455,110. Patented June 30, 1891.

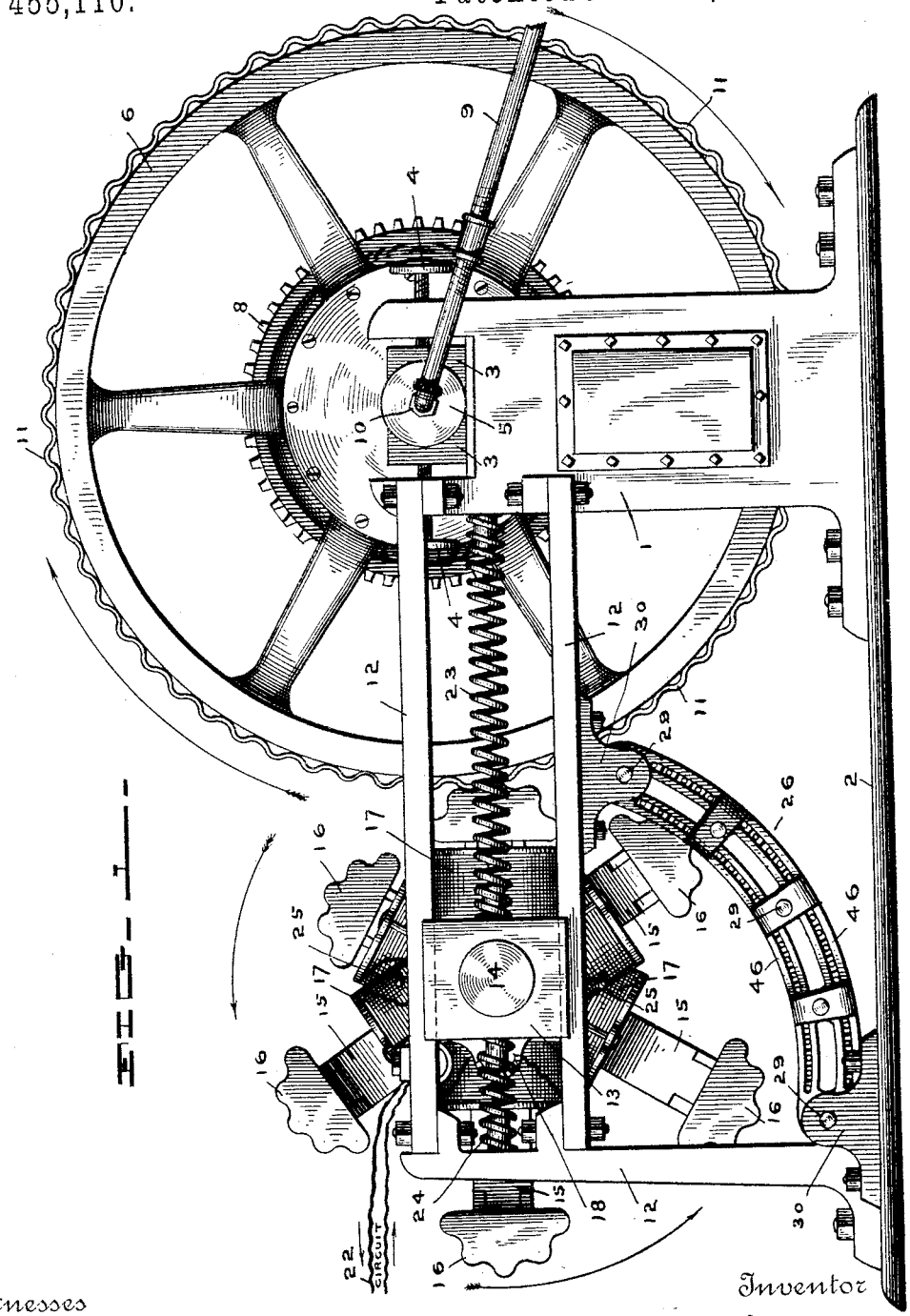

FIG. 1.

Witnesses

H. D. Healy.

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By his Attorney

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(No Model.) 4 Sheets—Sheet 2.

F. L. McGAHAN.

ELECTRIC MOTOR.

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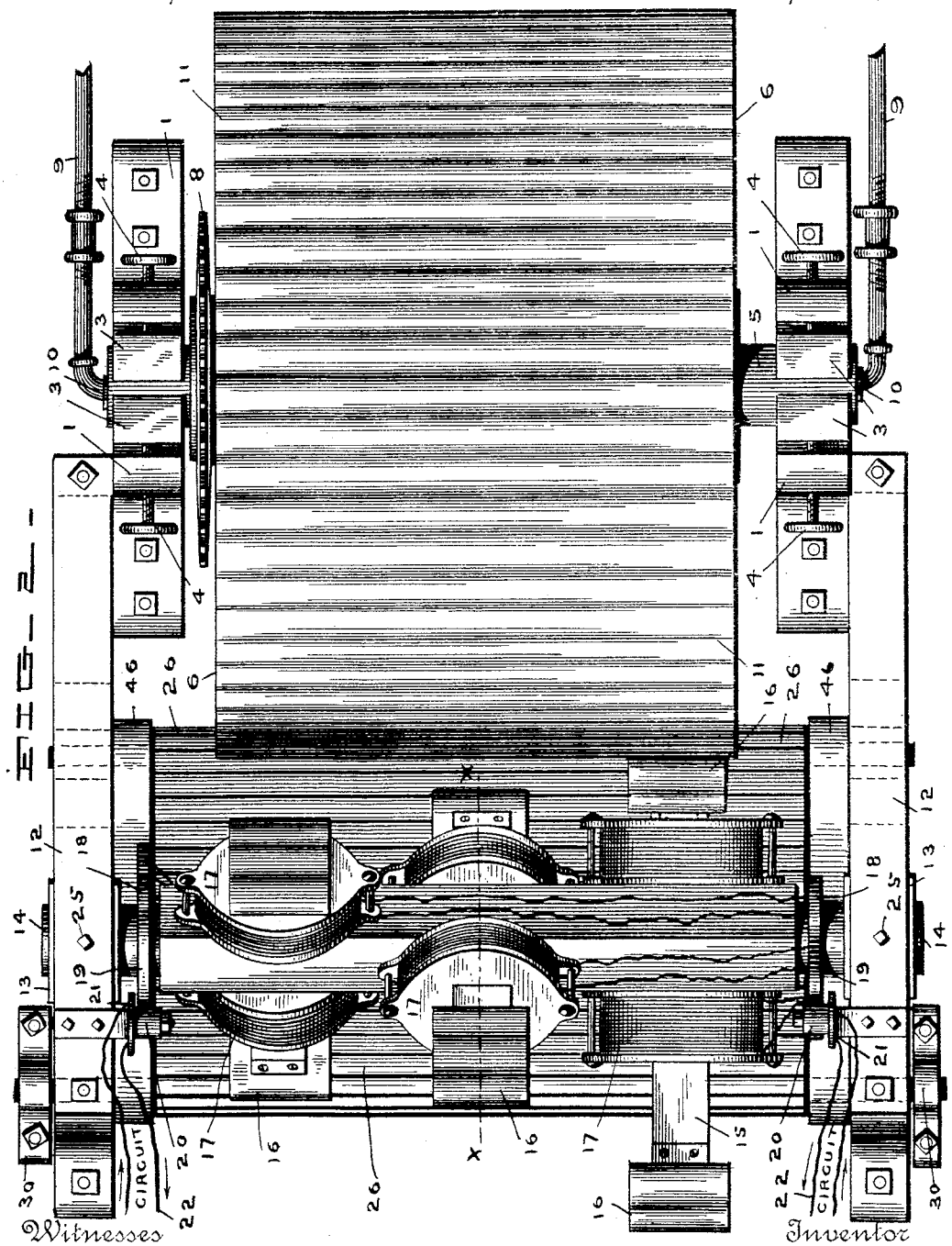

Witnesses

H. D. Healy.

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(No Model.) 4 Sheets—Sheet 3.

F. L. McGAHAN.

ELECTRIC MOTOR.

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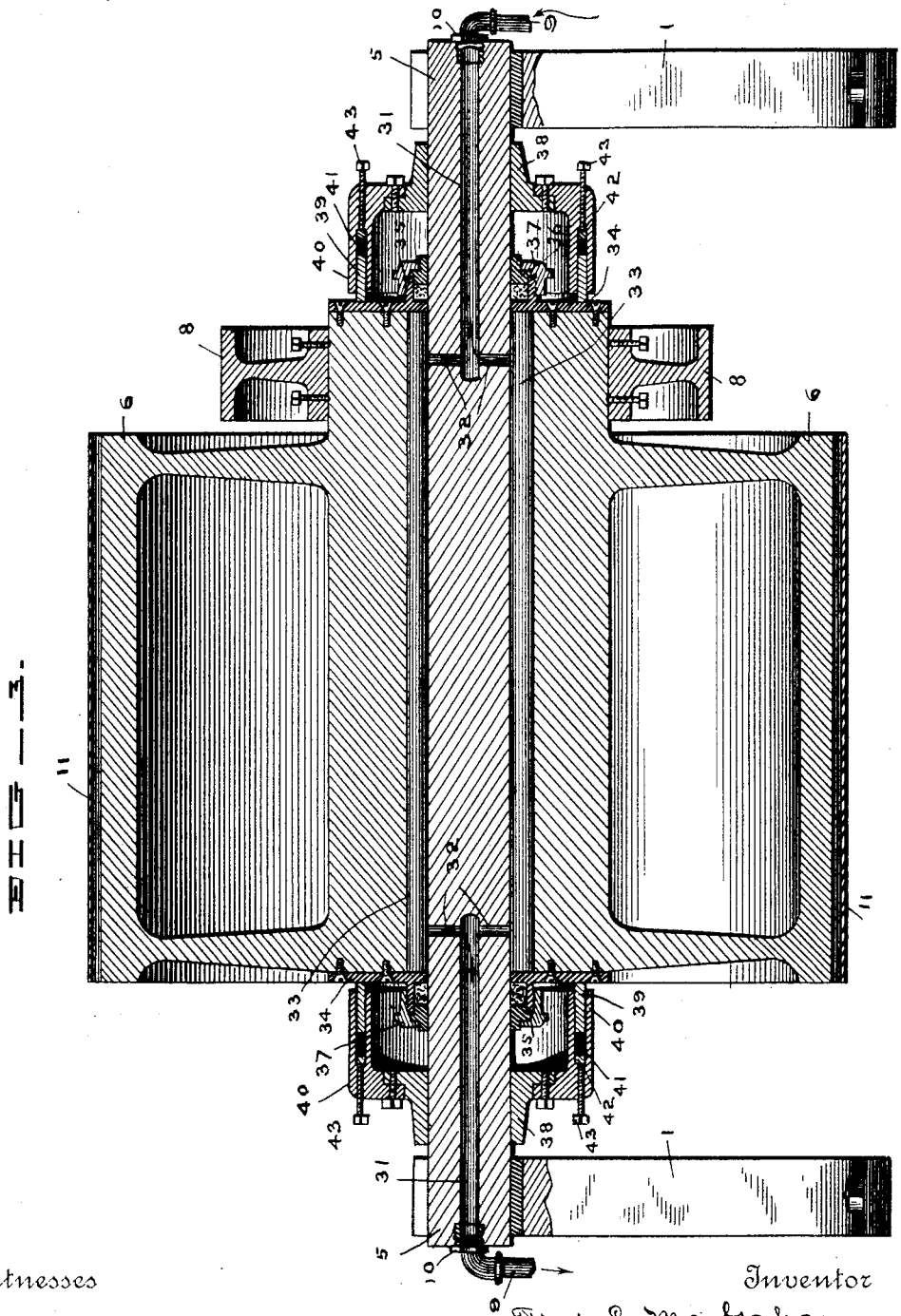

FIG. 3.

Witnesses

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(No Model.) 4 Sheets—Sheet 4.

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ELECTRIC MOTOR.

No. 455,110. Patented June 30, 1891.

FIG. 4.

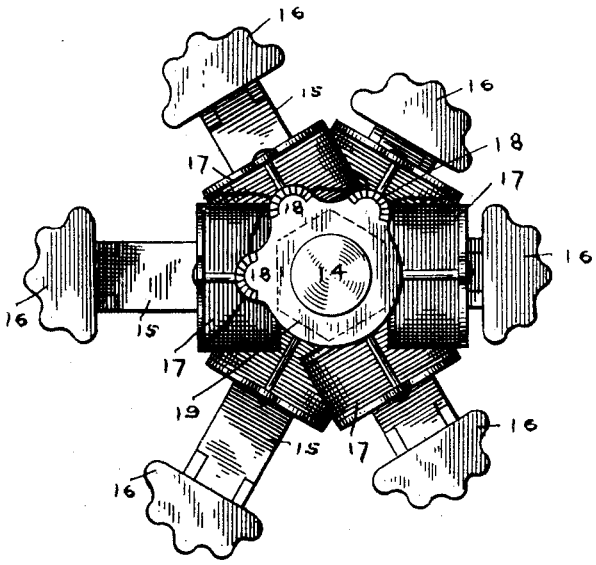


FIG. 5.

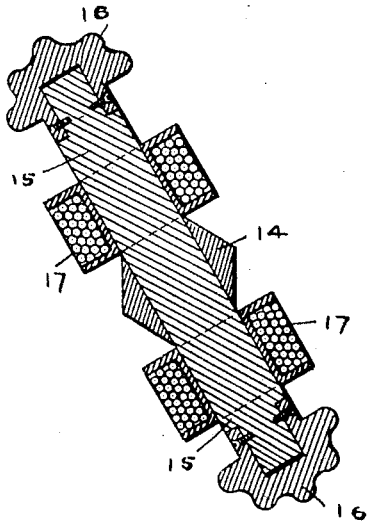


FIG. 6.

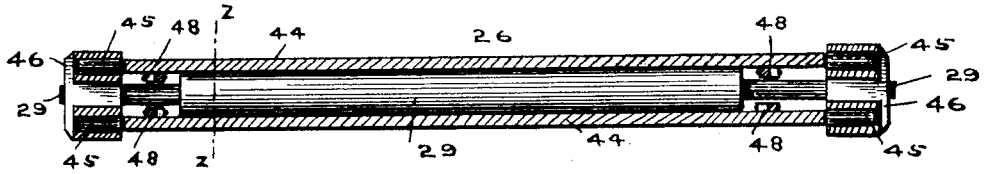


FIG. 7.

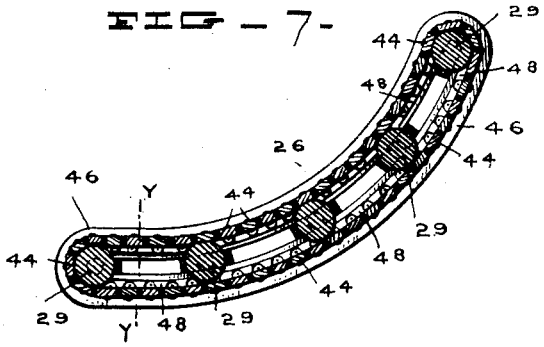
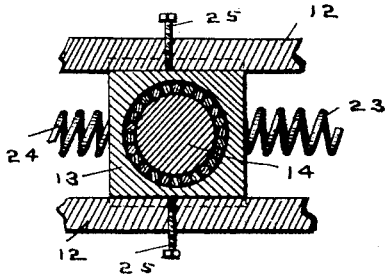


FIG. 8.



Witnesses

H. D. Healy.

C. B. Griffith.

Inventor

Fred L. McGahan

By his Attorney

C. F. Jacobs.

UNITED STATES PATENT OFFICE.

FREDERICK L. McGAHAN, OF INDIANAPOLIS, INDIANA.

ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 455,110, dated June 30, 1891.

Application filed February 16, 1891. Serial No. 381,728. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK L. McGAHAN, of Indianapolis, county of Marion, and State of Indiana, have invented certain new and useful Improvements in Electric Motors; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like figures refer to like parts.

My invention relates to the construction of electric motors; and it consists in the several parts and the combinations thereof, as hereinafter described and claimed, and will be understood from the following description.

In the drawings, Figure 1 is a side elevation of my device, the arrows indicating the movement of the mechanism. Fig. 2 is a top plan view of the same. Fig. 3 is a central longitudinal section of the main power-wheel and its hub and axle, showing a modification of the mechanism for introducing water to the bearings. Fig. 4 is a detached end view of the motor. Fig. 5 is a section through one of the motor-dogs, its coils and axle, on the line *x x*, Fig. 2. Fig. 6 is a longitudinal section through the pressure-plate on the line *y y*, Fig. 7. Fig. 7 is a cross-section on the line *z z*, Fig. 6. Fig. 8 is a cross-section through one of the boxings of the motor-axle.

In detail, 1 are frame-works supported upon a base 2, having boxings 3, which are adjustable by screws 4. 5 is the main axle rigidly held in such boxings.

6 is the main power-wheel, its hub loosely mounted on the axle 5, and 8 is a gear-wheel or driving-pulley mounted upon the hub of such wheel.

9 are water-pipes connected to screw-caps 10 at either end of the axle, the axle being centrally bored to admit the passage of water, one of these pipes being an inlet and the other an outlet pipe, the object being to keep the shaft at all times cool by the passage of the water through it.

The main power-wheel 6 has a grooved or corrugated rim 11.

12 are auxiliary frame-works secured to the base and also to the uprights of the main frames, and 13 are boxings supported upon the horizontal part of the auxiliary frame-works 12, in which is mounted an axle 14, anti-friction rolls being interposed between the axle and its boxings, the axle being cylindrical at the ends and hexagonal in its central body portion, which is provided with openings through which freely pass the dogs 15, having corrugated heads 16 for engaging with the grooved or corrugated rim of the main power-wheel. These heads are formed of any suitable non-conducting material.

17 are coils seated on the hexagonal sides of the axle 14 and inclosing the dogs 15, which serve as the cores of the coils when the current passes through the latter.

18 are commutators formed on collars 19, mounted at each end of the axle, the wires of the coils leading directly to the commutators, of which there are three on each collar, corresponding in number with the coils, each coil being connected to the commutator in line with it.

20 are brushes mounted on spindles having spring-bearings in brackets attached to the frame-work 12, held in frictional contact with the faces of each collar 21, to which are connected the main-circuit wires 22, and these brushes are adapted to come in frictional contact successively with the commutators at each end of the shaft 14 as the latter revolves.

23 are springs having bearings between the boxings 13 and the uprights of the frame. 24 are similar springs having bearings upon the other side of the boxings and the uprights of the auxiliary frames for giving an elastic backing to the boxings on either side, and 25 are set-screws, by means of which, if desired, the boxings may be horizontally locked to the supports.

26 is a pressure-plate composed of slats 44, having rollers 45 on their ends, which move in guides in curved plates 46, as the slats which are connected together at their ends by links 48 pass around the rolls 29, such rolls having bearings in the curved plates 46, the axles of the upper and lower rolls being extended, and having bearings in the adjustable brackets 30, connected beneath the horizontal part of the auxiliary frames 12 and the base 2 of the main frame below, and the tension of this pressure-plate may be increased or decreased by the adjustment of these brackets.

In Fig. 3 is shown a modified form of the mechanism for cooling the axle and hub of

the main wheel. The water-pipes are connected at each end of the axle to the screw-caps 10, but the openings 31 do not extend entirely through the axle, as in Figs. 1 and 2, but only within the line of the hub. There is a cross-opening 32, extending from the opening 31 to the outer diameter of the axle, between which and the hub are interposed a series of anti-friction rolls 33, and the water thus enters the friction-roll chamber. At either end of the hub is an annular cap 34, having a screw-threaded flange 35, which forms a stuffing-box to prevent the water from escaping from the anti-friction chamber. A collar 36 fits in this stuffing-box and is held tightly in place by a screw-cap 37. 38 are collars shrunk on the axle 5 and bolted to the grooved rings 40 by screw-bolts. In the grooves of each of the rings 40 is a Babbitt-metal ring 39, which projects beyond the face of the ring 40 and bears tightly against the outer face of the cap 34. Behind the Babbitt-metal ring is a rubber backing 41, and behind this is a metal ring 42, against which bear set-screws 43, placed in the ring 40 at suitable intervals, by means of which the wear upon the Babbitt metal may be taken up. This ring prevents any lateral movement of the main wheel on its axle and also forms an additional pressure against the cap 34. The water coming in through one of the pipes 10 passes through the opening 31 into the friction-roll chamber, where by the constant movement of the wheel it is distributed and passes out the opposite end of the axle, as indicated by arrows in Fig. 3, keeping the axle and hub at all times cool and also dispensing with the use of lubricants at those points.

The operation of my mechanism is as follows: The current from the circuit-wires 22, passing into the ring 21, and by frictional contact through the brush 20 and one of the commutators 18, thence through a coil, will at a certain point raise one of the dogs 15 to its full height. This dog having been partly raised by the pressure-plate 28, when thus drawn up will overbalance and rotate the axle 14, the opposite head of the dog contacting with the corrugated face of the main wheel, by which time the brush comes in contact with the next commutator, raising that dog in a similar manner, each dog in its upward movement being overbalanced by its opposite end coming in contact with the corrugated face of the main wheel, rotating the same. It will be seen, therefore, that the rotation of the main wheel is accomplished by the leverage and gravity of the dogs, their inner ends coming in contact with the grooved faces of such wheel, and that the office of the electric current in this mechanism is simply to thrust outward the dog through the well-known action of the current in the coil operating upon its core, so as to bring the dog into the overhanging position, where gravity will assert its force and carry the dog downward, thereby securing the leverage action of the opposite end upon the wheel to be driven. It will also be observed that there are always two of the dogs in a position to be acted upon by the force of gravity when a third is coming into position to allow its gravity to have effect. The real motive power, therefore, in this case is exerted by gravity, the electric force simply being utilized to bring the parts into position to allow gravity to become operative. The mechanism is therefore the reverse of that shown in my application filed February 11, 1891, Serial No. 381,058, wherein the force of the current is utilized to carry the dog forward to contact with the wheel, while in this case the dog is carried away from the wheel by the current.

What I claim as my invention, and desire to secure by Letters Patent, is the following:

1. In an electric motor, a wheel to be driven, loosely mounted on an axle supported in bearings upon a frame-work, the periphery of such wheel grooved or corrugated, a counter-shaft supported in bearings at one side of the wheel, two or more coils seated therein, the cores of the coils passing through such counter-shaft and provided with corrugated or grooved heads forming dogs for engaging with the grooves of the main wheel, and a suitable electric connection for thrusting the dog outward to a position where the gravity of the dog will operate as a lever to drive the main wheel, substantially as shown and described.

2. In an electric motor, a dog passing through a shaft suitably supported and through coils connected by suitable commutators and brushes with the power-circuit forming the core of such coil, such dog thrust outward by the force of the current traversing the coils into a position where its gravity operates as a lever to drive a wheel engaging with the opposite end of the dog, substantially as shown and described.

3. In an electric motor, a main frame, an axle journaled in adjustable boxings therein, a power-wheel loosely mounted on such axle, a gear-wheel or driving-pulley mounted on the hub of the power-wheel, the outer face of such wheel grooved or corrugated and engaging with one or more dogs passing through an axle suitably supported carrying two or more coils, such dogs constituting the cores thereof, such coils connected with the main circuit through contact of suitable commutators and brushes, the force of the current operating to thrust the dogs successively outward into a position where their gravity would produce a leverage upon the grooved face of the main wheel in contact with the opposite end of the dogs, in combination with a pressure-plate supported below and co-operating with the electric current for thrusting the dogs outward into an operative position, substantially as shown and described.

4. In an electric motor, the dog 15, having corrugated heads 16 at each end, in combination with the shaft 14, coils 17, seated upon

such shaft, the dog passing through both coils and shaft and operating as a core of the former, substantially as shown and described.

5. In an electric motor, the shaft 14, having collars 19 thereon, commutators 18, formed on projections of the collars, and coils 17, seated on the sides of the shaft, in combination with the dogs 15, passing through and acting as cores of the coils and the shaft and having corrugated heads 16, substantially as shown and described.

6. In an electric motor, an axle 5, supported in suitable bearings on the framework, a power-wheel 11, loosely mounted thereon and revolving on friction-pins 30, interposed between the hub of the wheel and the axle, the latter having central longitudinal bores 31, extending from each end within the line of the hub, cross-openings 32, connecting with the openings 31, and water-pipes 9, connected at each end of the axle in line with the longitudinal openings by screw-caps 10, whereby the axle is cooled and the friction-pins lubricated, substantially as shown and described.

In witness whereof I have hereunto set my hand this 11th day of February, 1891.

FRED. L. McGAHAN.

Witnesses:
H. D. NEALY,
E. B. GRIFFITH.