

(No Model.)

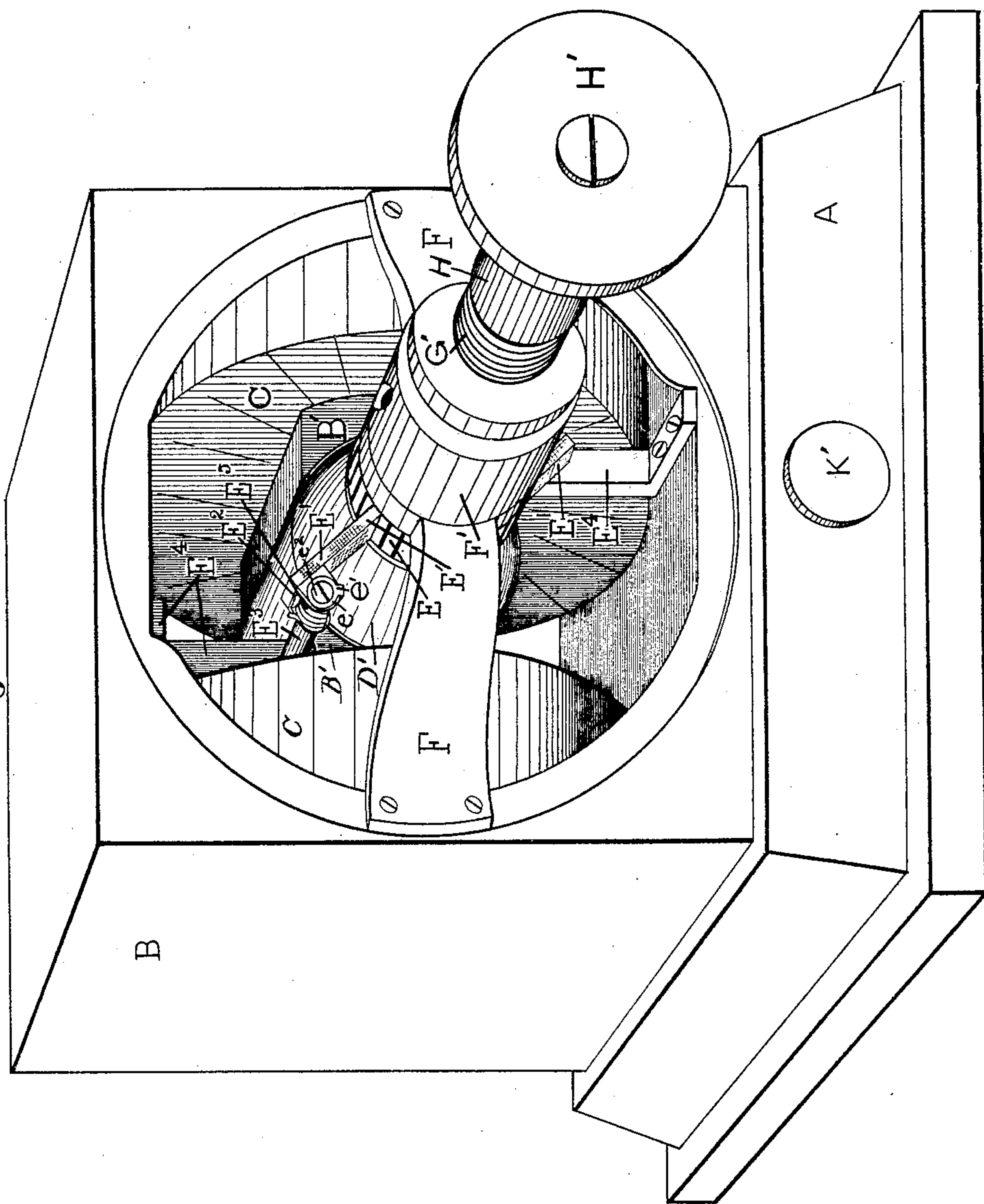
4 Sheets—Sheet 1.

O. H. & A. F. PIEPER.
ELECTRIC MOTOR.

No. 599,791.

Patented Mar. 1, 1898.

Fig. 1.



Witnesses.

G. Willard Rich.
J. M. Fowler Jr.

Inventors

Alphonse F. Pieper
Oscar H. Pieper
by C. M. Church
their Attorneys

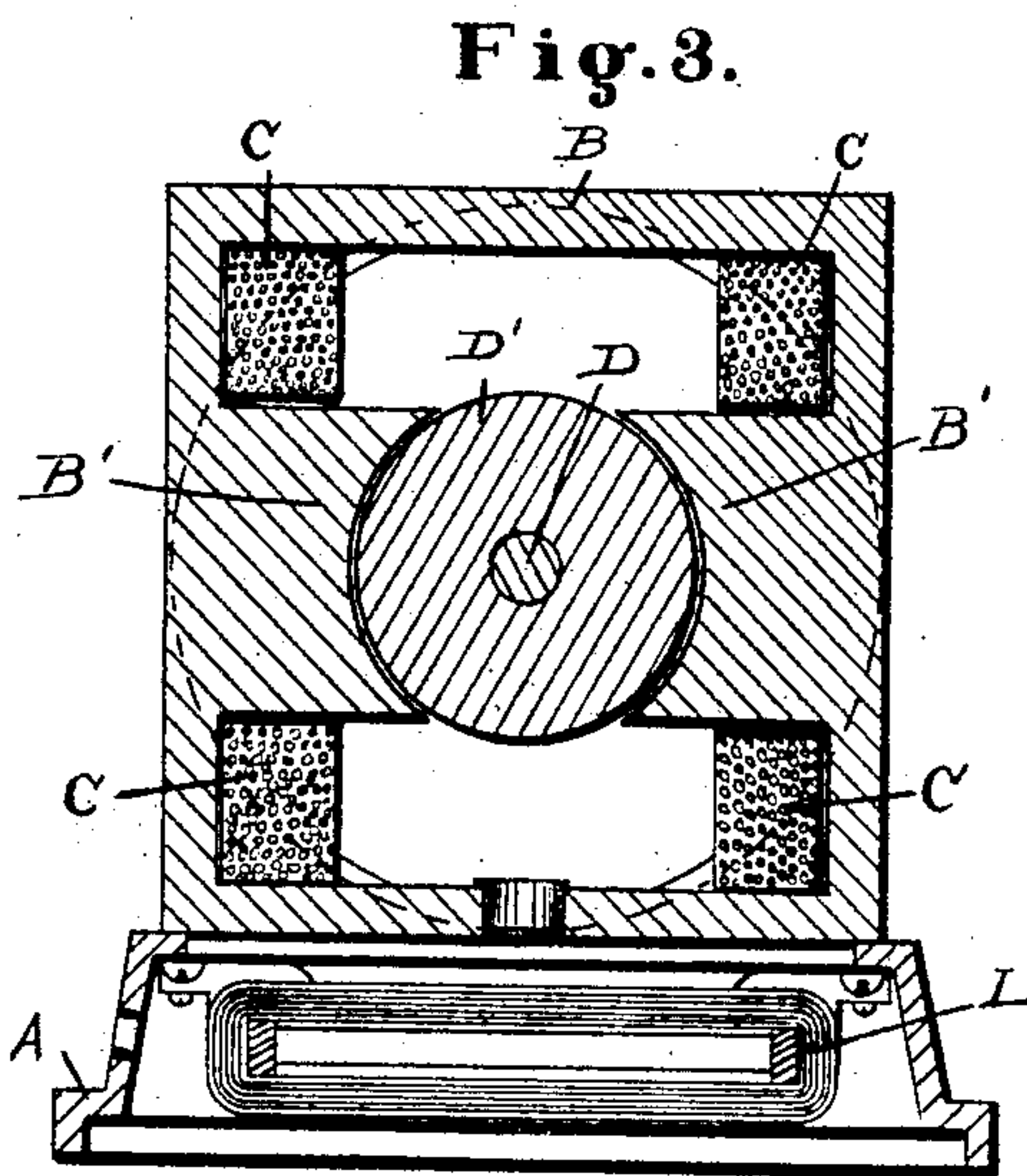
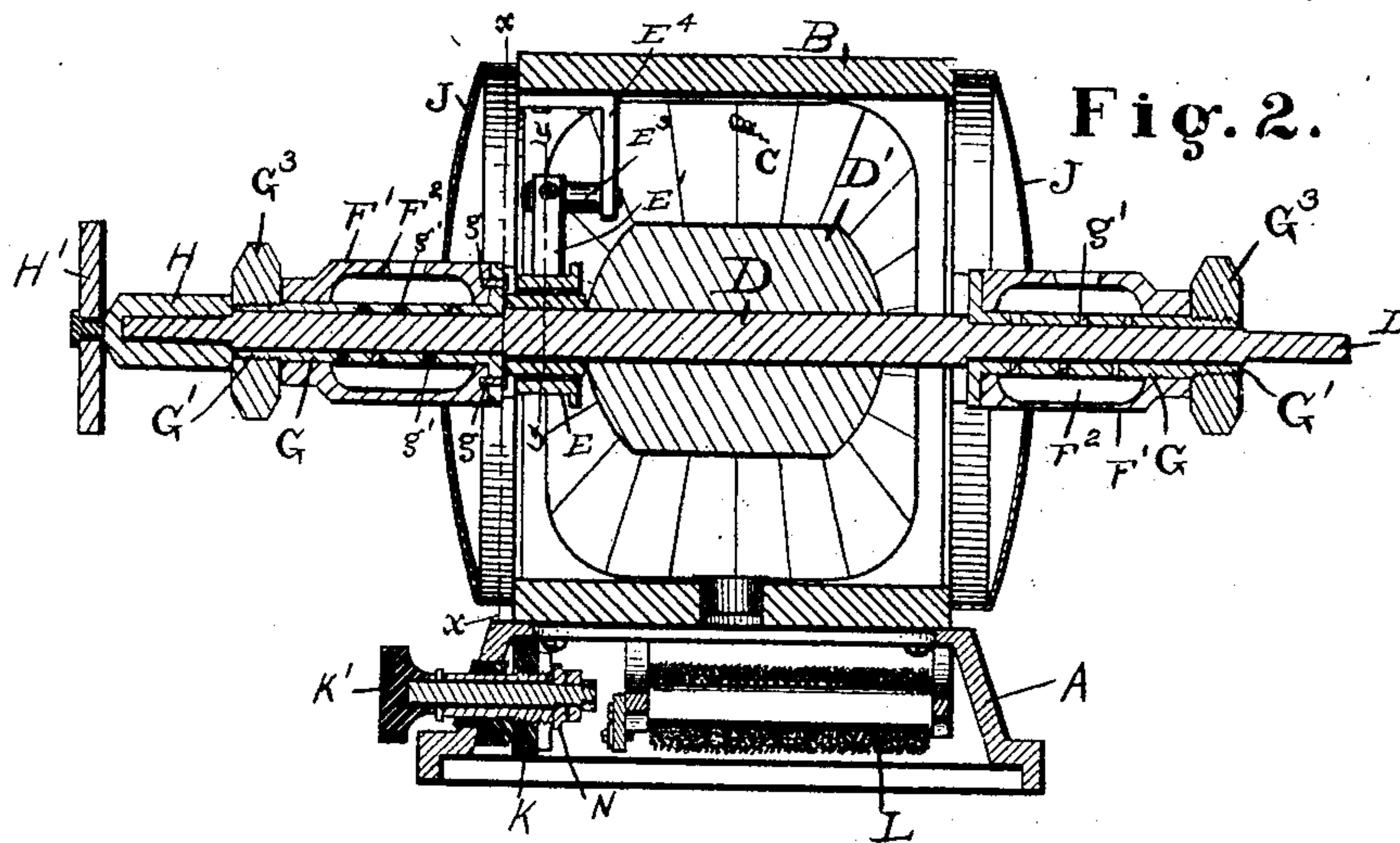
(No Model.)

O. H. & A. F. PIEPER.
ELECTRIC MOTOR.

4 Sheets—Sheet 2.

No. 599,791.

Patented Mar. 1, 1898.



Witnesses.

G. Willard Rich.
J. A. Roda.

Inventors

Oscar H. Pieper
Alphonse F. Pieper
by Charles H. Smith
their Attorneys

(No Model.)

4 Sheets—Sheet 3.

O. H. & A. F. PIEPER.
ELECTRIC MOTOR.

No. 599,791.

Patented Mar. 1, 1898.

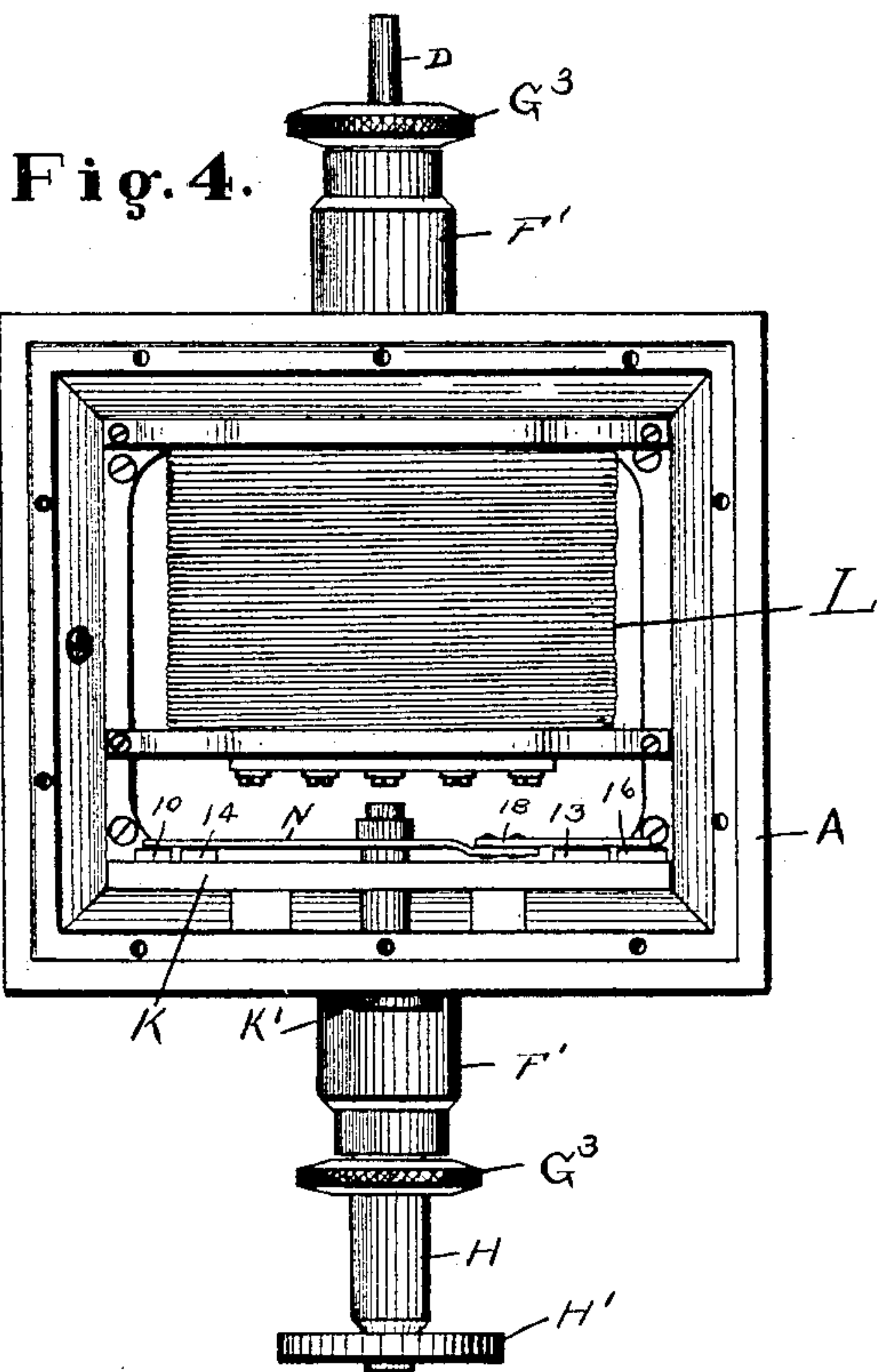
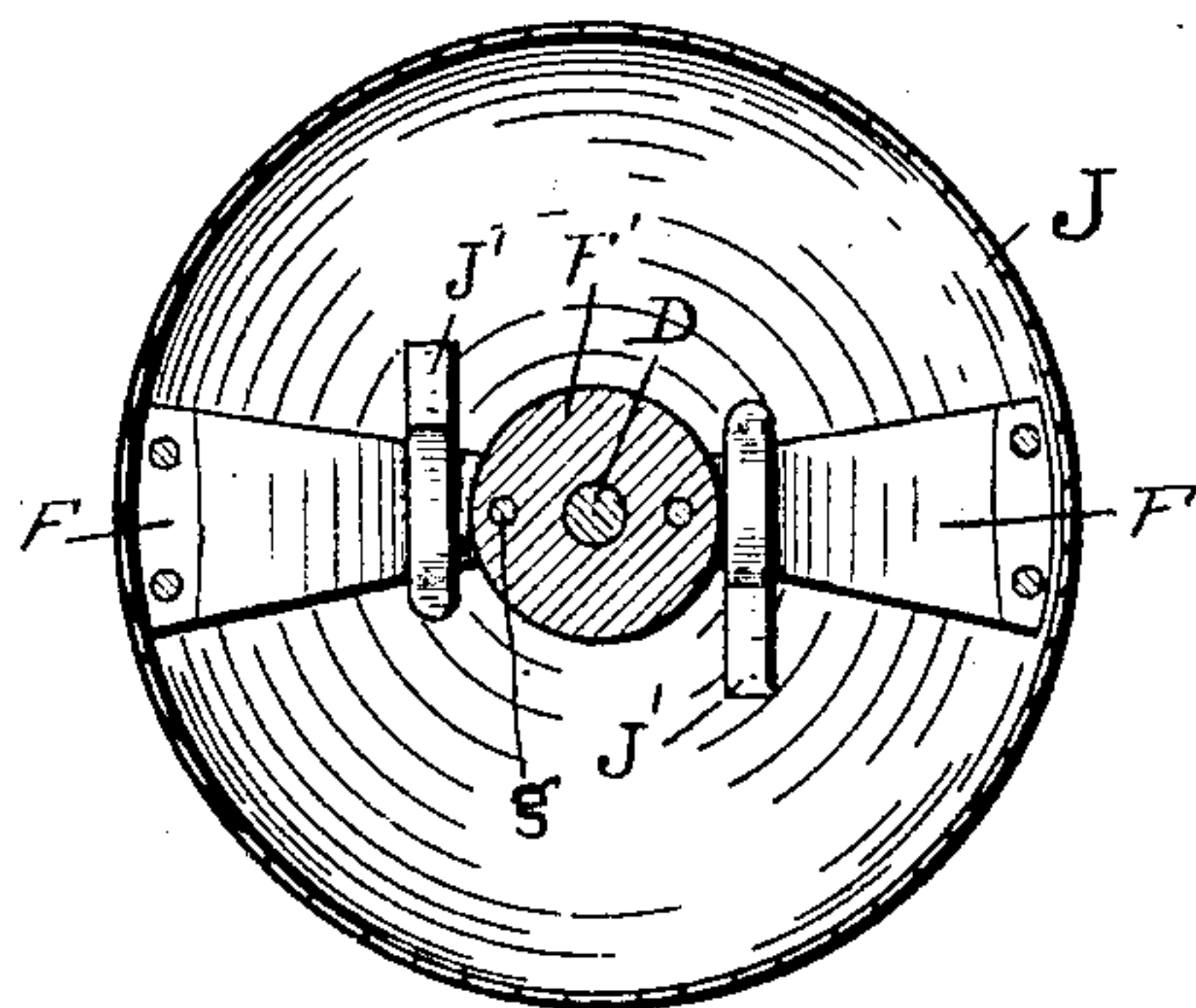


Fig. 5.



Witnesses.

G. Willard Rich.
J. A. Roda

Inventors

Oscar H. Pieper
Alphonse F. Pieper
by J. Churchman
their Attorneys

O. H. & A. F. PIEPER.
ELECTRIC MOTOR.

No. 599,791.

Patented Mar. 1, 1898.

Fig. 6.

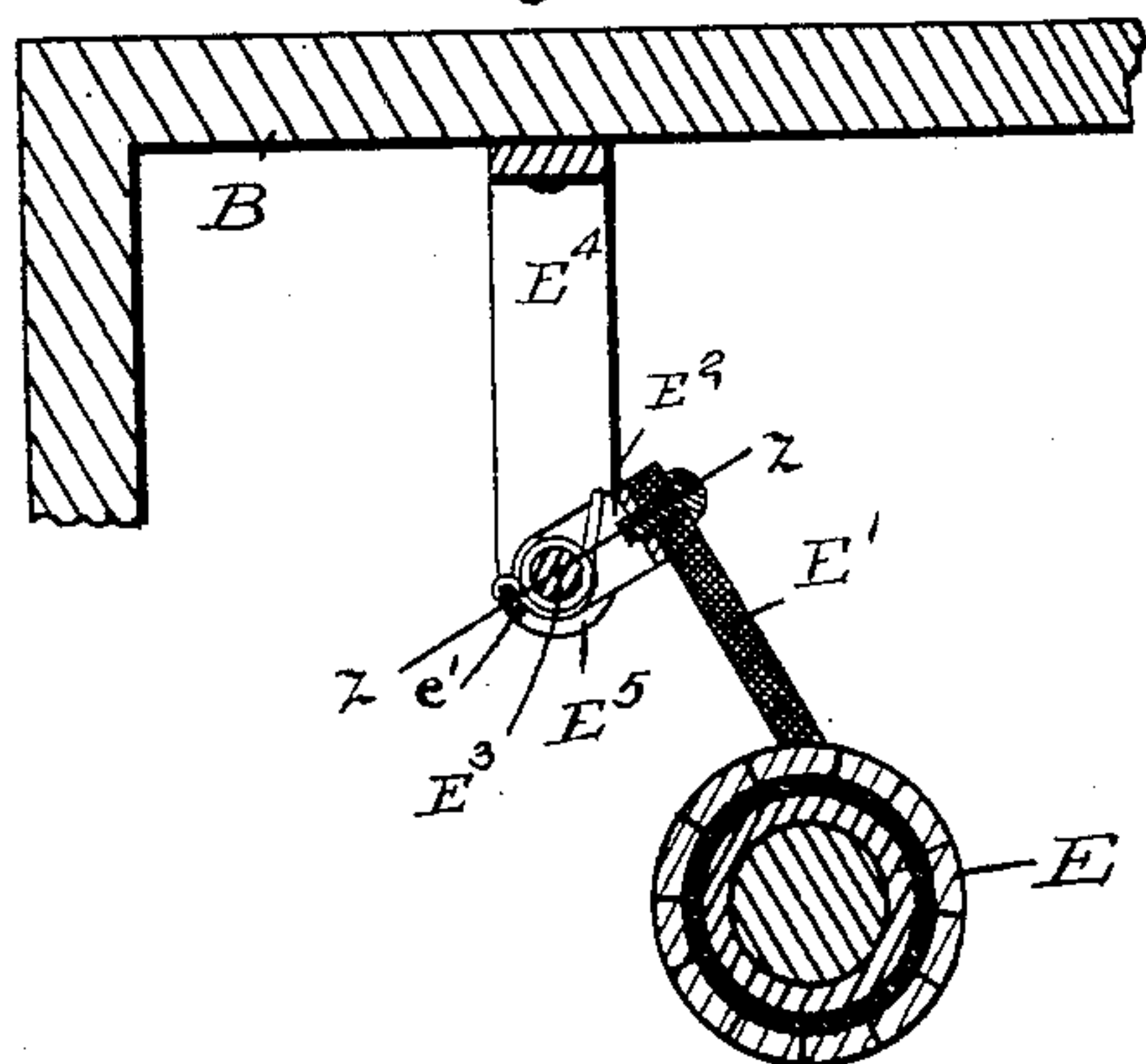


Fig. 7.

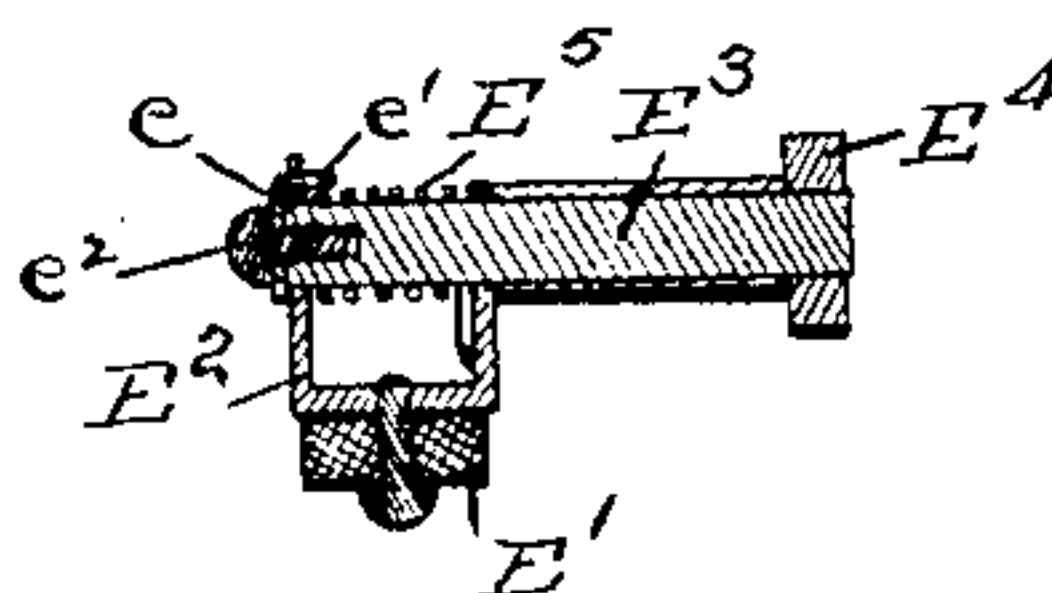
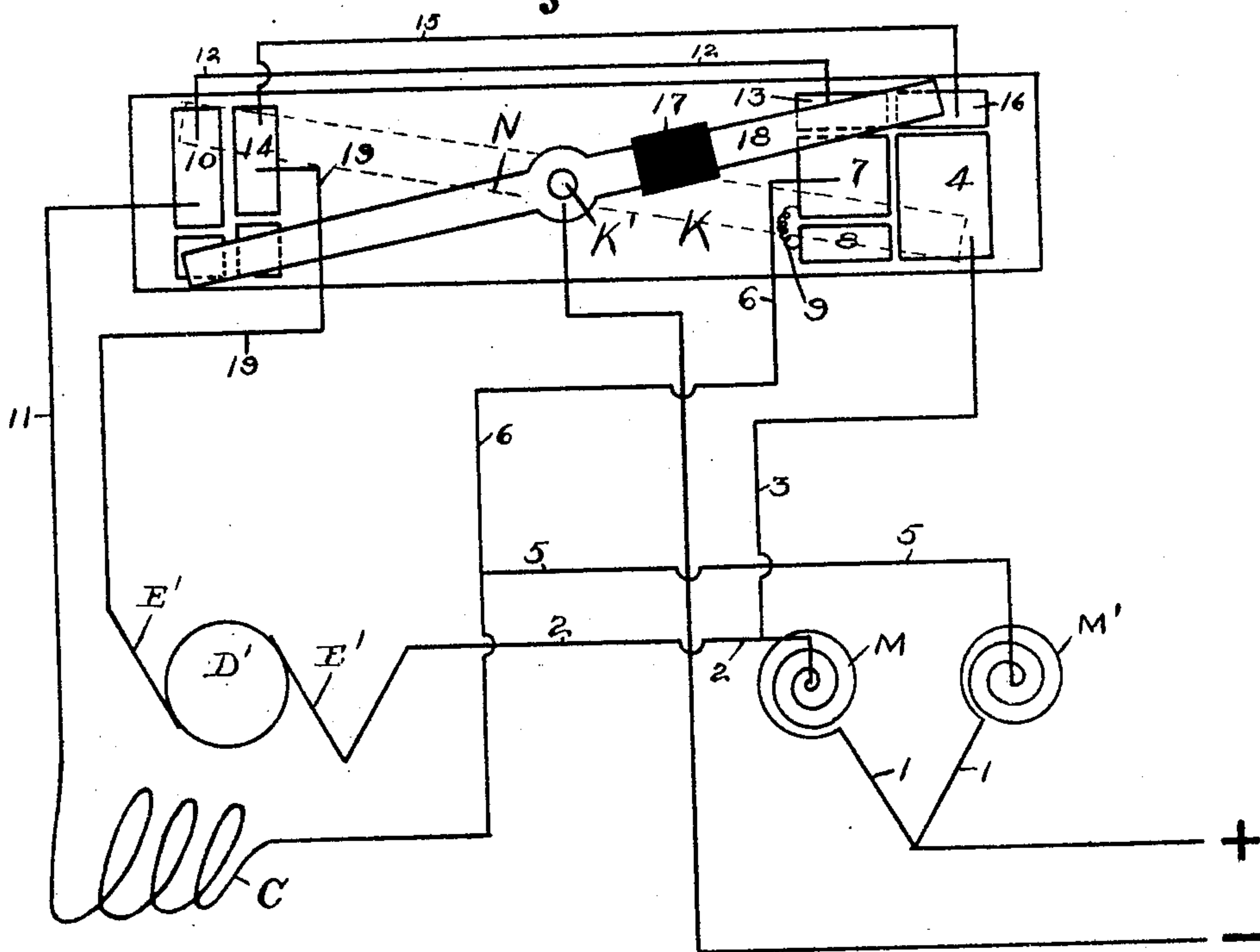


Fig. 8.



Witnesses.

G. Willard Rich.
G. A. Roda.

Inventors

Oscar H. Pieper
Alphonse F. Pieper
By Churchill
their Attorneys

UNITED STATES PATENT OFFICE.

OSCAR H. PIEPER AND ALPHONSE F. PIEPER, OF ROCHESTER, NEW YORK.

ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 599,791, dated March 1, 1898.

Application filed October 17, 1896. Serial No. 609,231. (No model.)

To all whom it may concern:

Be it known that we, OSCAR H. PIEPER and ALPHONSE F. PIEPER, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Electric Motors; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference letters and numerals marked thereon.

Our present invention has for its object to improve the construction and operation of electric motors particularly adapted for running light machinery, such as dental engines, and also rotary tools, as emery-wheels, chucks, &c., used by dentists; and it consists in certain improvements in the general construction of the machine and also in the improved circuit arrangement and switches whereby sparking at the switch is prevented when the current from a line is cut off; and the invention further consists in certain improvements, all as hereinafter described, the novel features being pointed out in the claims at the end of this specification.

In the accompanying drawings, Figure 1 is a perspective view of a motor constructed in accordance with our invention with one of the cover-plates removed; Fig. 2, a vertical sectional view taken in the plane of the armature; Fig. 3, a similar view taken at right angles to Fig. 2; Fig. 4, a bottom plan view with the bottom plate removed; Fig. 5, a sectional view on the line xx of Fig. 2; Fig. 6, a sectional view on the line yy of Fig. 2; Fig. 7, a sectional view on the line zz of Fig. 6; Fig. 8, a diagrammatic view of the circuit arrangement.

Similar reference letters and numerals in the several figures indicate similar parts.

A indicates the base-frame of the motor, preferably constructed of cast metal, and B the upper frame, preferably rectangular, having the open circular ends and the pole-pieces B' formed integral therewith and adapted to receive the field-coils C, as shown particularly in Fig. 3.

D indicates the armature-shaft, and D' the armature thereon, constructed in the usual or any preferred way.

Extending across the ends of the frame B are the bridge-pieces F, secured at their ends to the frame B and having the enlargements F', within which are formed chambers F² for lubricating material, as will be described. Extending across the chambers F² are sleeves G, having flanges at their inner ends secured by screws g to the inner sides of the bridges F, and their outer ends, which project beyond the enlargements F', are threaded at G'. The sleeves G form bearings for the armature-shaft and are perforated at g' to allow the passage to the bearings of a lubricant contained in the chamber F². A suitable wicking of fibrous material may be placed within these chambers to convey the lubricant to the shaft. The ends of the shaft are made tapering for receiving corresponding tapering recesses formed in the sleeves or supports H of any rotary tool which is adapted to be secured upon the shaft. In the present arrangement we have indicated an emery-wheel H', secured to the sleeve H; but it will be understood that a chuck, pulley, or other device could be employed. The sleeve H of the tool is adapted to project in close proximity to the end of the sleeve G, and in order that said tool may be readily removed we mount upon the threaded end G' of the sleeve G a nut G³, (not shown in Fig. 1,) which is normally screwed up against the tubular extension G'; but when desired to remove the tool it is only necessary to screw said nut outward, thereby forcing the tool off the tapered end of the shaft and permitting the ready application of another one, if desired. This feature of our invention is particularly desirable in a machine of this description, as it provides for the quick removal of the tool from the rotary shaft when desired and obviates holding the shaft with one hand, as is necessary when the tool is secured by a screw-thread, and this portion of our invention could of course be applied to other machines and tools which employ tapering rotary shafts.

E indicates the commutator, secured to the shaft D, and E' the commutator-brushes, composed of suitable material, such as compressed and consolidated copper netting, fastened to a yoke E², composed of a single piece of sheet material and journaled loosely upon the end of a stud or arm E³, attached to an arm E⁴.

E⁵ indicates a small spring encircling the stud E³ and engaging the yoke at one end and at the other an arm e' on a plate or washer e, secured to the stud E³ by a screw e². This
 5 spring operating on the yoke carrying the commutator-brush presses the latter tightly upon the commutator.

J indicates circular cover-plates adapted to close the ends of the opening in the motor-frame, having an aperture for the central extension F' of the bridges F and having on their inner sides spring-arms J', (see Fig. 5,) adapted, when said plates are placed in position and turned in the direction of the arrow,
 15 to engage the arms of the bridges and become fastened in position.

The circuit arrangements of the motor are clearly shown in Fig. 8, from which it will be seen that the motor is shunt-wound, and
 20 the switch devices forming part of our present invention and now to be described are located within the base A, K indicating the switch-block, of insulating material, and K' the operating-handle of the switch extending
 25 outward. Also located within the base A is a spider or frame L, having upon it two resistance-coils formed by making a continuous coil around said spider and tapping it in the middle, as indicated diagrammatically by
 30 M M', Fig. 8. The circuits are similar to those described in Patent No. 558,517, granted April 21, 1896, to Oscar H. Pieper, embodying in addition certain switch arrangements whereby when it is desired to cut off the cur-
 35 rent from the motor the field and armature are each short-circuited before breaking the circuit from the main line. The main-line conductors are indicated by + and -, the former being connected by wires 1 1 with the
 40 terminals of coils M M', the first-mentioned coil being connected by wire 2 with the armature-circuit and also by the wire 3 with the contact-plate 4 on the switch-base K. 5 indicates the wire leading from the coil M' to
 45 one terminal of the field-coil C, and also connecting with this wire is a wire 6, connected to a contact-plate 7, adjacent to which is a contact-plate 8, and between the two plates 7 and 8 a resistance-coil 9. The leading-in
 50 wire — connects with the arm of the switch N, one end of which is adapted to cooperate with a plate 10, connected by wire 11 with one of the terminals of the field-coil, and also connected by a wire 12 with a contact-plate
 55 13, arranged in proximity to the plate 7. Arranged beside the plate 10 is a contact-plate 14, connected by a wire 15 with a contact-plate 16, arranged adjacent to the plate 13. Mounted upon the free end of the switch-arm,
 60 but insulated therefrom by insulation 17, is a conducting-arm 18, serving merely to connect with the contacts 4, 7, 8, 13, and 16. The plate 14 is connected by a wire 19 with one terminal of the armature-coil. When the
 65 motor is started, the switch end is gradually turned from the position in full lines to that in dotted lines, the arm N connecting the

contacts 10 and 14, while the arm 18 connects the arms 7 and 4 at first and finally 8 and 4, so that when the motor is running at slow
 70 speed and the greatest amount of torque is required there is a resistance M' in series with the field-magnet winding, a resistance M in series with the armature, and also a branch connected across between one wire
 75 of the field and the corresponding wire of the armature containing the variable resistance 9. This feature is contained in the patent to O. H. Pieper, before referred to; but our
 80 present invention relates to the short-circuiting of the field and armature before breaking the main circuit from the dynamo, and the coils M M' perform in this connection the function of resistance-coils, as outlined in the
 85 above-mentioned patent, and also to avoid a complete short circuit of the main feed-wires. When now the switch is being turned back to the position shown in full lines, the
 90 contact-arm 18 will connect the plates 4 and 16 and 7 and 13 before the arm N leaves the plates 10 and 14, thereby short-circuiting the field-circuit from wire 6 through plate 7, arm
 95 18, plate 13, conductor 12, plate 10, and conductor 11, and short-circuiting the armature from conductors 2 and 3 through plate 4, arm
 100 18, plate 16, conductor 15, plate 14, and conductor 19, the switch-arm N finally opening the main-line circuit, which now has no inductive resistance in circuit, the coils M M' being
 wound non-inductively. Consequently the
 105 break will take place without the usual sparking. The coils M M' avoid a complete short circuit on the main-line current, which would necessarily take place when the armature and
 110 field are short-circuited, and are also for the purpose as stated in the patent to O. H. Pieper, above referred to. It will be further understood that no sudden stoppage or brake
 action of the armature is desired and none will take place, the field-magnets being de-

This motor as a whole is easily constructed and is admirably adapted to the purpose intended—that is, for the use of dentists or
 115 others not requiring a great amount of power.

We claim as our invention—

1. In a shunt-wound electric motor, the combination with the main switch for controlling the current to the field and armature, and resistance between one of the leading-in
 120 wires and the machine-circuits, of a switch actuated by the main switch and contacts cooperating therewith arranged and operating to short-circuit the field and armature before
 125 breaking the main circuit by means of the main switch, substantially as described.

2. In a shunt-wound electric motor, the combination with the main switch controlling the supply of current from the line and a non-inductive resistance between one line-
 130 terminal and the machine-circuits, of normally open short circuits between the terminals of the armature-circuit and the field-circuits, and a switch controlling said short cir-

cuits actuated from the main switch and operating to close said short circuits for the armature and field circuits before the main circuit is broken, substantially as described.

5 3. In a shunt-wound electric motor, the combination with contacts 10 and 14 of the field and armature circuits, and the main switch for connecting them to one line-terminal, of resistances interposed between one
10 line-terminal and the field and armature circuits, and switch devices operated from the main switch for short-circuiting the field and armature before the main switch leaves the contacts, 10 and 14, substantially as described.

15 4. In a shunt-wound motor, the combination with the contacts 10 and 14 of the field and armature circuits, and the switch-arm N connected to one line-terminal, of a resistance in series with the field, a resistance in
20 series with the armature, a branch between corresponding conductors of the field and armature, a switch controlling said branch moving with the switch N and operating to short-circuit the field and armature coils before the flow of current through the switch N
25 and contacts 10 and 14 is broken, substantially as described.

5. In a shunt-wound electric motor, the combination with the main switch for controlling the current from the mains to the field and armature, a circuit containing a resistance between the field and one line-terminal, a circuit containing a resistance between the
30 armature and one line-terminal, and switching devices connected to and actuated by the main switch operating to short-circuit the field and armature before breaking the main circuit through the machine, substantially as described.

40 6. In a shunt-wound electric motor, the combination with the field and armature, of the resistance-coils M, M' connected to one leading-in wire, the switch-contacts 10 and 14 connected to the field and armature terminals, the contacts 7 and 4 and conductors 3 and
45 6, the contact 8 and resistance 9, the switch-arm N, the arm 18 moved by the switch-arm, and contacts 13 and 16 connected to contacts 10 and 14, substantially as described.

7. In an electric motor, the combination 50 with the frame B, the bridge and the stationary bearing-sleeve in the bridge, having the externally-threaded end extending beyond the bridge, and the nut thereon, of the armature-shaft having the tapering end beyond 55 the threaded end of the sleeve, substantially as described.

8. As a means for removing tapering sleeves from tapering shafts, the combination with a shaft having a tapering free end, and a bearing or support therefor, of a stationary annular threaded boss around the shaft, and a nut thereon adapted to be moved on the thread longitudinally of the shaft, substantially as described. 60 65

9. In an electric motor, the combination with the frame B having the central aperture, the chambered bridges F on opposite sides, the perforated bearing-sleeves in the bridge having the threaded ends, and the nuts 70 on the ends of the armature-shaft having the tapered ends extending beyond the ends of the sleeves, substantially as described.

10. The combination with a rotary shaft and a tool secured thereon by tapering frictional surfaces, of a bearing for the shaft, a stationary annular threaded boss around the shaft, and a nut screwing on said boss and adapted to engage the tool and move it longitudinally of the shaft, substantially as described and for the purpose specified. 75 80

11. The combination with the frame B open at the end and having the pole-pieces and the field-coils thereon, of the bridge-piece F extending across the open end of the frame, 85 the armature-shaft having its bearing in the bridge, and the cover-plate J having the central aperture, and the arms J, J' thereon, substantially as described.

OSCAR H. PIEPER.

ALPHONSE F. PIEPER.

Witnesses as to O. H. Pieper:

W. R. MARSHALL,

ALLEN J. HARTER.

Witnesses as to A. F. Pieper:

F. F. CHURCH,

G. W. RICH.