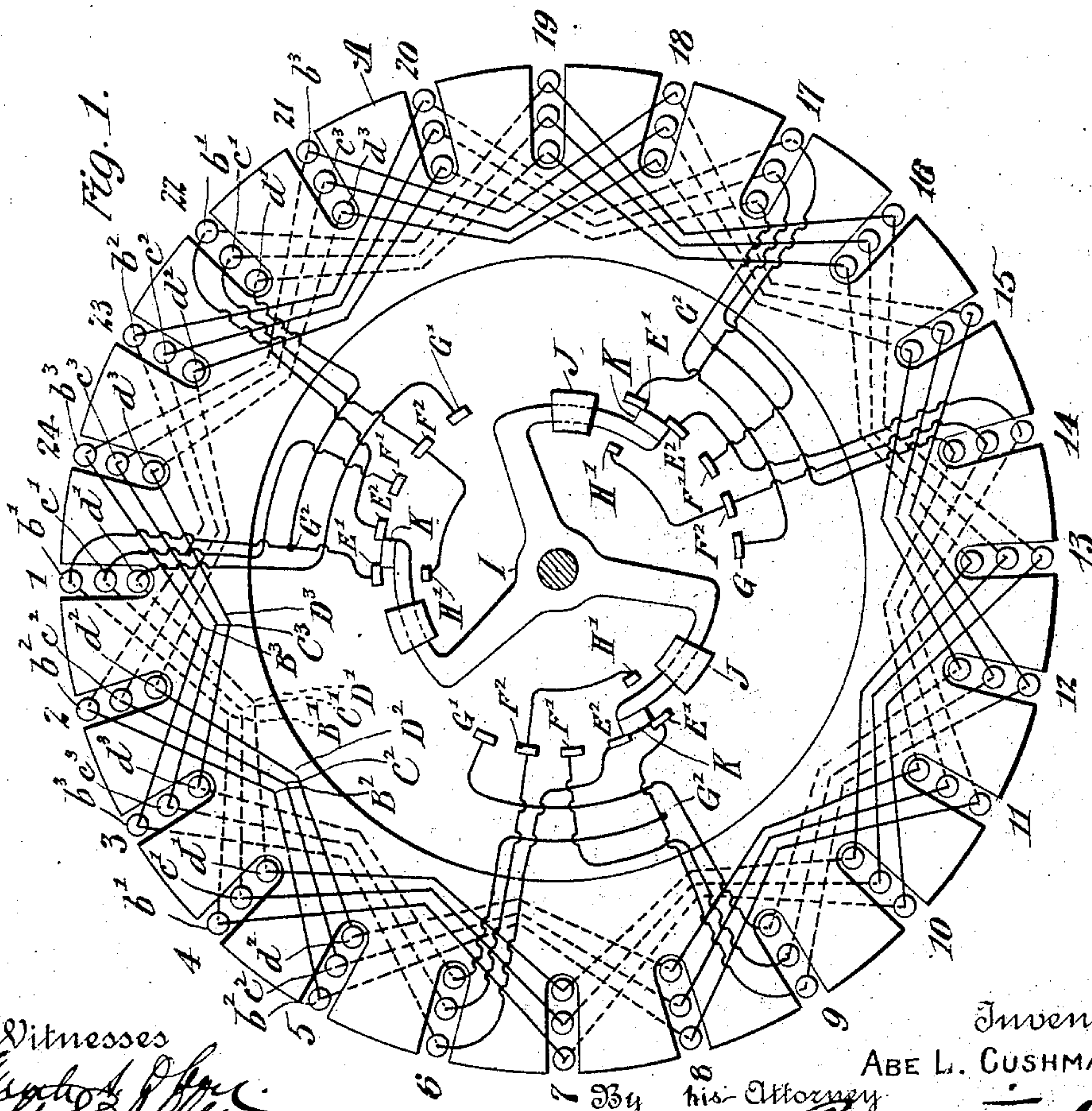
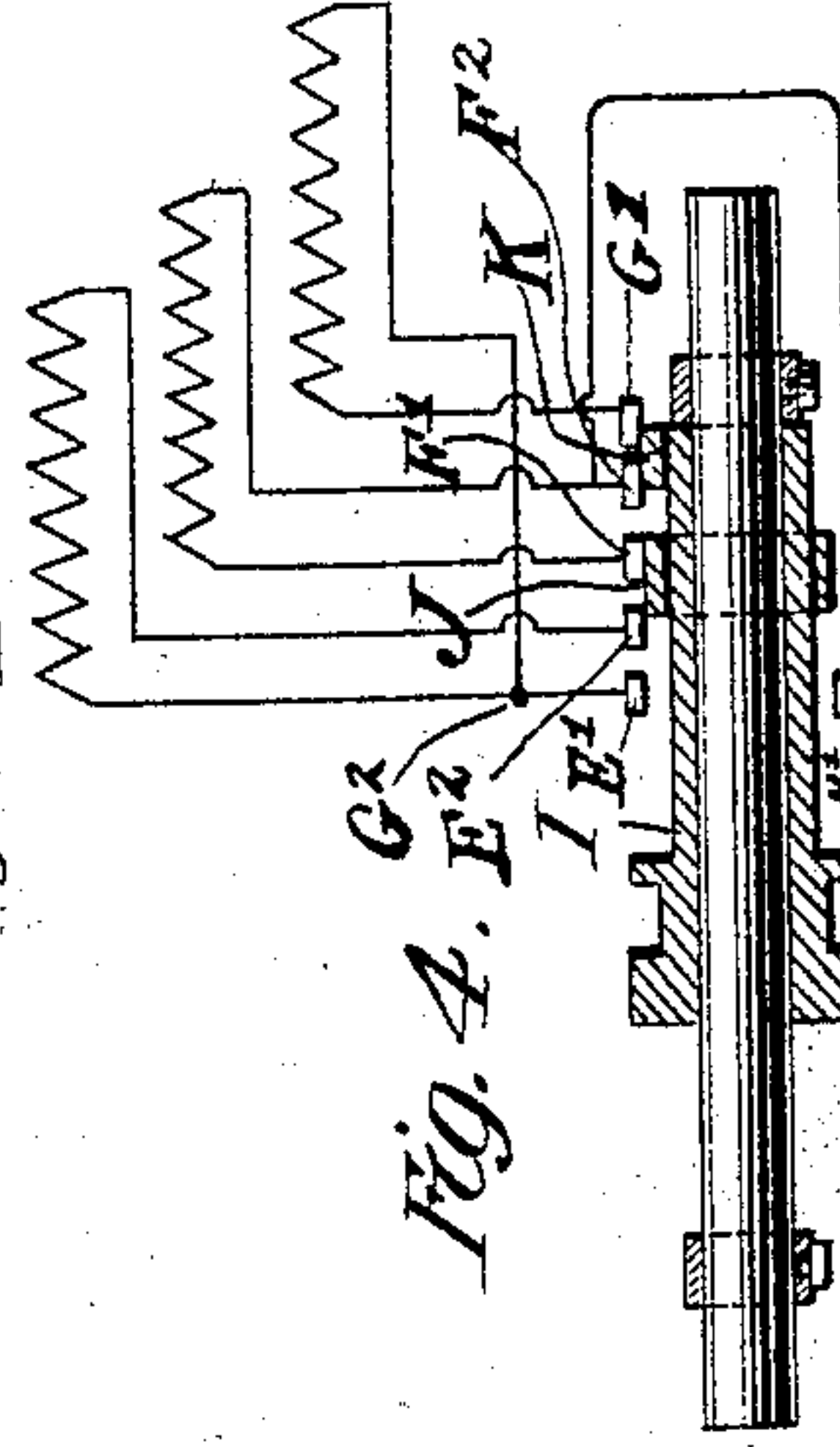
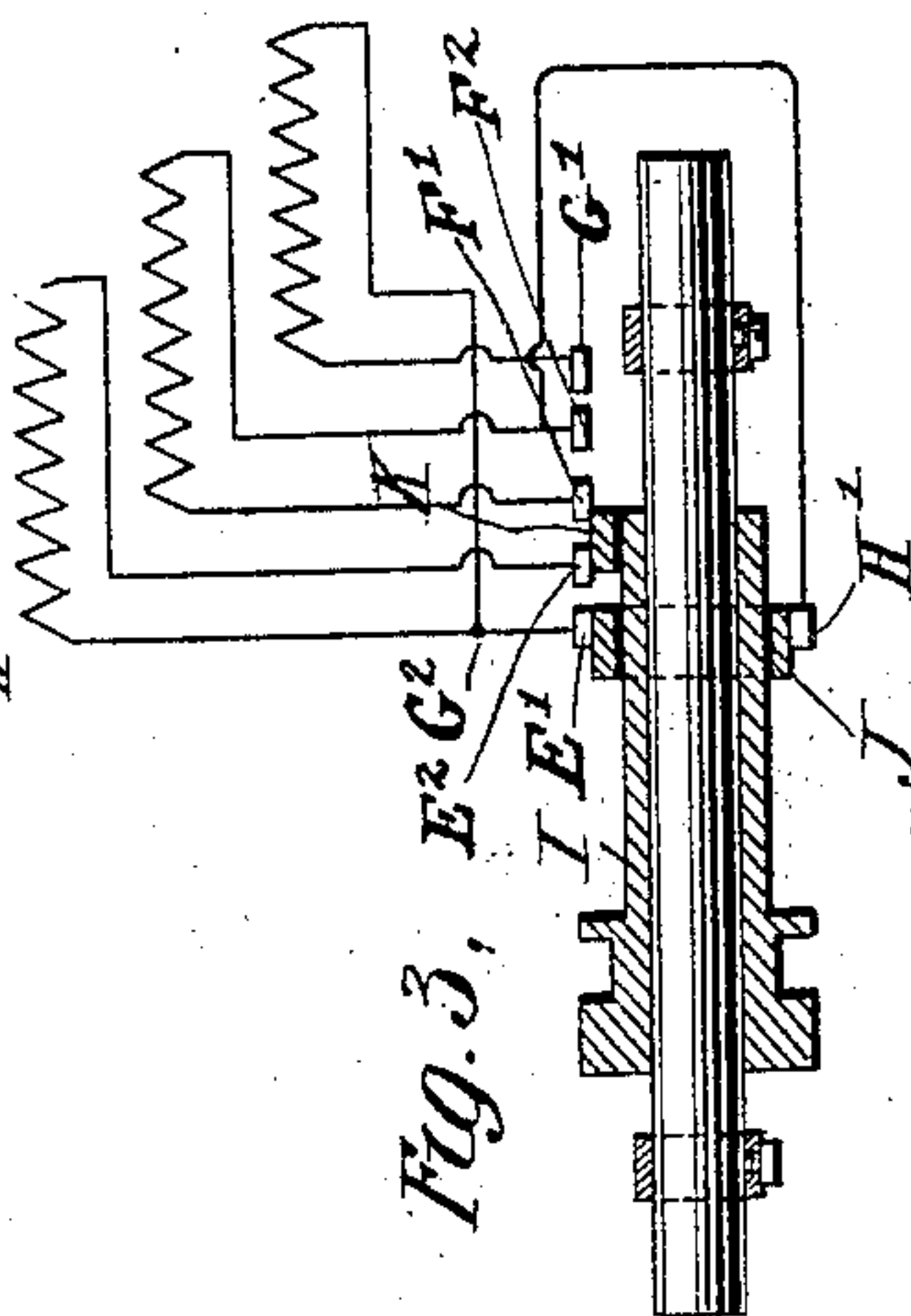
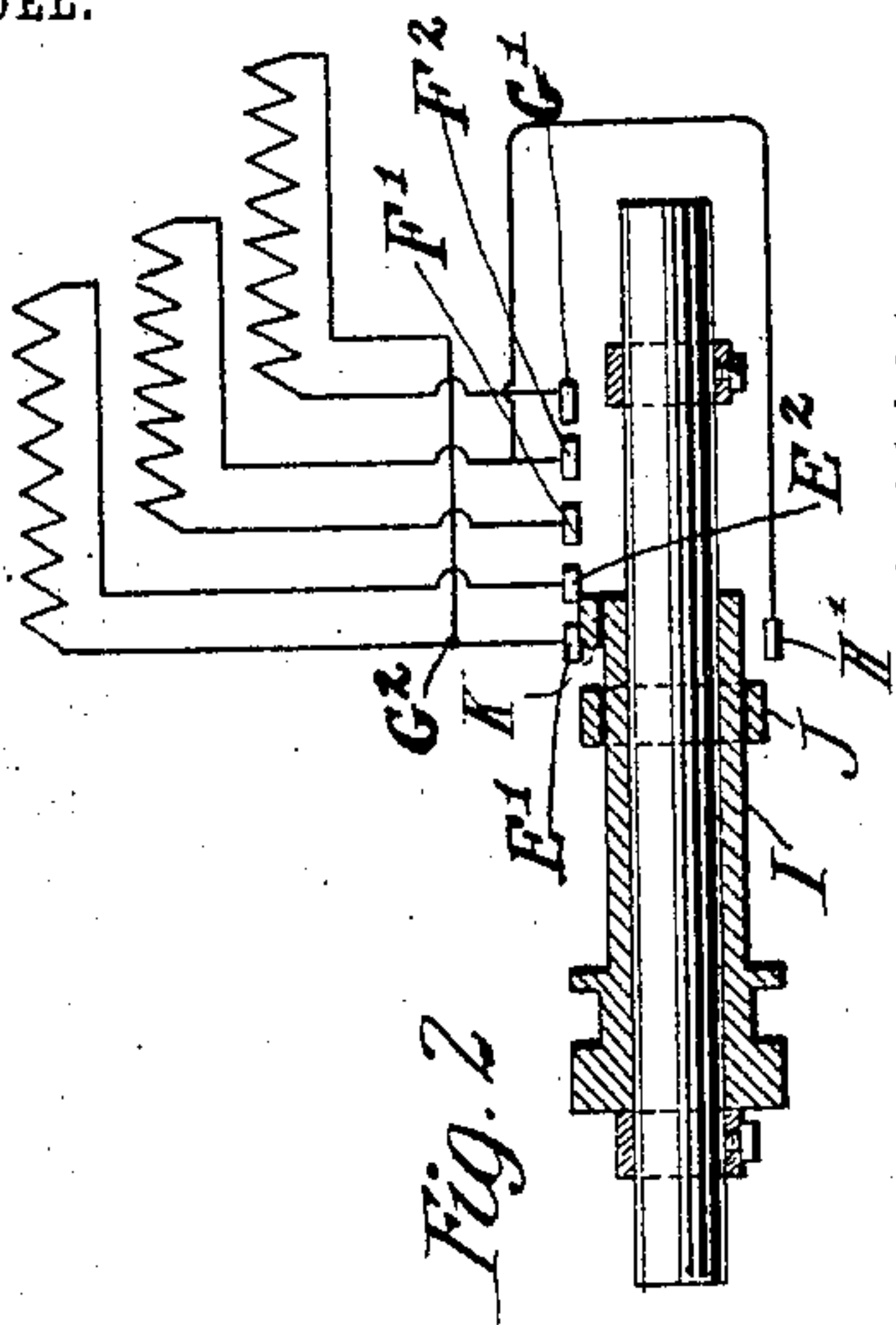


No. 725,225.

PATENTED APR. 14, 1903.

A. L. CUSHMAN.
INDUCTION MOTOR.
APPLICATION FILED OCT. 13, 1902.

NO MODEL.



Witnesses
[Signature]
[Signature]

Inventor:-
ABE L. CUSHMAN

By *[Signature]* his Attorney.

UNITED STATES PATENT OFFICE.

ABE L. CUSHMAN, OF CONCORD, NEW HAMPSHIRE, ASSIGNOR OF ONE-HALF
TO BENJAMIN A. KIMBALL, OF CONCORD, NEW HAMPSHIRE.

INDUCTION-MOTOR.

SPECIFICATION forming part of Letters Patent No. 725,225, dated April 14, 1903.

Application filed October 13, 1902. Serial No. 126,983. (No model.)

To all whom it may concern:

Be it known that I, ABE L. CUSHMAN, a citizen of the United States, residing at Concord, Merrimack county, New Hampshire, have invented certain new and useful Improvements in Induction-Motors, of which the following is a full, clear, and exact description.

My invention relates to induction-motors, and has for its object to secure a good starting torque without the insertion or use of any high specific resistance material in the secondary or induced circuit. I accomplish this end by dividing the winding into a plurality of sections, all of low specific resistance material, such as copper, and connecting more or less of these sections in series by means of a switch, so as to form a closed circuit. If there are several groups, one section only of each group is used at starting, other sections of each group being gradually introduced. This results in smaller magnetization of the armature by the induced currents, and consequently smaller reaction at starting, resulting in a good starting torque. As the speed increases more sections can be put in in series, increasing the power without increasing the armature magnetization and reaction until the full power of the motor is attained at full speed with all the sections in use.

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

Figure 1 is a digram of the windings and a switch. Fig. 2 shows the switch for connecting the various sections in series. Figs. 3 and 4 show other positions of the same switch.

In the drawings, A is a core having slots 1 to 24 of the induced winding. In each slot there are three bars $b^1 c^1 d^1$, $b^2 c^2 d^2$, and $b^3 c^3 d^3$ of material of low specific resistance, such as copper, those in every third slot being connected so as to form three groups of conductors $B^1 C^1 D^1$, $B^2 C^2 D^2$, and $B^3 C^3 D^3$, those bars in the same slot belonging to the same group. The ends of each of the three conductors or elements of each set are connected to terminals $E^1 E^2 F^1 F^2 G^1 G^2$, the last being connected to the contact E^1 . The terminal F^2 is also connected to a terminal H^1

opposite to the terminal E^1 . As the switch I, having the insulated contact-pieces J and K, is moved it first connects the terminals $E^1 E^2$, forming one conductor or element into a closed circuit. In the next position of the switch the terminals E^2 and F^1 are electrically connected, also the terminals E^1 and H^1 , forming a closed circuit of two conductors or elements arranged in series. In the next position of the switch the terminals E^2 and F^1 are electrically connected and F^2 and G^1 are electrically connected, forming a closed magnetic circuit of all three conductors or elements arranged in series, which is the relation in which they are arranged when full speed is attained. With the form of switch shown in Fig. 2 the movement is longitudinal to the shaft, the conductors $B^1 C^1 D^1$ being connected to contacts, as shown, and the other conductors correspondingly arranged and connected.

It will be seen from the above that while only material of low specific resistance is used, yet the energy of the current in the induced portion is kept small at starting without the assistance of any material of low specific resistance, and the armature reaction is consequently small and the starting torque correspondingly large, while when speed has been acquired the introduction of the other conductors increases the energy in the induced secondary current and increases the power of the motor.

What I claim is—

1. In an induction-motor, the combination of a secondary winding made up of elements of low specific resistance, and means for forming a closed induced circuit from a part only of said elements, and for placing in series with said part additional elements, as desired.

2. In an induction-motor, the combination of a secondary winding made up of elements of low specific resistance, and means for forming a closed circuit of a greater or less number of said elements arranged in series with one another.

3. In an induction-motor, the combination of a secondary winding made up of elements of low specific resistance adapted to be put in series to form a closed magnetic circuit, and a switch, one continuous movement of which

increases the number of such elements in series in said closed circuit while the opposite movement decreases such number.

4. In an induction-motor, the combination
5 of a plurality of groups of elements of low specific resistance and a switch whereby a greater or less number of the elements be-

longing to the same group can be placed in series to form a closed circuit.

ABE L. CUSHMAN.

Witnesses:

WILLIAM C. BRUNEL,
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