(No Model.) 3 Sheets—Sheet 1.

# F. H. WILLIAMS.

## ELECTRIC MOTOR.

No. 546,442. Patented Sept. 17, 1895.

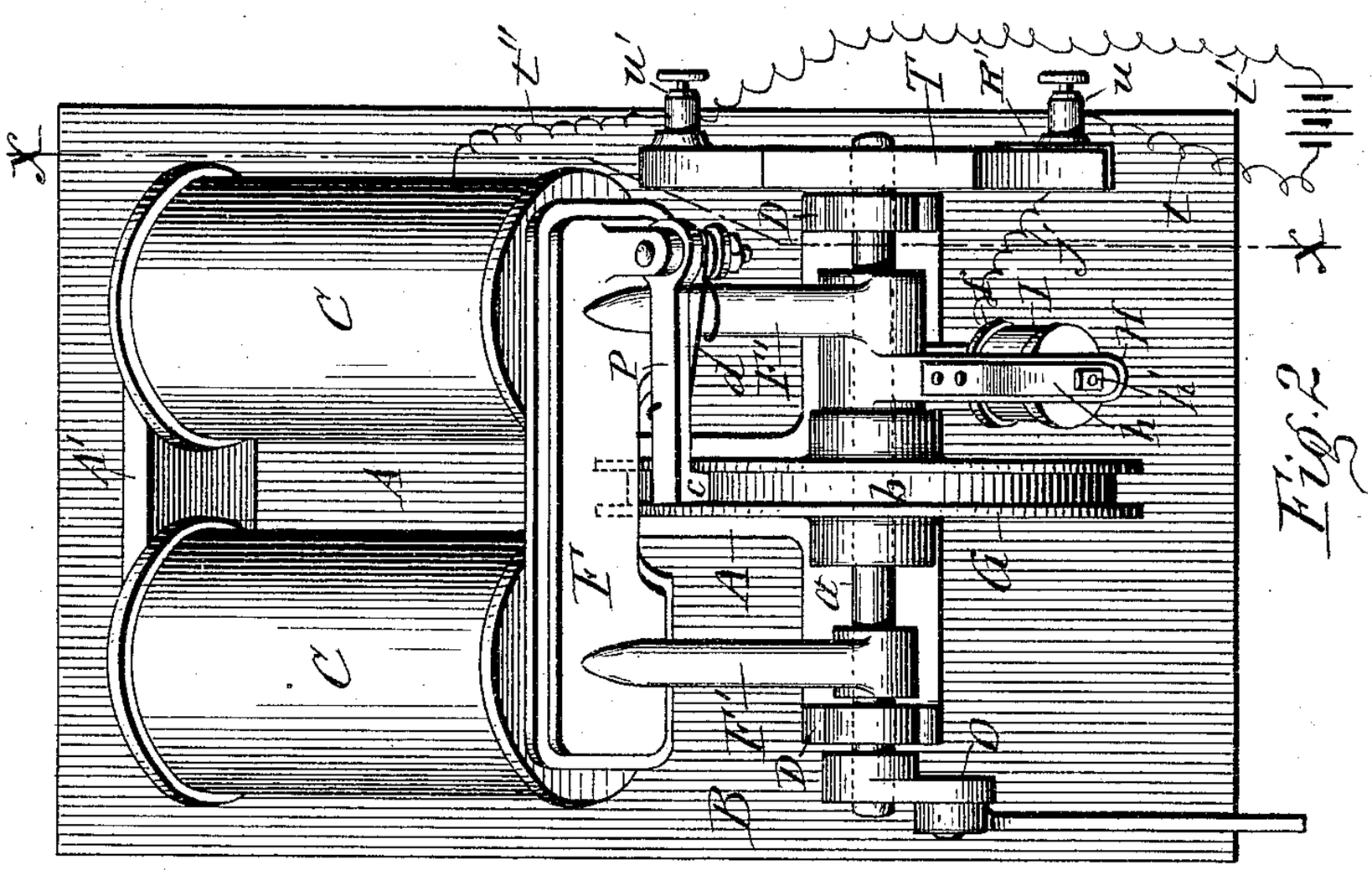

Fig. 2.

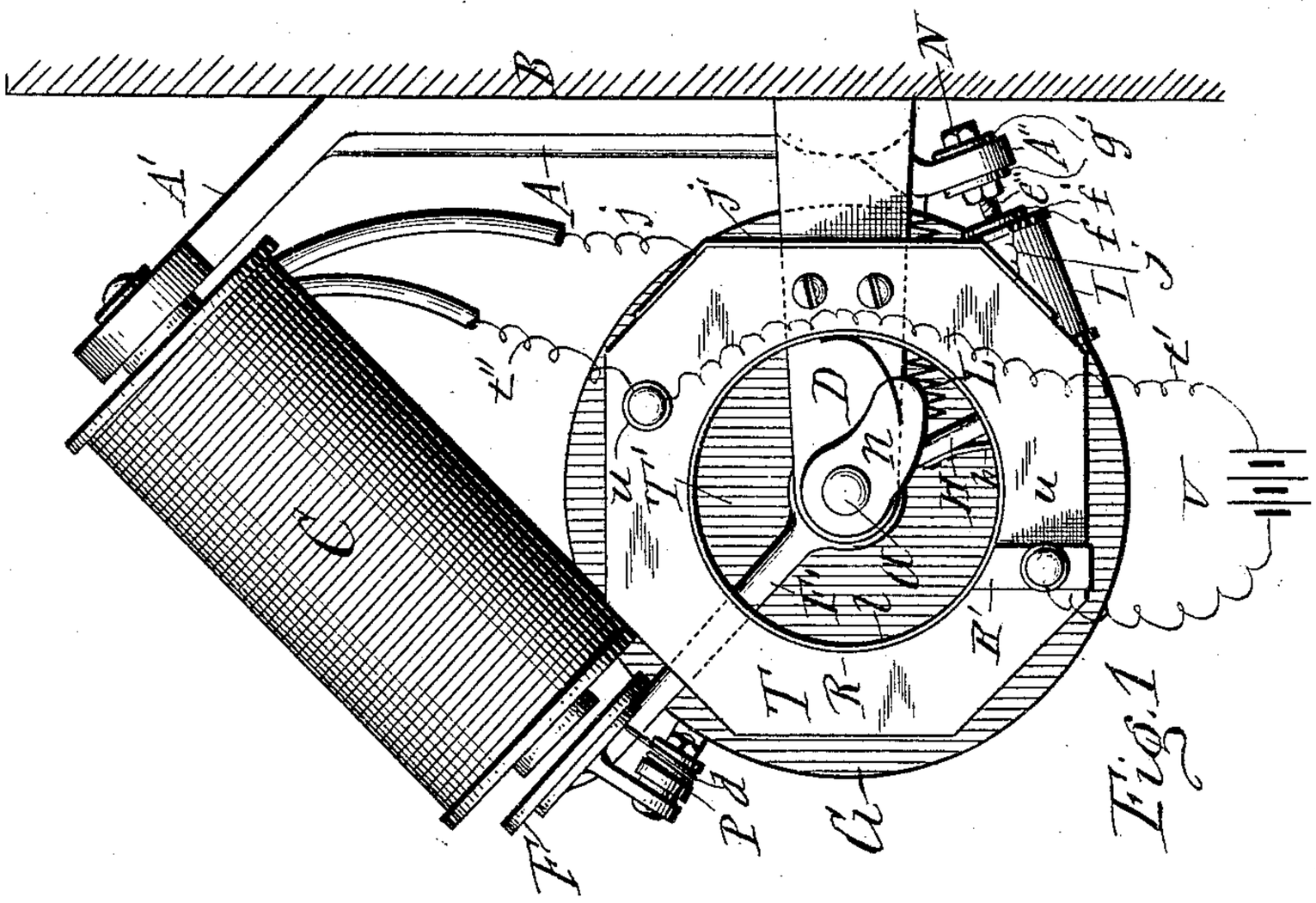

Fig. 1.

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C. L. Bendixon.

Inventor:

Frank H. Williams

By E. Laas

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(No Model.)

3 Sheets—Sheet 2.

# F. H. WILLIAMS.

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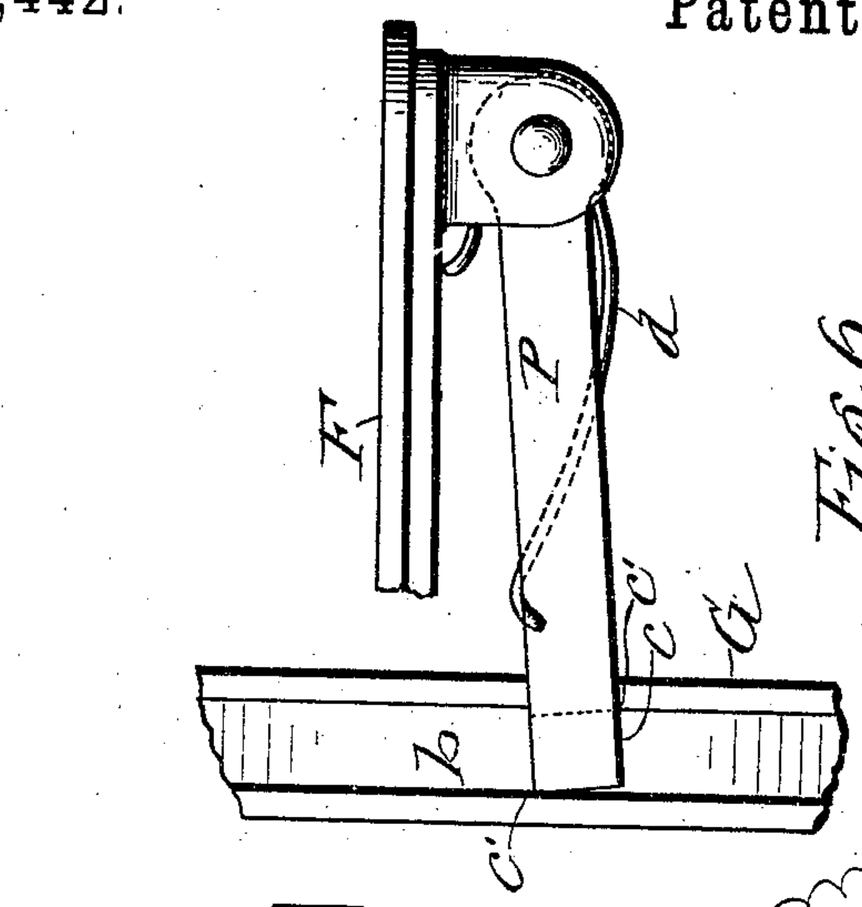


Fig. 6.

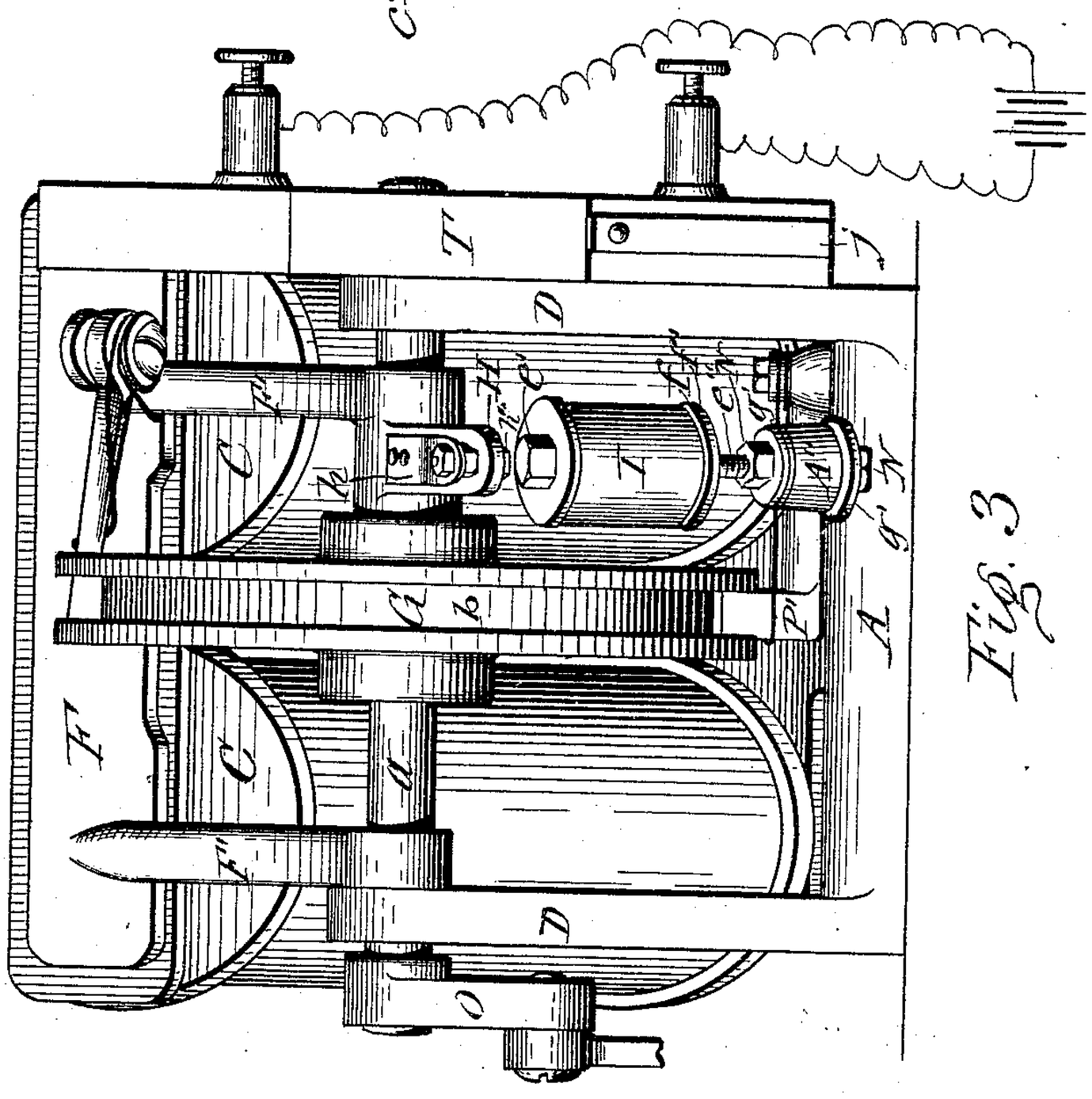


Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

# F. H. WILLIAMS.

## ELECTRIC MOTOR.

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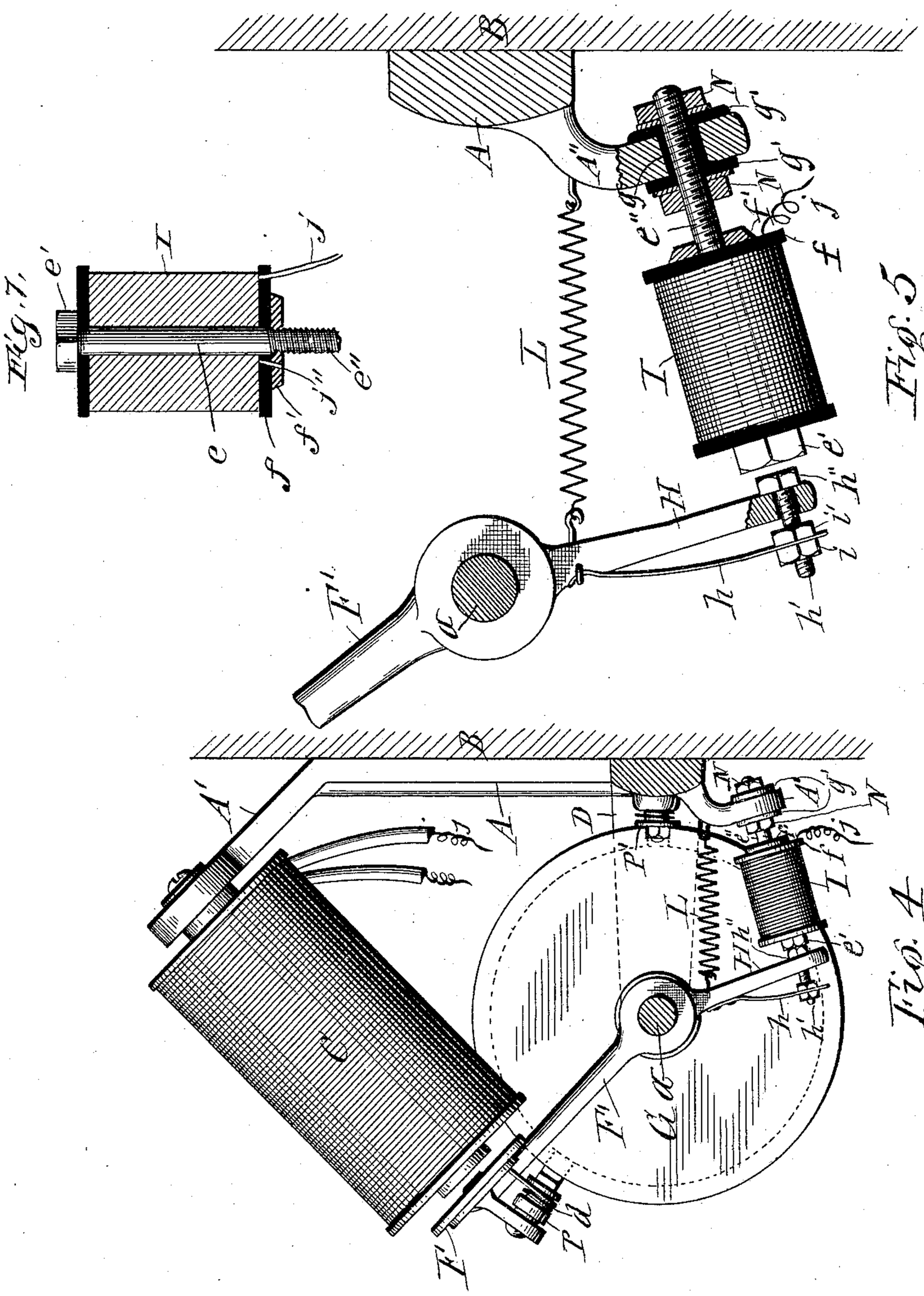

Witnesses:

C. E. Tomlinson

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# UNITED STATES PATENT OFFICE.

FRANK H. WILLIAMS, OF GREENE, NEW YORK.

## ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 546,442, dated September 17, 1895.

Application filed March 11, 1895. Serial No. 541,222. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK H. WILLIAMS, of Greene, in the county of Chenango, in the State of New York, have invented new and useful Improvements in Electric Motors, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to a novel organization of an electric motor which is simple in construction and efficient and durable in its operation; and the invention consists in the novel construction and combination of parts, as hereinafter fully described, and specifically set forth in the claims.

In the annexed drawings, Figure 1 is a side view of an electric motor embodying my invention. Fig. 2 is a front view of the same. Fig. 3 is a view of the lower end of the motor. Fig. 4 is a transverse section on line X X in Fig. 2. Fig. 5 is an enlarged vertical transverse section of the supplementary magnet. Fig. 6 is an enlarged plan view of the pawl which transmits motion to the driving-shaft of the motor; and Fig. 7 is a longitudinal section of the supplementary magnets, showing the connection of the helix to the core of said magnet and the end of the helix which leads to the motor-magnets.

Similar letters of reference indicate corresponding parts.

A represents the supporting-frame of the motor, which frame is composed of suitable metal, preferably of cast-iron. It is preferably secured in an upright position to a wall B of a building. The upper end of this frame is formed with an overhanging portion A′, to which are fastened the motor-magnets C, which are disposed with their free ends in a downwardly-inclined position. From the lower portion of the frame A project at right angles to the wall B two arms D D, in the free ends of which is journaled a horizontal shaft *a*, on which are pivotally mounted the supporting-arms F′ of the armature F, which is thus allowed to rock on its support to and from the magnets C. From the heel of the armature F or pivoted end of one of the supporting-arms F′ thereof extends rearward an arm H, under the free end of which is a circuit-maker consisting of a supplementary magnet I, which is smaller or inferior to the main or motor magnets C. The supplementary magnet has a soft-iron core *e* presented toward the arm H, but some distance therefrom. The helix of said magnet is connected at one end with the motor-magnets C by means of a metal strip *j′*, attached to the wooden plate T, hereinafter described, and by wires *j j*, extending from opposite ends of said metal strip, respectively, to the aforesaid helix and to the magnets C, as shown in Fig. 1 of the drawings. The opposite end of the helix of the supplementary magnet passes through an insulating-washer *f*, as shown at *j″*, and is fastened to the nut *f′*, which is under said washer and connected to the screw-threaded lower end portion of the core, as more clearly shown in Fig. 7 of the drawings. The nut *f′*, in conjunction with the shouldered head *e′* on the upper end of the core, confines the helix in its position, as illustrated in Fig. 5 of the drawings, which also shows the means of supporting the supplementary magnet in its requisite position—*i. e.*, the lower end of the frame A has projecting from it a lug A″, which is provided with a vertical perforation of sufficient size to receive through it the screw-threaded downward extension *e″* of the core, with the insulating-bushing *g* surrounding it. Nuts N N on the extension *e″*, above and below the lug A″, with insulating-washers *g′ g′* between the nuts and lug, fasten the supplementary magnet I to said lug. To the arm H is attached a spring *h*, the free end of which is over the free end of the arm and has attached to it the iron armature *h′*, which constitutes an electric contact-point and passes through an orifice in the arm, at the under side of which it is provided with a head *h″*. The upper end of said armature passes through the spring *h* and is screw-threaded and provided with nuts *i i′* over and under the spring, by means of which nuts the armature can be adjusted to extend a greater or less distance from the bottom of the spring. The said armature or contact-point has a vertical play, which is limited by the top shoulder of the head *h″* and bottom of the nut *i′* coming in contact with the arm H during the oscillation imparted to the said arm by the attraction and release of the armature F to and from the main or motor magnets C. A spiral spring L connects the arm H to the frame A and

serves to tilt said arm, and thereby throw the armature F from the magnets C when the electric circuit is broken. In this movement the head $h''$ of the aforesaid contact-point strikes the core $e$ of the supplementary magnet I, and thereby limits the aforesaid movement of the armature F. The spring $h$ being attached directly to the metallic arm H, which is mounted directly on the metallic shaft $a$, to which latter the commutator-brush is attached, as hereinafter described, brings the contact-point $h'$ in circuit with the commutator.

The operation of the described circuit-breaker is as follows: When the circuit is broken, the armature F is drawn away from the main magnets C by the spring L, and thereby pushes the contact-point $h'$ into contact with the core $e$ of the supplementary magnet I, and thus closes the circuit. This causes the main or motor magnets to be energized and to attract the armature F. This movement of the latter lifts the arm H, but does not lift with it immediately the contact-point $h''$, which is retained in contact with the core $e$ by magnetic attraction until said arm strikes the nut $i$ and then lifts said contact-point from the core $e$, and thereby breaks the circuit. The aforesaid detention of the contact-point upon the core $e$ serves to maintain the circuit closed during a sufficient period to allow the armature F to be attracted and rocked over to the magnets C. This is one of the salient features of my present invention. To utilize the resultant continuous oscillations of the armature F, I fasten to the driving-shaft $a$ the wheel G, which is provided with a circumferential groove $b$ in its periphery, and to the armature is pivoted the pawl P, which terminates with a lug or tooth $c$, extending into the groove $b$. Said tooth is formed rectangular, and, by means of the spring $d$ forcing the pawl rearward, said tooth is held diagonally across the groove of the wheel G and presents two bights facing opposite sides of the groove. In the movement of the armature from the magnets said armature slips on the shaft $a$, so as to yield laterally from the wheel, and thus allows the pawl to turn to bring the tooth thereof toward parallelism with the groove of the wheel, and thus lose its hold thereon. In the reverse movement of the armature incident to the attraction of the magnets the tooth of the armature is subjected to a twist in the groove of the wheel, and is thereby caused to pinch opposite sides of the groove, so as to compel the wheel to turn on its axis. To prevent reverse movement of the wheel, another similar pawl P′ is pivoted to the base of the frame A and made to engage the wheel. In this manner an intermittent rotary motion is imparted to the wheel G and its supporting-shaft $a$, which latter may be provided either with a crank O, as shown, or with a pulley or suitable gear, from which the desired power may be derived for various purposes.

R denotes the commutator, which consists of the usual metallic segments $l\,l$, secured to a supporting-plate T, of wood or other suitable insulating or non-conducting material, and disposed in a plane at right angles to the shaft $a$. $n$ designates the commutator-brush, which is fastened to the shaft $a$. In order to insure perfect contact of said brush with the segments $l\,l$, I provide the plate T with an annular opening T′, which is concentric to the shaft $a$ and has fastened to its inner side the segments $l\,l$. The brush $n$ is within the opening T′ and is bent to form a spring, which presses on the said segments.

The commutator is connected in circuit with the motor-magnets C by a wire $t$, extending from the battery V to a binding-post $u$, secured to a plate R′, extending from one of the segments $l$, and by another wire $t'$, extending from the battery to a binding-post $u'$ on the wooden plate T, and a wire $t''$, running from said binding-post to the magnets C, as shown in Figs. 1 and 2 of the drawings.

What I claim as my invention is—

1. In combination with the motor-magnets and their armature, a circuit-breaker consisting of an inferior supplementary magnet having its helix connected with the core and with the aforesaid motor-magnets, and an electric contact-finger carried to and from the core of the supplementary magnet by the aforesaid armature as set forth.

2. In combination with the motor-magnets and oscillatory armature, an inferior supplementary magnet having its helix connected with the core and with the motor-magnets, an arm oscillated toward and from said core by the oscillations of the armature a spring supported on said arm, and an electric contact-point on said spring and lifted thereby from the core of the supplementary magnet and pressed into contact with the core by the oscillations of the supporting arm of said spring as set forth.

3. In combination with the motor-magnets, oscillatory armature and circuit-breaker actuated by said armature, a revoluble shaft, a wheel fixed to said shaft and provided with a circumferential groove, a pawl pivoted to the armature and having a tooth with reversely beveled sides engaging opposite sides of the groove of the wheel to transmit motion to the wheel during the movement of the armature to the magnets as set forth.

4. In combination with the motor-magnets, a revoluble shaft, the armature mounted on said shaft and rocking independently thereof to and from the magnets, an arm extending from the heel of the armature, a supplementary magnet under the free end of said arm and having its helix connected with the core and with the motor-magnets, a spring secured to said arm, an electric contact-screw passing through the spring and arm directly over the core of the supplementary magnet, nuts on the screw directly under and over the spring to adjustably support the screw, a head on the

screw beneath the arm with a vertical play between said head and arm and held normally in contact with the arm by the aforesaid spring, commutator-segments in a plane at right angles to the aforesaid shaft and concentric thereto, the commutator-brush attached to said shaft and in electric connection with the aforesaid contact-screw, a wheel fixed to the aforesaid shaft, and a pawl connected to the armature and transmitting motion to said wheel all combined to operate substantially as set forth.

In testimony whereof I have hereunto signed my name this 27th day of February, 1895.

FRANK H. WILLIAMS. [L. S.]

Witnesses:
GRACE E. HINCKLEY,
W. H. SHERWOOD.