

(No Model.)

J. A. DAVIS & R. A. FOWDEN.
ELECTRIC MOTOR.

No. 506,209.

Patented Oct. 10, 1893.

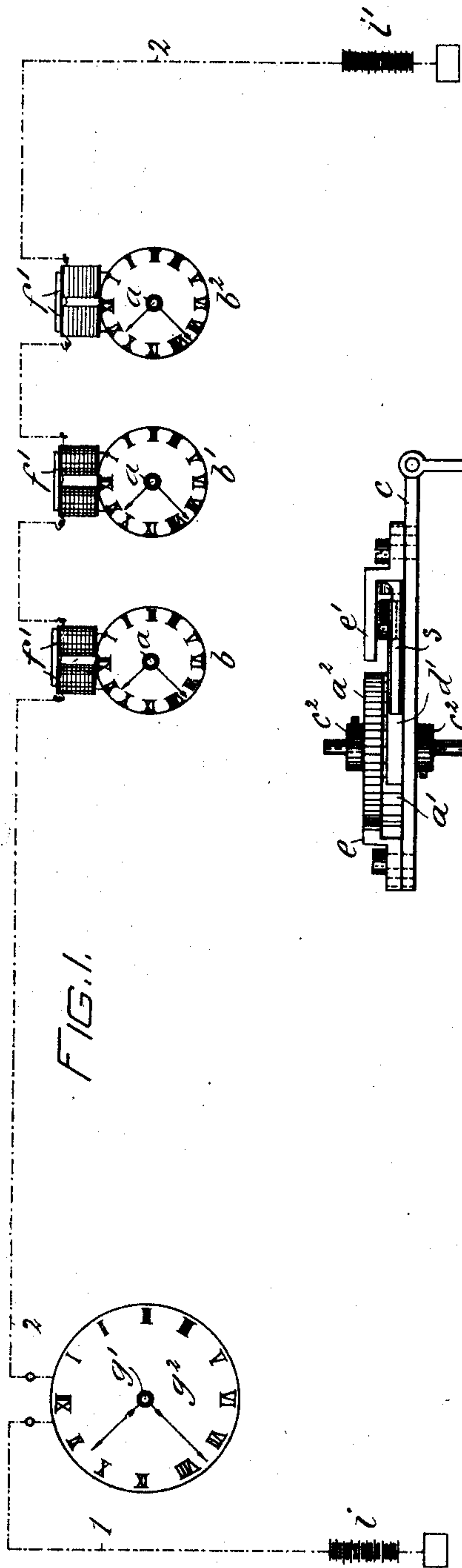


FIG. 1.

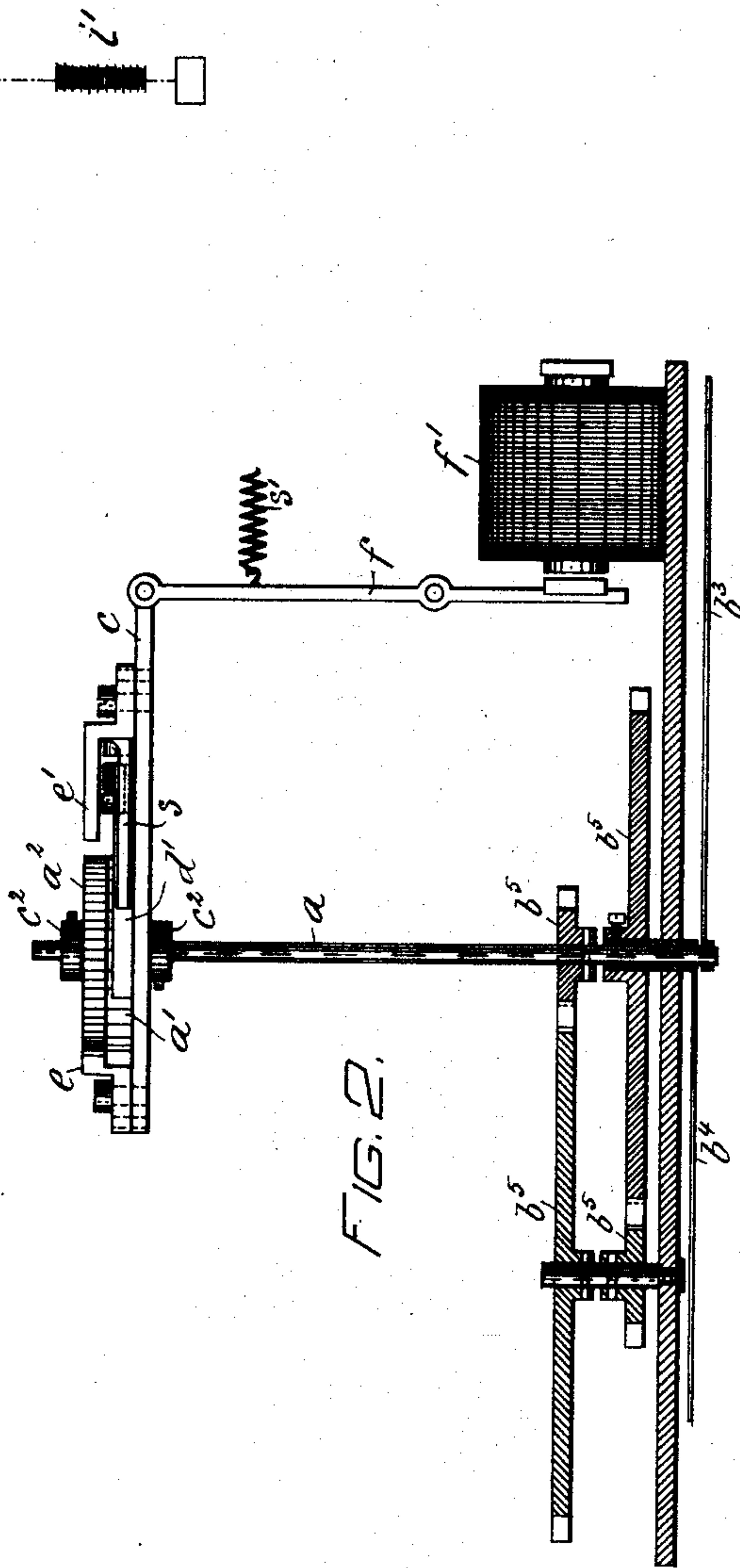


FIG. 2.

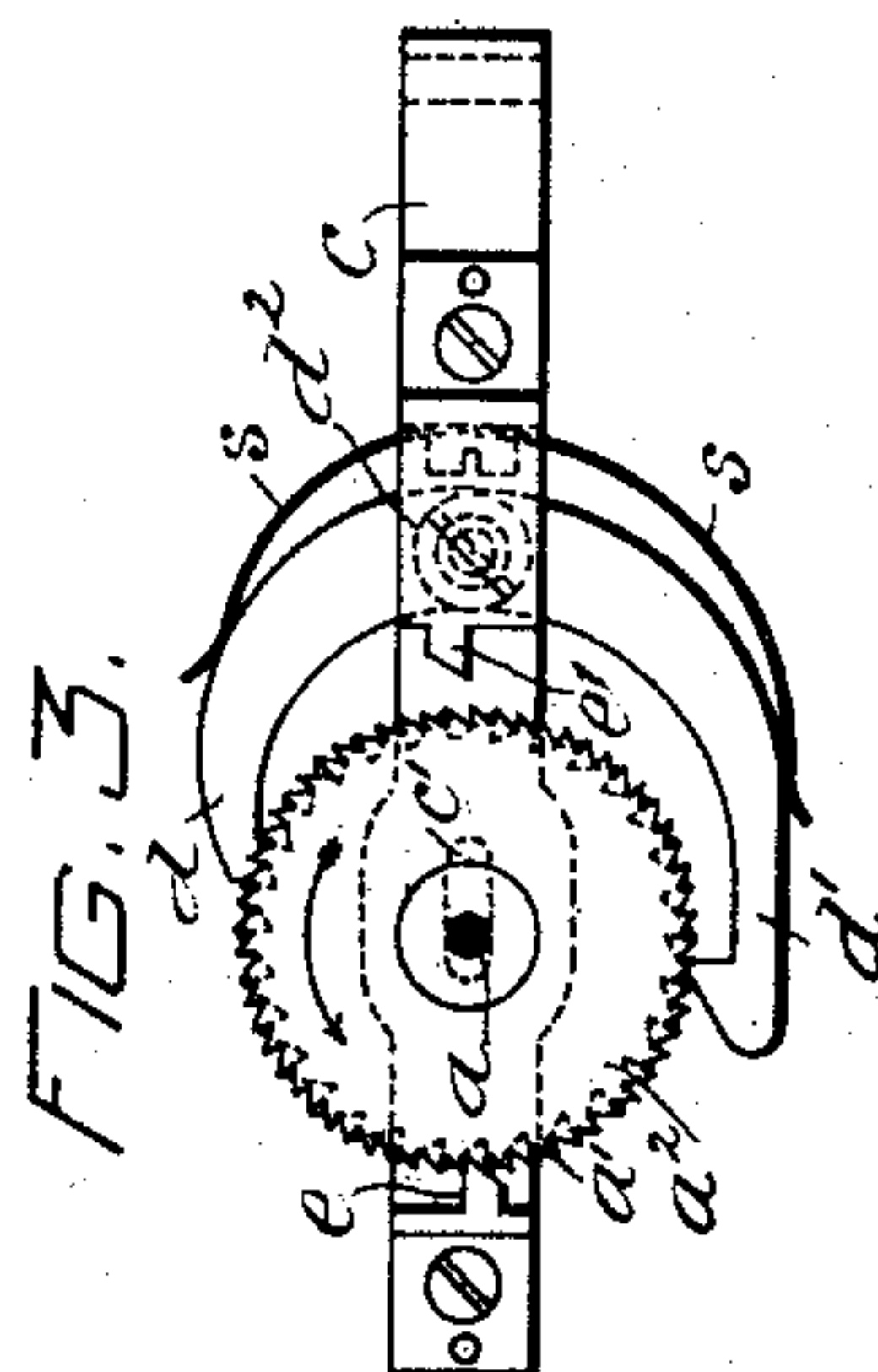


FIG. 3.

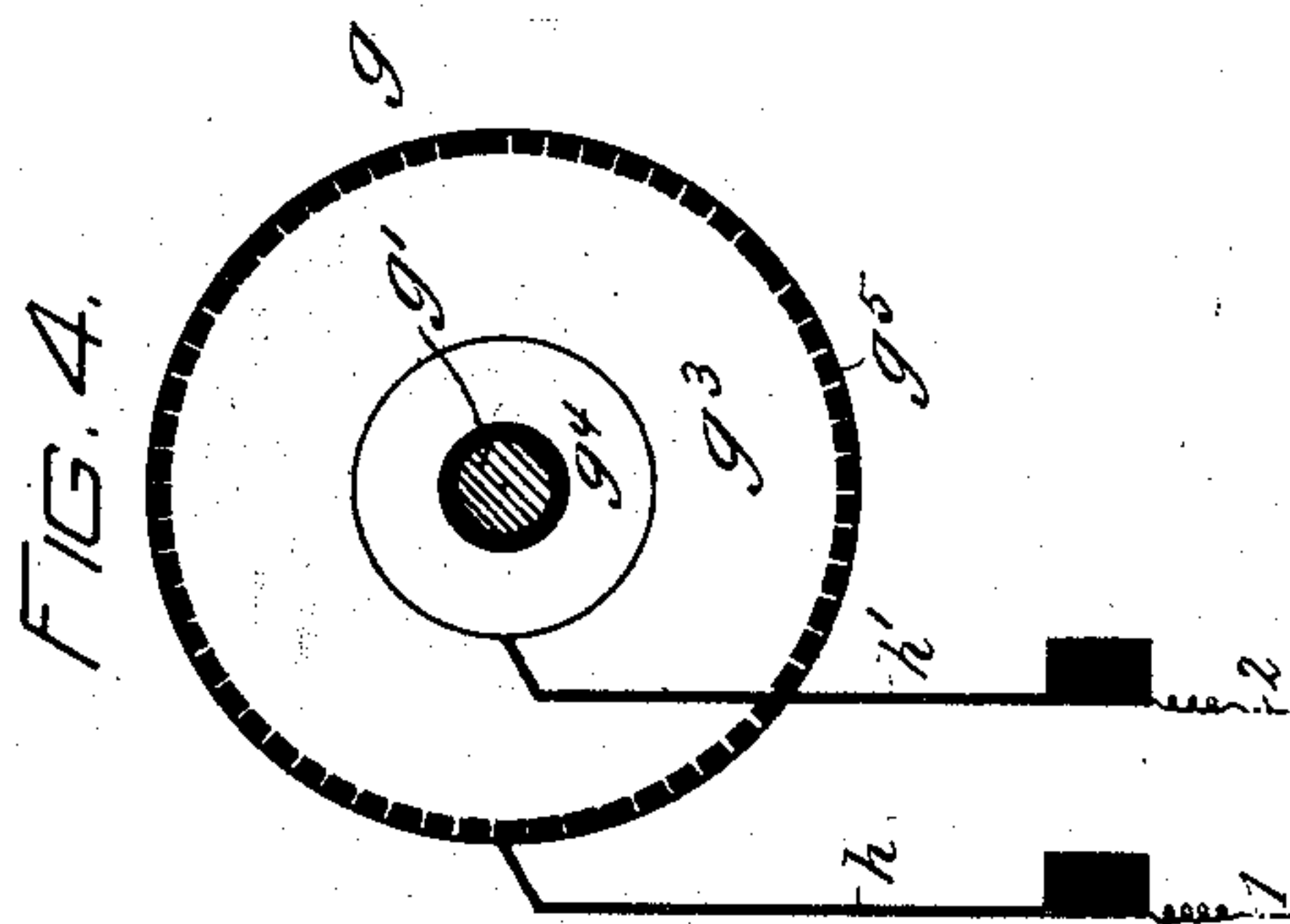


FIG. 4.

WITNESSES:
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UNITED STATES PATENT OFFICE.

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ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 506,209, dated October 10, 1893.

Application filed December 23, 1892. Serial No. 456,143. (No model.)

To all whom it may concern:

Be it known that we, JOB A. DAVIS and ROBERT A. FOWDEN, citizens of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric Motors, of which the following is a specification.

Our invention relates to improvements in step-by-step electric motors for synchronously controlling clocks, telegraph, stock or type printing and other instruments.

The principal objects of our invention are first, to provide a simple, reliable and comparatively inexpensive electric-motor adapted to drive a revoluble member with a uniform intermittent motion and to limit and equalize the steps of said intermittent motion; and second, to provide a step by step electric-motor constructed and arranged for operation in such manner that a series of the motors looped in line are adapted to synchronously operate and control clocks, telegraph, stock or type printing instruments.

Our invention consists of a step by step electric-motor, comprising a revoluble member provided with ratchet and escape-wheels, and means responding to electrical impulses in line and provided with pawls, whereof one operates by a thrust and the other is provided with a hook shaped extremity and operates by a pull to rotate said ratchet-wheel and with detents, stop-dogs, pallets or anchors for limiting and adjusting the movements of the escape-wheel.

Our invention further consists of a series of instruments having a revoluble member thereof provided with ratchet and escape-wheels and having means responding to electrical impulses in line and provided with pawls, whereof one operates by a thrust and the other is provided with a hook-shaped extremity and operates by a pull to rotate said ratchet-wheel and with detents, stop-dogs, pallets or anchors for limiting and adjusting the movements of the escape-wheel, and a line circuit controlled by electrical and mechanical devices actuated by the revoluble member of an instrument synchronously op-

erated in conjunction with all the other instruments connected in circuit therewith.

Our invention further consists of the improvements hereinafter fully described and claimed.

The nature, objects and scope of our invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof, and in which—

Figure 1, is a diagrammatic view illustrating a series of clocks provided respectively with step by step motors embodying features of our invention and controlled and synchronized by means of electrical and mechanical devices operated by the principal clock. Fig. 2, is a side view partly in section, illustrating a step by step electric motor embodying features of our invention in application to one of the series of clocks shown at the right hand side of Fig. 1. Fig. 3, is a detached plan view, showing a revoluble member provided with a ratchet-wheel and an escape-wheel and a bar provided with pawls operating respectively by a thrust and a pull to intermittently rotate said member and with detents, stop-dogs, pallets or anchors for limiting said intermittent motion; and Fig. 4, is a side view of a circuit breaker and closer operated by the revoluble member of the principal clock and adapted to control the line circuit.

In the drawings *a*, is a revoluble member, in the present instance, the minute hand spindle or shaft of one of the series of clocks *b*, *b'* and *b''*, which are provided respectively with minute hands *b''*, and with hour hands *b'''*, controlled by the minute hand *b''*, through the instrumentality of a train of gearing *b'''*. This revoluble-member *a*, is provided with a ratchet-wheel *a'*, and with an escape wheel *a''*.

c, is a bar provided with a slot *c'*, for the accommodation of the revoluble member *a*, and guided by means of a collar *c''*, adjustably connected with the revoluble member *a*, by means of a set-screw.

d and *d'*, are pawls pivotally attached to the bar *c*, by means of a post or screw *d''*, and held normally in engagement with the teeth of the ratchet *a'*, by means of a spring *s*. The

working extremity of the pawl d , operated by a thrust to rotate the ratchet-wheel a' , in the direction indicated by the arrow in the drawings when the bar c , is shifted toward the left 5 and the working extremity of the pawl d' , is hook-shaped and operates by a pull to rotate the ratchet-wheel a' , in the same direction when the bar c , is shifted toward the right. e and e' , are detents, stop-dogs, pallets or 10 anchors carried by the bar c , and adapted to engage the teeth of the escape wheel a^2 , and thus limit and adjust the steps of the intermittent motion imparted to the revoluble member a , by the pawls d' and d^2 . The bar 15 c , is pivotally connected with the armature-lever f , of an electro-magnet f' , and the armature-lever f , is solicited normally into the position illustrated in the drawings, by means of a retracting-spring s' , so that when the circuit 20 is closed through the coils of the electro-magnet f' , the armature-lever f , is pulled up, thus causing the bar c , to be shifted toward the left in the drawings, with the result that the pawl d engages the ratchet-wheel a' , and 25 shifts the revoluble-member a , and the detent, stop-dog, pallet or anchor e' , engages the escape wheel a^2 , and limits and adjusts the range of motion of the revoluble member a . When the circuit through the magnet f' , is 30 interrupted, the bar c , is shifted by the spring s' , toward the right, with the result that the pawl d' , engages the ratchet-wheel a' , and rotates the member a , whereupon the detent, stop-dog, anchor or pallet e , engages the escape 35 ment wheel a^2 , and thus adjusts and limits the range of motion of the member a .

g , is a circuit breaker and closer operated by the minute hand spindle or shaft g' , of a mechanically driven principal clock g^2 . The 40 circuit breaker and closer g , in the present instance, comprises two disks g^3 and g^4 , insulated from the shaft or spindle g' , and in electrical communication with each other. The periphery of the disk g^4 , is of conducting material, and the periphery of the disk g^3 , is provided 45 with insulating points or contacts g^5 , of which there are in the present instance sixty corresponding with the number of minutes in one hour. The contact spring h , of the circuit breaker and closer g , is connected to 50 earth through a battery i , by a conductor l , and the contact spring h' , of the circuit breaker and closer g , is connected to earth through a battery i' , and through the coils of 55 the magnets f' , of the motors of the series of clocks b , b' and b^2 , by means of a conductor 2.

The mode of operation of the hereinabove described apparatus is as follows:—The revolution of the hour hand spindle or shaft g' , 60 causes the circuit breaker and closer g , to make and break the circuit through the coils of the magnets f' , of the series of clocks b , b' and b^2 , once every minute, and each make in the circuit through the coils of the magnets 65 f' , causes the bar c , to be shifted toward the left under the influence of the magnets f' , and each break in the circuit causes the bar

c , to be shifted under the influence of the spring s' , toward the right, and these movements of the bar c , cause the revoluble member or minute hand spindle a of each clock to 70 be rotated for a distance corresponding to a minute as designated upon the faces or dials of the clocks b , b' and b^2 . It being understood that for this purpose the ratchet-wheel 75 a' , is provided with one hundred and twenty teeth, and that the escape-wheel a^2 is provided with two hundred and forty teeth, although for the sake of clearness a less number of teeth is shown in the drawings. The 80 repetition of the hereinabove described makes and breaks or impulses in the line circuit causes each of the motors to drive its corresponding clock in such manner that all the 85 clocks move synchronously and in unison and are controlled by the principal clock g^2 .

It will be obvious to those skilled in the art to which our invention appertains that modifications may be made in the details of our invention without departing from the spirit 90 thereof, and hence we do not limit ourselves to the precise construction and arrangement of parts hereinabove explained and illustrated in the accompanying drawings.

Having thus described the nature and objects of our invention, what we claim as new, 95 and desire to secure by Letters Patent, is—

1. A step by step electric-motor, comprising a revoluble-member provided with ratchet and escape wheels, and a slotted device or 100 bar for accommodating said revoluble member and responding to electrical impulses and provided with pawls, whereof one is provided with a hook-shaped extremity and operates by a pull and whereof the other operates by 105 a push or thrust to rotate said ratchet-wheel, and detents, pallets, stop-dogs or anchors mounted on said device or bar and adapted to limit and adjust the movements of the escape-wheel, substantially as and for the purposes 110 set forth.

2. A step by step electric-motor, having a revoluble-member provided with ratchet and escape-wheels, a bar provided with a slot for the accommodation of said revoluble-member, 115 and with pivotal pawls, whereof one is provided with a hook-shaped extremity and rotates said ratchet-wheel by a pull and whereof the other rotates said ratchet-wheel by a push or thrust, and detents, pallets or stop-dogs 120 carried by said bar and adapted to limit and adjust the movements of the escape-wheel, substantially as and for the purposes set forth.

3. In combination, a series of instruments 125 having a revoluble-member provided with ratchet and escape-wheels, a slotted device for the accommodation of said revoluble member and responding to electrical impulses in line and provided with pawls, whereof one 130 operates by a thrust and the other is provided with a hook-shaped extremity and operates by a pull to rotate said ratchet-wheel, pallets, detents or anchors for limiting and adjusting

the movements of the escape-wheel, a line circuit, electrical and mechanical devices actuated by a principal instrument and adapted to synchronously operate all the primary instruments therewith, substantially as and for the purposes set forth.

4. In combination, a series of instruments having a revoluble-member provided with ratchet and escape-wheels, a slotted bar for the accommodation of said revoluble member, and responding to electrical impulses in line and provided with pawls, whereof one is provided with a hook-shaped extremity adapted to operate by a pull and whereof the other is adapted to operate by a thrust to rotate said ratchet-wheel, detents, pallets or anchors for

limiting and adjusting the movement of the escape-wheel, and a line circuit controlled by a circuit breaker and closer actuated by a principal instrument and adapted to synchronously operate all the other instruments looped or connected in circuit therewith, substantially as and for the purposes set forth.

In testimony whereof we have hereunto set our signatures in the presence of two subscribing witnesses.

JOB A. DAVIS.
ROBERT A. FOWDEN.

Witnesses:

THOMAS M. SMITH,
RICHARD C. MAXWELL.