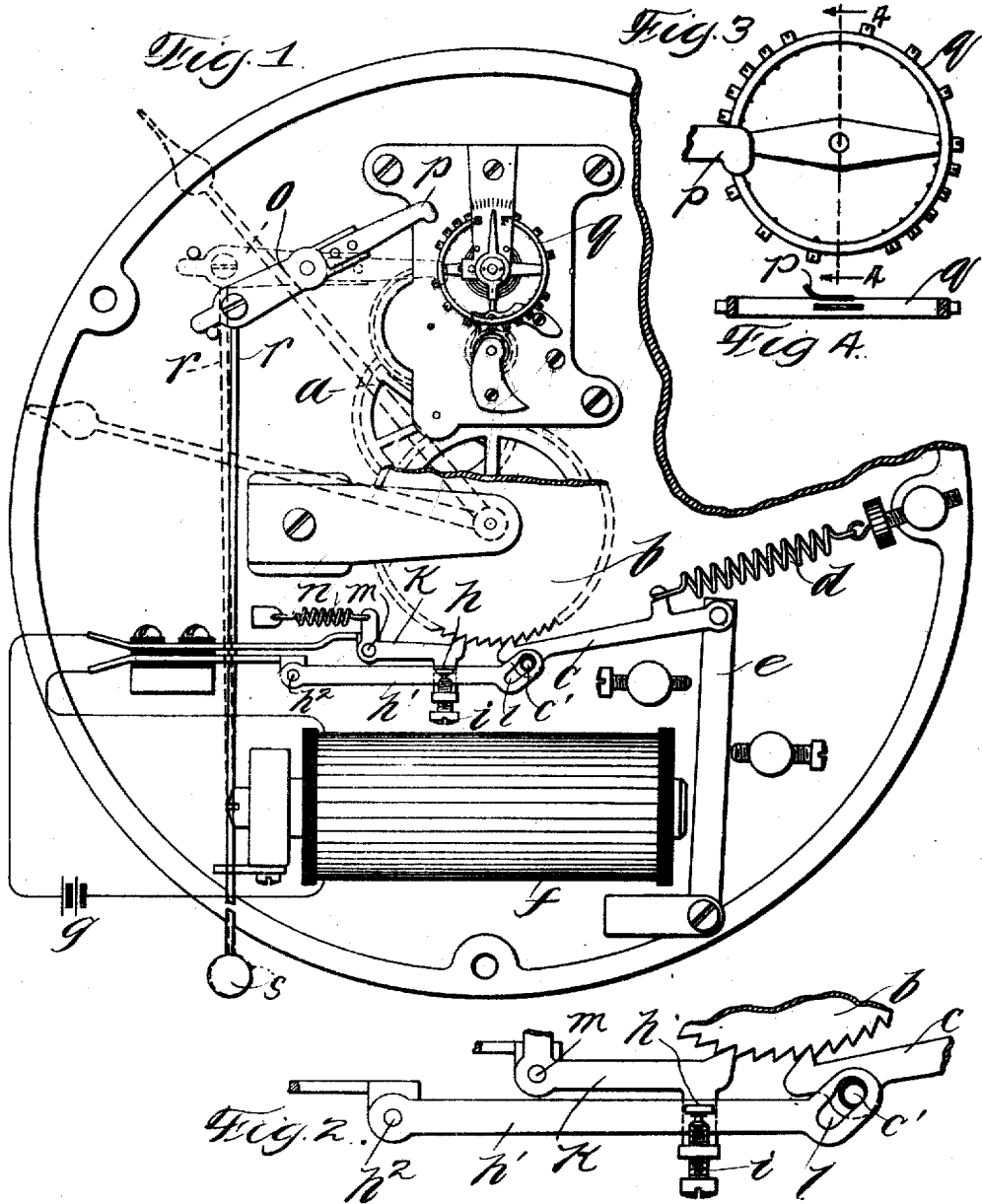


E. E. YAXLEY.
MOTOR.

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929,744.

Patented Aug. 3, 1909.



WITNESSES:

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UNITED STATES PATENT OFFICE.

ERNEST E. YAXLEY, OF CHICAGO, ILLINOIS.

MOTOR.

No. 929,744.

Specification of Letters Patent.

Patented Aug. 3, 1909

Application filed December 28, 1908. Serial No. 469,540.

To all whom it may concern:

Be it known that I, ERNEST E. YAXLEY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Motors, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to motors and particularly to that class of motors finding service in the operation of clocks, though I do not wish to be limited to the use to which the device of my invention is put.

It is one of the objects of my invention to provide means for stopping the operation of the wheel train of the motor, which means also preferably acts to start the train when it is desired to have the stopping action of said means removed. The means comprises a braking device which is preferably accessible from the exterior of the motor, which braking device is preferably coöperatively related to the balance wheel of the motor in a manner to engage said balance wheel when the motor is to be stopped and to actuate the balance wheel when the motor is to be released, thereby to start the motor, the braking mechanism thus having added to it the additional function of a starter.

The present feature of my invention is of particular service in connection with the motors employed for operating master clocks, though I do not wish to be limited to the use to which my invention is put. When used in connection with master clocks, it enables the clock adjuster to stop the master clock quickly and to start it quickly for the purpose of bringing the master clock into synchronism with standard time, and whereby the secondary clocks may be permitted to remain in synchronism with the master clocks. By way of example, let it be assumed that the master clock effects an operation of the motor devices of the secondary clocks once a minute, and let it be further assumed that the master clock is a half minute fast (for example) with respect to standard time. The motor mechanism of the master clock may be stopped by means of the braking device just a half minute, immediately whereupon the braking device may be operated to release the motor of the master clock

and at the same time start it into action, whereby the master clock is brought into synchronism with standard time and the secondary clocks are not thrown out of synchronism with the master clock.

Another feature of my invention relates to that class of motors in which electro-magnetic mechanism is employed for the purpose of supplying the same with motive power, and has for its object the provision of means for maintaining the contacts that govern the energizing circuit clean and bright. This latter feature of my invention finds its preferred adaptation to the motor mechanism covered in my co-pending application for United States Letters Patent Serial No. 424,760, filed April 2, 1908, though I do not limit myself to the adaptation of my present invention to the motor of said application.

I will explain my invention more fully by reference to the accompanying drawing, showing several embodiments thereof, in which—

Figure 1 is a rear view of a clock motor constructed in accordance with my invention. Fig. 2 is an enlargement of a part of the mechanism illustrated in Fig. 1. Fig. 3 is an enlargement of a part of the mechanism illustrated in Fig. 1. Fig. 4 is a sectional view on line 4 4 of Fig. 3.

Like parts are indicated by similar characters of reference throughout the different figures.

The motor mechanism illustrated comes, as has been stated, within the scope of claims in my aforesaid application for United States Letters Patent Serial No. 424,760, filed April 2, 1908, such motor mechanism being selected for purpose of illustration in the present application as one to which my present invention in its different aspects is readily adapted. This motor mechanism includes a clock train *a* in suitable relation with the hands of the clock, all as is well understood by those skilled in the art. The initial wheel *b* of the train *a* is in the form of a ratchet wheel, to which torque is initially applied for the purpose of operating the balance of the train in suitable gear relation with the wheel *b*. Torque is applied to the wheel *b* by means of an actuating pawl *c*, which is, in turn, operated by a spring *d*. The pawl *c* is pivoted upon an armature *e* and power is effectively exerted upon the pawl *c* by the

spring *d*, it being understood that this power is effectively exerted during the time that the magnet *f* is in open circuit. When the armature *e* has completed its normal receding movement from its electro-magnet, the circuit including the electro-magnet and a suitable source of current, as the battery *g*, is closed between the contacts *h* and *i*, as will be presently described, whereby the tension of the spring *d* is increased for the purpose of renewing the power that is required to operate the motor. During the attraction of the armature this circuit is maintained closed. To accomplish this result in the embodiment of the invention shown, I enable the holding pawl or detent *k* (which is included in circuit with the battery *g* in serial relation with the contact *i*) to act upon the contact *i* in such a manner that when the actuating pawl *c* has moved the wheel *b* its predetermined arcual distance, preferably one tooth, the holding pawl will drop into engagement with a fresh tooth and permit the contact *i* to engage the contact *h*.

In order to open the circuit, the contact *h* is lifted, which lifting operation takes place when the armature *e* has been fully attracted, it being understood that when the armature is fully attracted, the actuating pawl *c* has engaged a fresh tooth, the pawl, when dropping into engagement with a fresh tooth, permitting an agency to effect the elevation of the contact *h*, which agency is desirably the same spring *d*. The contact *h* is provided upon an arm *h*¹ which is mounted to swing or rotate about a center illustrated at *h*² upon a bracket that affords a support for said arm *h*. The contact *i* is carried upon a bracket extension of the pawl *k*, is located beneath the contact *h*, and is desirably in the form of a screw, thus making the contact *i* adjustable with respect to the contact *h*, the contacts *h* and *i* both being preferably rigid. The arm *h*¹ and the pawl *c* are articulated together, the pawl *c* being provided with a cam pin *c*¹ while the contiguous end of the arm *h*¹ is provided with a slot *l* which has its lowermost oblique surface parallel with the surface of the tooth *b*, over which the pawl *c* is adapted to ride when said pawl is moved by the armature in re-winding the motor. The lower part of the uppermost surface of the cam slot *l* has a similar direction, but the upper portion of the upper surface of the cam slot *l* is swung toward the said tooth surface over which the pawl *c* rides when being moved by the armature of the electro-magnet, so that when the pin *c* is in line with the upper portion of the cam slot *l*, the arm *h*¹ is permitted to descend slightly so as to cause a partial approach of the contact *h* toward the contact *i* before the detent or holding pawl *k* drops into engagement with a fresh tooth. When the armature has just

about reached its fully receded position, in which movement the wheel *b* has been rotated toward the armature by the pawl *c*, the detent pawl *k* drops into engagement with a fresh tooth, the contact *i* then approaching and engaging the contact *h*, which contact *h* had hitherto approached the contact *i*, as has been stated, the contact *i* in its movement reaching the contact *h* to close circuit through the battery *g*, whereupon the magnet *f* is energized to attract its armature *e* to replenish power in the spring *d*.

The holding pawl *k* is desirably in the form of a bell-crank lever pivoted at *m* and having connection with a spring *n* which serves to hold the pawl *k* in engagement with the ratchet wheel *b*. It will be observed that the surface of the contact *h* engaged by the contact *i*, is in substantial horizontal alinement with the pivot *h*² of the arm *h*¹ and that surface of the contact *i* that is adapted for engagement with the contact *h* is in oblique alinement with the pivot *m* of the pawl *k*, so that when the pawl *k* drops into fresh tooth engagement, the contact *i* is moved over the engaged surface of the contact *h*, thereby rubbing said surface so as to maintain the engaged surfaces of the contacts *h* and *i* constantly bright and clean. The initial engagement of the contact *i* with the contact *h* is effected when the pawl *k* has dropped part way and the rubbing action occurs during the time that the pawl drops the balance of the way into engagement with the tooth. This result, in the embodiment of the invention illustrated, is obtained by reason of the fact that the line including the rubbed surface of the contact *i* and pivot *m* is angular with respect to the line including the rubbed surface of the contact *h* and pivot *h*². The result is further promoted by having the centers *m* and *h*² non-co-incident. The initial engagement of the contact *i* with the contact *h* occurs during the engagement of the pin *c*¹ with the upper end of the cam slot *l*. The enlargement of the upper end of the cam slot *l* permits the spring *n* acting through the contact *i* and the contact post *h*, to lift the arm *h*¹, the rubbing action between the contacts *h* and *i* occurring during the lifting movement of the arm *h*¹. It is thus important in the precise construction that I have illustrated to enlarge the upper end of the cam slot *l*, for if the upper surface of said cam slot were kept parallel with the lower surface of said cam slot throughout, and therefore parallel with the surface of the tooth over which the pawl *c* rides, the contact *h* would not be lowered toward the contact *i* and the spring *n* would not be adapted to effect rubbing movement of the contact *i* over the contact *h*, which rubbing movement accompanies the lifting action of the contact *i* upon the contact *h*. In other words, the post *h* is dropped

by reason of the deflection in the upper oblique wall of the cam slot *l*, a distance through which it may afterward be raised by the lifting action of the contact *i*, for if the post *h* did not drop and afterward were permitted to rise by reason of the enlargement at the upper end of the cam slot *l*, the only function which the spring *n* would exercise would be to bring the contact *i* solidly against the contact *h* without lifting the contact *h*, for were the enlargement at the upper end of the cam slot *l* that had permitted the descent of the contact *h*, absent, said contact *h* could not be elevated, because the pin *c'* would not, without said enlargement of the cam slot *l*, have had opportunity to leave the lower oblique surface of the cam slot *l*, which lower oblique surface serves to limit the upward movement of the arm *h'* carrying the contact *h*. In other words, lost motion is provided between the pin *c'* and the upper end of the cam slot *l*, which permits of the descent of the arm *h'* and contact *h*, and, consequently, permits said arm *h'* and contact *h* to rise before the pin *c'* is rigidly engaged by the lower oblique wall of the cam slot. The undeflected portion of the upper wall of the cam slot *l* serves, in cooperation with the pin *c'*, to move the contact *h* away from the contact *i* after the energization of the magnet *f*, to open the circuit of said magnet, and thereby permit the spring *d* to operate the motor.

In order that the motor may be stopped, I desirably provide the braking mechanism illustrated, which includes a centrally pivoted braking lever *o* carrying a brake shoe *p* whose arc of travel intercepts the periphery of the balance wheel *q*, the operating rod *r* hanging from the lever *o*, extending to the exterior of the motor mechanism, where it terminates in a handle *s*, by grasping which the rod *r* may be moved up or down to swing the brake shoe into or out of engagement with the balance wheel, the braking engagement of the brake shoe *p* with the balance wheel being indicated in dotted lines in Fig. 1 and in full lines in Figs. 3 and 4, the idle position of the brake shoe being indicated in full lines in Fig. 1. After the motor has been stopped a sufficient length of time, it is moved from the position shown in the dotted lines in Fig. 1 to the position shown in full lines. Inasmuch as I have shown the brake in cooperative relation with the balance wheel and occupying the position it does with relation to the balance wheel, the upward movement of the brake shoe, in being released from the brake wheel, will impart a turning movement to the balance wheel, which is set into operation as soon as the brake shoe leaves the balance wheel.

I have tested the device constructed as illustrated in the drawing, and by operating the motor at a high rate of speed, have

caused contact to be made and broken at *h* and *i* over ten million times without any attention to the contacts *h* and *i*, thus indicating that a clock would operate, with a suitable source of current at *g*, upward of twenty years. This test is still being continued, and inasmuch as the contacts *h* and *i* have not been impaired by burning, corroding or in any other discernible way, it would seem that the motor of my invention would be capable of operation for a much greater period of time, which great length of service is obtainable, as has been indicated, without any cleaning of the contacts *h* and *i* other than that occasioned by the rubbing action of the contacts.

It will be observed that the brake when applied to the balance wheel, rotates the balance wheel, thereby promoting the starting tendency of the balance wheel when the brake is released.

While I have herein shown and particularly described the preferred embodiment of my invention, I do not wish to be limited to the precise arrangement illustrated, as changes may readily be made without departing from the spirit of the invention.

Having thus described my invention, I claim as new and desire to secure by Letters Patent the following:—

1. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet wheel forming part of the load operated by the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device without disturbing the load, and switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth engagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing about another point, the line including the point about which the pawl may swing and the contact carried by the pawl intersecting the line including the companion contact and the point about which it swings, the point about which one of the contacts swings or rotates being sufficiently nearer the contacts than the point about which the companion contact swings or rotates, so as to occasion material rubbing action between the contacts to keep said contacts clean.

2. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet wheel forming part of the load operated by

the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device without disturbing the load, and switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth engagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing about another point, the point about which one of the contacts swings or rotates being sufficiently nearer the contacts than the point about which the companion contact swings or rotates, so as to occasion material rubbing action between the contacts to keep said contacts clean.

3. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet wheel forming part of the load operated by the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device, and switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth engagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing about a point non-co-incident with the point about which the pawl is adapted to swing, the mechanism by which the power device may operate said load including an operating pawl actuated by the power device and engaging said ratchet wheel, said pawl having cam engagement with the member carrying the contact that is companion to the contact carried by the first aforesaid pawl, serving to open the circuit of the electro-magnet after said contacts have been engaged and permitting the contact-supporting member that is in cam engagement with said pawl to partially approach the contact carried by the first aforesaid pawl, whereby the first aforesaid pawl is adapted to cause the contact it controls to lift and rub over the companion contact when circuit is closed through said electro-magnet.

4. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet wheel forming part of the load operated by the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device, and switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth en-

gagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing about a point non-co-incident with the point about which the pawl is adapted to swing, the line including the point about which the pawl may swing and the contact carried by the pawl intersecting the line including the companion contact and the point about which it swings, the mechanism by which the power device may operate said load including an operating pawl actuated by the power device and engaging said ratchet wheel, said pawl having cam engagement with the member carrying the contact that is companion to the contact carried by the first aforesaid pawl, serving to open the circuit of the electro-magnet after said contacts have been engaged and permitting the contact-supporting member that is in cam engagement with said pawl to partially approach the contact carried by the first aforesaid pawl, whereby the first aforesaid pawl is adapted to cause the contact it controls to lift and rub over the companion contact when circuit is closed through said electro-magnet.

5. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet wheel forming part of the load operated by the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device without disturbing the load, and switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth engagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing about another point, the line including the point about which the pawl may swing and the contact carried by the pawl intersecting the line including the companion contact and the point about which it swings, the mechanism by which the power device may operate said load including an operating pawl actuated by the power device and engaging said ratchet wheel, said pawl having cam engagement with the member carrying the contact that is companion to the contact carried by the first aforesaid pawl, serving to open the circuit of the electro-magnet after said contacts have been engaged and permitting the contact-supporting member that is in cam engagement with said pawl to partially approach the contact carried by the first aforesaid pawl, whereby the first aforesaid pawl is adapted to cause the contact it controls to lift and rub over the companion contact when circuit is closed through said electro-magnet.

6. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet wheel forming part of the load operated by the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device without disturbing the load, and switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth engagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing about another point, the line including the point about which the pawl may swing and the contact carried by the pawl intersecting the line including the companion contact and the point about which it swings, the point about which one of the contacts swings or rotates being nearer the contacts than the point about which the companion contact swings or rotates, the mechanism by which the power device may operate said load including an operating pawl actuated by the power device and engaging said ratchet wheel, said pawl having cam engagement with the member carrying the contact that is companion to the contact carried by the first aforesaid pawl, serving to open the circuit of the electro-magnet after said contacts have been engaged and permitting the contact-supporting member that is in cam engagement with said pawl to partially approach the contact carried by the first aforesaid pawl, whereby the first aforesaid pawl is adapted to cause the contact it controls to lift and rub over the companion contact when circuit is closed through said electro-magnet.

7. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet wheel forming part of the load operated by the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device without disturbing the load, and switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth engagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing about another point, the point about which one of the contacts swings or rotates being nearer the contacts than the point about which the companion contact swings or rotates, the mechanism by which the power device may

operate said load including an operating pawl actuated by the power device and engaging said ratchet wheel, said pawl having cam engagement with the member carrying the contact that is companion to the contact carried by the first aforesaid pawl, serving to open the circuit of the electro-magnet after said contacts have been engaged and permitting the contact-supporting member that is in cam engagement with said pawl to partially approach the contact carried by the first aforesaid pawl, whereby the first aforesaid pawl is adapted to cause the contact it controls to lift and rub over the companion contact when circuit is closed through said electro-magnet.

8. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet wheel forming part of the load operated by the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device, switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth engagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing about a point non-co-incident with the point about which the pawl is adapted to swing, the mechanism by which the power device may operate said load including an operating pawl actuated by the power device and engaging said ratchet wheel, said pawl having cam engagement with the member carrying the contact that is companion to the contact carried by the first aforesaid pawl, serving to open the circuit of the electro-magnet after said contacts have been engaged, there being lost motion between the pawl that is employed to transmit power from the power device and the contact-supporting member in cam engagement therewith to permit the contact carried by the first aforesaid pawl to rise and rub over the companion contact.

9. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet wheel forming part of the load operated by the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device, and switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth engagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing

about a point non-coincident with the point about which the pawl is adapted to swing, the line including the point about which the pawl may swing and the contact carried by the pawl intersecting the line including the companion contact and the point about which it swings, the mechanism by which the power device may operate said load including an operating pawl actuated by the power device and engaging said ratchet wheel, said pawl having cam engagement with the member carrying the contact that is companion to the contact carried by the first aforesaid pawl, serving to open the circuit of the electro-magnet after said contacts have been engaged, there being lost motion between the pawl that is employed to transmit power from the power device and the contact-supporting member in cam engagement therewith to permit the contact carried by the first aforesaid pawl to rise and rub over the companion contact.

10. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet wheel forming part of the load operated by the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device without disturbing the load, and switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth engagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing about another point, the line including the point about which the pawl may swing and the contact carried by the pawl intersecting the line including the companion contact and the point about which it swings, the mechanism by which the power device may operate said load including an operating pawl actuated by the power device and engaging said ratchet wheel, said pawl having cam engagement with the member carrying the contact that is companion to the contact carried by the first aforesaid pawl, serving to open the circuit of the electro-magnet after said contacts have been engaged, there being lost motion between the pawl that is employed to transmit power from the power device and the contact-supporting member in cam engagement therewith to permit the contact carried by the first aforesaid pawl to rise and rub over the companion contact.

11. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet

wheel forming part of the load operated by the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device without disturbing the load, and switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth engagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing about another point, the line including the point about which the pawl may swing and the contact carried by the pawl intersecting the line including the companion contact and the point about which it swings, the point about which one of the contacts swings or rotates being nearer the contacts than the point about which the companion contact swings or rotates, the mechanism by which the power device may operate said load including an operating pawl actuated by the power device and engaging said ratchet wheel, said pawl having cam engagement with the member carrying the contact that is companion to the contact carried by the first aforesaid pawl, serving to open the circuit of the electro-magnet after said contacts have been engaged, there being lost motion between the pawl that is employed to transmit power from the power device and the contact-supporting member in cam engagement therewith to permit the contact carried by the first aforesaid pawl to rise and rub over the companion contact.

12. Apparatus of the class described including an electro-magnet, a power device in which energy is stored by the electro-magnet when energized, mechanism operable by said power device to enable the transmission of power therefrom to perform work, a ratchet wheel forming part of the load operated by the power device, a holding pawl adapted to engage the ratchet wheel to hold the same to enable the electro-magnet to replenish power in said power device without disturbing the load, and switching mechanism for closing circuit through said electro-magnet when said pawl has fresh tooth engagement, said switching mechanism including one contact carried by said pawl and a second contact mounted to rotate or swing about another point, the point about which one of the contacts swings or rotates being nearer the contacts than the point about which the companion contact swings or rotates, the mechanism by which the power device may operate said load including an operating pawl actuated by the power device and engaging said ratchet wheel, said pawl having cam engagement with the member carrying the contact that is companion to the contact carried by the first aforesaid pawl, serving to open the circuit of the electro-magnet after said contacts have been engaged, there being

lost motion between the pawl that is employed to transmit power from the power device and the contact-supporting member in cam engagement therewith to permit the contact carried by the first aforesaid pawl to rise and rub over the companion contact.
In witness whereof, I hereunto subscribe

my name this 26th day of December A. D., 1908.

ERNEST E. YAXLEY.

Witnesses:

G. L. CRAGG,
L. C. STROH.