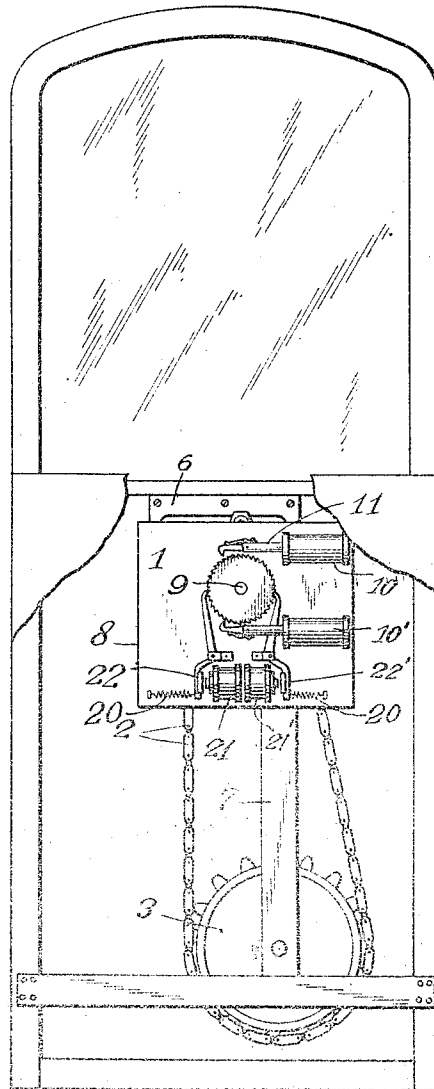


H. E. NORWOOD.
ELECTRICALLY CONTROLLED WINDOW RAISING AND LOWERING MECHANISM.
APPLICATION FILED JUNE 16, 1917.

1,260,435.

Patented Mar. 26, 1918.
5 SHEETS—SHEET 1.

Fig. 1.

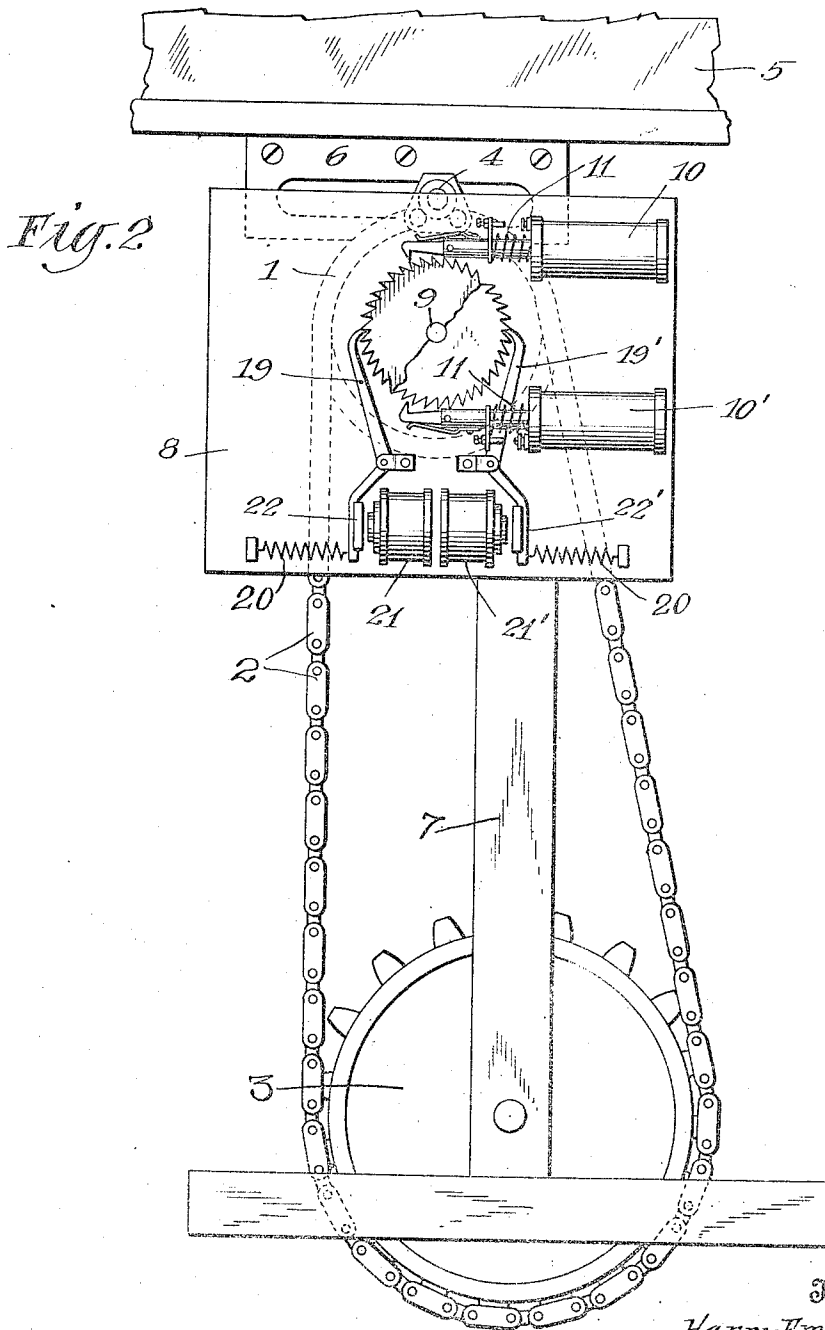


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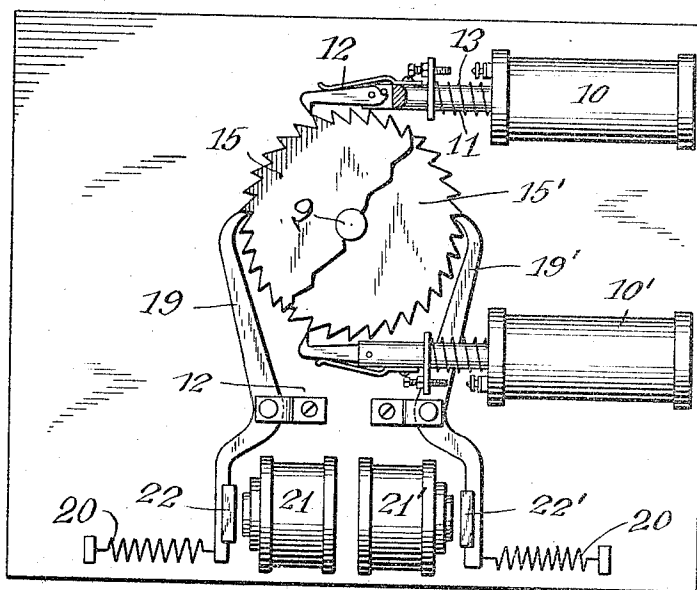
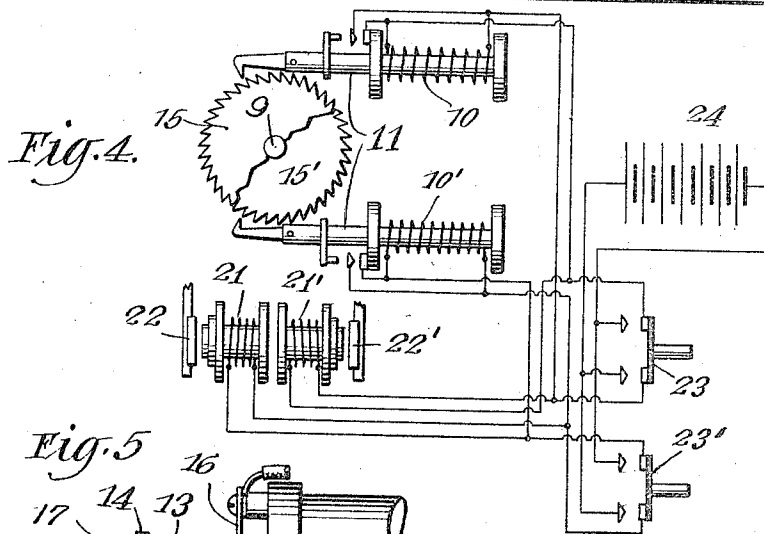
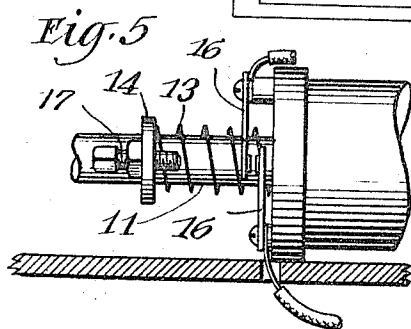
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Fig. 3.



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5 SHEETS—SHEET 4.

Fig. 6.

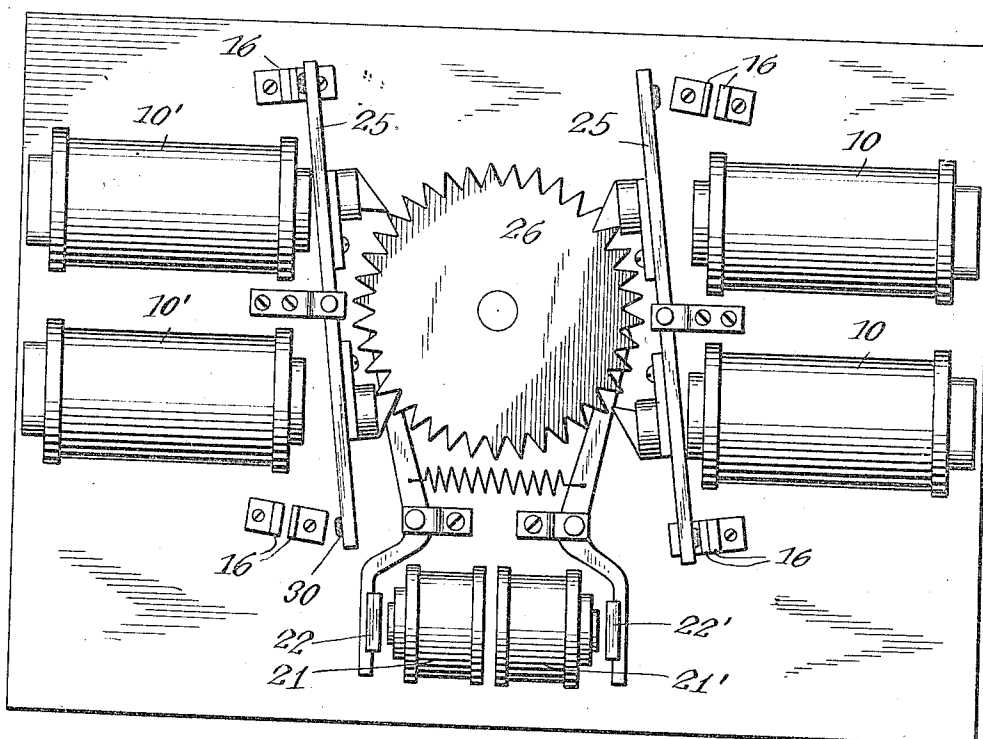
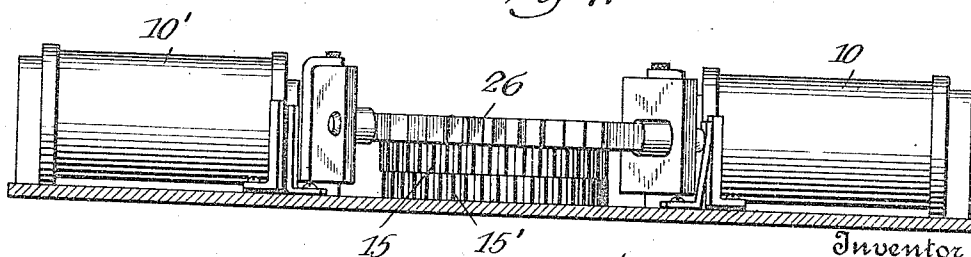


Fig. 7.



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5 SHEETS—SHEET 5.

Fig. 8.

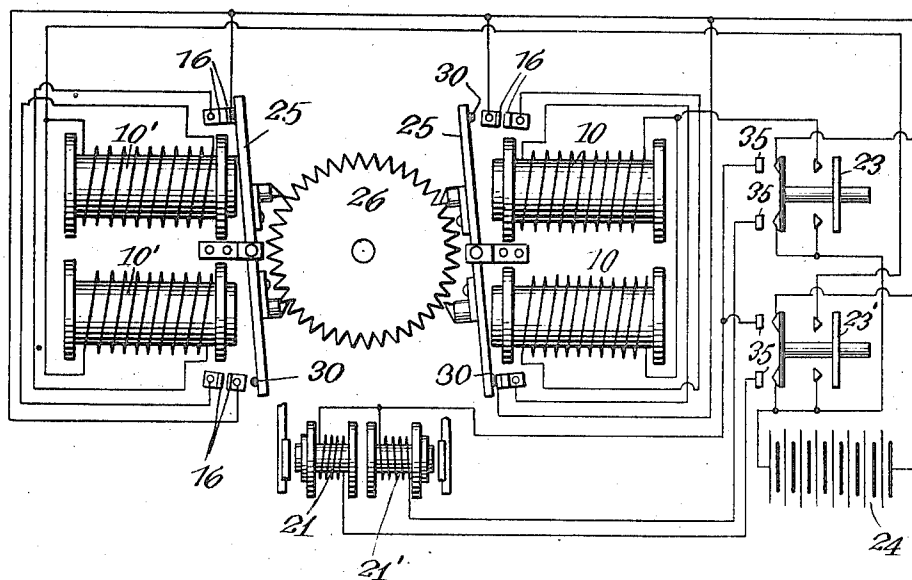
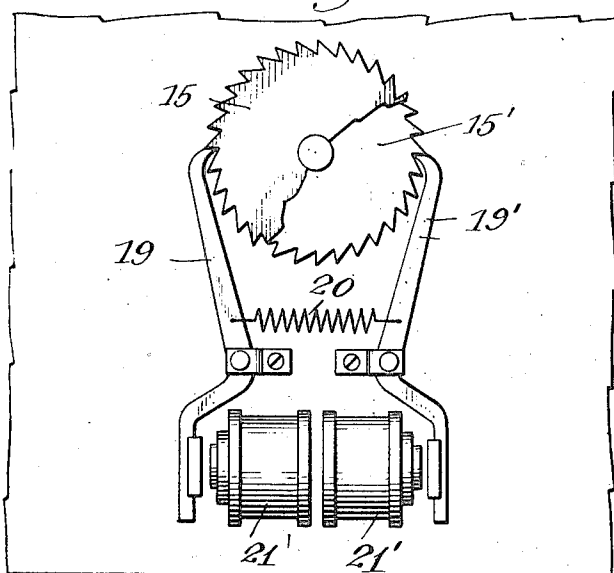


Fig. 9.



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UNITED STATES PATENT OFFICE.

HARRY EMERY NORWOOD, OF NEW YORK, N. Y., ASSIGNOR TO PERFECT WINDOW
REGULATOR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

ELECTRICALLY-CONTROLLED WINDOW RAISING AND LOWERING MECHANISM.

1,260,435.

Specification of Letters Patent.

Patented Mar. 26, 1918.

Application filed June 16, 1917. Serial No. 175,145.

To all whom it may concern:

Be it known that I, HARRY EMERY NORWOOD, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electrically-Controlled Window Raising and Lowering Mechanism, of which the following is a specification.

My invention relates to apparatus for raising or lowering a window to any desired position and automatically locking it in such position.

The object of my invention is to provide simple and inexpensive means whereby the desired raising and lowering movement and the locking of the window in the desired position at will may be effected by electro-magnetism.

A further object of my invention is to provide electro-magnetic means for this purpose which shall be of such small lateral dimensions that the whole operating mechanism for raising and lowering and locking the window may be conveniently located in the panel of a door or an automobile or carriage body.

To these ends my invention consists essentially in the combination with the window of a wheel preferably a sprocket wheel operatively connected with the window by any suitable means such for instance as a belt, like a chain belt, running on said wheel and itself engaging by a suitable pin with a part carried by the wheel, and means for imparting a step by step movement or action to said wheel by electro-magnetic action in either direction at will.

The invention further consists in an improved means whereby the window may be locked and unlocked under the control of electro-magnets energized and deenergized at the same time with the magnets producing the step by step action.

The invention also consists in the details of construction and combinations of devices more particularly hereinafter described and claimed.

Referring to the accompanying drawings:

Figure 1 is a general elevation of an apparatus embodying my invention and shows the same applied in connection with a glass window plate of a carriage or automobile door.

Fig. 2 is an enlarged elevation showing the apparatus.

Fig. 3 is an enlarged elevation of the electro-magnetic actuating means.

Fig. 4 is a general diagram of the circuits of the apparatus.

Fig. 5 is a detailed view of one end of an actuating electro-magnet and shows the circuit closer and breaker for producing a step by step action.

Fig. 6 is a general elevation of a modified step by step action operated by electro-magnets and Fig. 7 is a plan of the same.

Fig. 8 is a general diagram of the circuits for an apparatus such as illustrated in Figs. 6 and 7.

Fig. 9 is an enlarged view of the locking devices electro-magnetically operated or controlled, suitable for use with the apparatus shown in Figs. 6, 7 and 8.

1 indicates a wheel such as a sprocket wheel adapted to turn in either direction upon a suitable shaft and 2 is a belt such as a chain belt running over said wheel and over another wheel 3 which takes the lower run of the chain or belt 2. 4 indicates a stud or pin carried by the belt and whereby said belt is operatively connected with the window or glass plate 5 which is to be raised and lowered in suitable guide-ways in the door or body. The connection between the pin or stud 4 and the window 5 is shown as effected by means of a plate 6 bolted or secured to the lower part of the window 5 and having a longitudinal guide slot in which the pin or stud 4 engages as well understood by those skilled in the art, so that, as the sprocket wheel 1 is rotated in one direction the window will be raised out of the panel in which the operating parts are located or will be lowered into the same as the wheel is rotated in the opposite direction.

7 indicates a suitable framework in which the parts of the operating mechanism may be mounted and 8 a plate or plates forming a part of said framework or attached thereto and serving for the attachment of the magnets and reciprocating actuating mechanisms operated by said magnets as will be presently described.

9 indicates the shaft on which the wheel 1 is mounted or to which it is secured. 10 indicates an electro-magnet the circuit of

which may be closed by any circuit controlling devices or push-button and which, when energized, operates with an automatic step by step action so long as said circuit is closed to turn the wheel 1 in a direction to raise the window; and 10' indicates a similar magnet similarly controlled and acting in a way to impart rotation to the wheel 1 in the reverse direction and thereby lower the window.

In the embodiment of my invention shown in Figs. 1 to 5 inclusive the form of magnet shown is one having a movable core 11 upon the end of which is borne an actuating pawl 12, but as will be further described, an electro-magnet having fixed core and movable armature might be used for the same purpose. 13 indicates a spring which encircles the core and is retained between the head of the magnet and the collar 14 secured to said core. Said spring acts on the core in a direction opposed to the magnetic pull so that, by combining with the magnet an automatic circuit breaker or device for intermittently and automatically energizing and deenergizing the magnet, a reciprocating or to and fro movement may be imparted automatically to the pawl 12 and a step by step action of the wheel 1 may be produced by the use of suitable toothed or ratchet wheels upon which the pawls 12 act.

In the embodiment of my invention illustrated in Figs. 1 to 5 inclusive, two ratchet wheels 15, 15' are employed. These ratchet wheels are suitably secured to the wheel 1 or the shaft thereof and have their teeth reversely arranged as shown. The teeth of wheel 15 are properly disposed so that by the to and fro movement of the core of magnet 10 said wheel 15 will be turned step by step by the action of the pawl 12 in a direction to turn the sprocket wheel 1 and raise the window, while the teeth of wheel 15' are reversely disposed so that, under the action of magnet 10' and its core and attached actuating pawl the wheel 1 will be turned in the reverse direction to lower the window. The automatic interrupted action of the magnets may be produced as well understood in the art by breaking the energizing circuit thereof or by any other suitable means. I have however, in the present instance, shown this action as being brought about by the shunting action of a circuit closer and breaker as this is preferable under the conditions of use of my device to an interruption of the circuit of the magnet coils.

The elements of the shunting circuit closer and breaker may comprise, as shown, a pair of springs 16 mounted on the head of the electro-magnet and adapted to be brought into contact with one another to shunt the coils when the core is drawn into the coil in a direction to actuate the pawl 12 and wheel upon which the pawl bears. The

closure of said springs can readily be effected by a screw or pin 17 mounted on the flange or collar 14 secured to the end of the core.

19 indicates a retaining pawl or locking dog engaging wheel 15 and 19' a similar pawl or locking dog engaging wheel 15'. These pawls are normally maintained in engagement with said wheels by the action of a suitable spring or springs 20 (Fig. 2) and are electro-magnetically controlled by means of electro-magnets 21, 21' acting on armatures 22' and 22' attached to the pawls or pawl arms. By a current applied to electro-magnet 21' at the time when the magnet 10 is called into action to produce a step by step rotation of wheel 1 in a direction to raise the window, the armature 22' is drawn up and the pawl 19' which interlocks with the teeth of wheel 15' is removed from locking position, thus leaving the sprocket wheel and shaft free to rotate step by step under the action of magnet 10 and its actuating pawl. In this operation the retaining pawl or dog 19 serves to hold the wheel 15 against reverse movement. So long therefore as the circuit is closed through magnet 10 and magnet 21' the wheel 15 is actuated rapidly step by step in an automatic manner and the window is gradually raised, being retained at each small step of upward movement by the pawl 19. When the circuit is interrupted through magnet 10 and magnet 21', the reciprocating motion of the actuating pawl ceases and the pawl 19' drops back into place and no further movement in an upward direction is possible since the parts are locked against such movement by the pawl or dog 19', while reverse or downward movement is prevented by the pawl or dog 19. The window is therefore retained in the desired lifted position so long as the magnets remain out of action.

To lower the window the circuit of magnet 10' is closed by the push-button or circuit controller, as will be presently described, and the magnet 21 is energized, so that the armature 22 will be drawn up and the pawl or locking dog 19 will be withdrawn from engagement with wheel 15, thus permitting reverse rotation of the wheel 1 to be effected by a step by step electro-magnetic action of the magnet 10' in a direction to lower the window.

One of the arrangements of circuit controllers which may be employed for effectually controlling the action of the magnets 10, 10' and 21, 21' in the manner above described is indicated diagrammatically in Fig. 4. In this instance the circuit controller or push-button that may be used for raising the window at will is indicated at 23 and that for lowering indicated at 23'. Any source of suitable electric energy for energizing the magnets is indicated at 24. As

shown each button carries a pair of contacts insulated from one another and is provided with a pair of cooperating contact points engaged by said contacts when the push-button is depressed. By tracing the circuits shown in the diagram it will be seen that on closing push-button 23 current is made to flow through the coils of magnet 10 and the core thereof is energized so as to actuate the pawl 12 to partially rotate the wheel 15. As the core is drawn into the coil the contacts of spring 16 are engaged and the current is thereby shunted from the magnet 10, so that by the action of the retractor 13 the core is moved in the opposite direction and the pawl 12 brought to position to engage a fresh tooth or teeth of the wheel. When the pressure on the button 23 ceases and the circuit of the magnet is thereby broken by said push-button, the lifting movement of the mechanism ceases owing to the withdrawal of current from the magnet 10. So long as the push-button remains depressed, however, the pawl 12 will be reciprocated automatically and the window will rise rapidly by a series of minute step by step movements. The closure by button 23 also closes the circuit from the source of energy through the magnet 21' operating on armature 22' and pawl or locking dog 19' producing the unlocking action already set forth and the wheel therefore remains unlocked by the dog 19' so long as the button 23 is depressed and while the step by step action is taking place. The interruption of the circuit of magnet 10 by the push-button is also accompanied by interruption of the circuit of the electro-magnet 21', so that the locking dog or pawl 19' will resume normal position and the mechanism will be effectually locked against movement in either direction. By examination of the circuits it will be seen that the closure of the circuit by the button 23' causes current to circulate in the coils of 21 from the source 24, thereby acting upon the armature for the other locking dog or pawl as already set forth. The button or circuit closer 23' also operates to close circuit of the actuating electro-magnet 10' and a reciprocating or step by step action through the power of said magnet applied to the wheel 15' to lower the window takes place in obvious manner.

As already stated, the step by step action by the power of electro-magnets may be produced by the use of magnets having fixed cores and movable armatures. A form of apparatus embodying such a modification is illustrated in Figs. 6, 7, 8 and 9. In this instance I show a pair of magnets for the up movement and a similar pair for the down movement, the magnets of each pair being combined with suitable automatic circuit closers whereby they are thrown into and out of action in alternation to produce, by

positive electro-magnetic force, and without the use of a retractor, suitable vibratory movement of a lever 25 pivoted, as shown, and carrying at opposite sides of its fulcrum respectively the impulse pawls or pallets of a pair of pallets acting on toothed wheel 26. The construction of toothed wheel and impulse pawls is preferably like that of a vibrating escapement so that the pawls attached to one lever 25 will not lock the wheel against rotation by the impulses of the other lever but the teeth of the wheel will pass the impulse teeth freely, the lever at such time vibrating freely. The locking means for the wheel 26 secured as before to the sprocket wheel may consist, as in the case of the apparatus shown in Figs. 1 to 5, of a pair of ratchet wheels 15, 15' mounted on the same shaft as wheel 26. Ratchet dogs or pawls 19, 19' may cooperate with wheels 15, 15' and wheel 26 to lock the latter against movement in either direction and in the manner already described in connection with the apparatus shown in Figs. 1 to 5. The reciprocating vibratory motion so long as the circuit is closed by the circuit controller or push-button 23 or 23' may be produced in the same manner as already described by contacts 16 adapted to be pressed into contact with one another by the insulating button 30 carried by the lever 25.

When push-button 23 is depressed the connection is closed to the pair of magnets 10. As will be seen, by following the circuits, and with the lever 25 for magnets 10 in the position shown, the circuit is complete through the lower pair of contacts 16 for the upper magnet 10 which, being thereby energized, operates the lever 25, thereby interrupts its own circuit and by closing the circuit through the upper pair of contacts 16 completes the connection through the lower magnet 10. The latter being in turn energized, draws the armature lever back to position shown and interrupts its own circuit and the action is automatically repeated with a consequent vibratory action of the lever so long as the button 23 is depressed. A similar action takes place in the pair of magnets 10' when and so long as the button 23' is depressed.

With the parts in position shown it is obvious that the closure of circuit for the magnets 10' by button 23' will produce first, an energization of lower magnet 10' through the closing of spring 16 at the top and that the first movement of the armature lever under the magnetic pull will result in breaking the circuit of the lower magnet 10' and the closure of the circuit of the other magnet 10' and a reciprocating or vibratory action of the left-hand armature lever 25 and a step by step movement of the wheel 26 in the opposite or down direction will ensue and be continued so long as the button 23' is depressed.

is held depressed. In these operations it will be readily understood that owing to the action of the springs carrying the contacts there is a following contact which follows up the movement of the lever 25 thereby keeping the magnet energized and that the lever will be carried by acquired momentum over after the interruption of the circuit so as to effectually close the opposite contacts, thereby producing the rapid reciprocatory motion desired. The action upon the dogs 19, 19' holding them respectively out of action, and synchronous with the closure of the circuit of their magnets respectively by the depression of the push-button will take place in obvious manner and as will be seen by following the circuits closed for said magnets 21, 21' on the supplemental contacts 35 of said push-buttons.

As will be obvious to those skilled in the art, the desired reciprocating action of an impulse pawl or pawls might be secured without retractors by the use of other arrangements of electro-magnets and armature or armatures suitably connected to an impulse pawl or pawls without departing from my invention.

What I claim as my invention is:

1. In an apparatus for raising and lowering windows, the combination with a wheel adapted to turn in either direction and operatively connected with the window to raise or lower the same, a magnet for actuating the wheel step by step in one direction to raise the window and provided with means for producing an automatic interrupted action of the magnetism as described, a magnet and means for producing automatic interrupted action thereof for producing movement of the wheel in the opposite direction and means for closing the connection between one or the other magnet at will and a suitable source of energy to raise or lower the window by a step by step action.

2. In an apparatus for raising and lowering windows, the combination with the window of a wheel operatively connected therewith, a magnetically actuated device operating automatically with interrupted magnetic action to move the wheel in one direction to raise the window, similar means acting on said wheel to move it in the opposite direction to lower the window and circuit controlling devices for connecting and disconnecting at will one or the other of said magnetic means with a suitable source of energy for the raising or lowering operation.

3. In an apparatus for raising and lowering windows, the combination with the window of a wheel operatively connected therewith, a magnetically actuated device operating automatically with interrupted magnetic action to move the wheel in one direction to raise the window, similar means act-

ing on said wheel to move it in the opposite direction to lower the window, circuit controlling devices for connecting and disconnecting at will one or the other of said magnetic means with a suitable source of energy for the raising or lowering operation, locking devices for holding the window against movement in either direction and electro-magnetic means controlling said locking devices, said electro-magnetic means being continuously energized and independently of the interrupted magnetic action by which the window is raised or lowered so long as the lowering or lifting movement is continued.

4. In an apparatus for raising and lowering windows, the combination of a sprocket wheel, a window operatively connected with the sprocket wheel by a belt or chain and a pin or stud carried by the chain and engaging the window or part carried thereby electro-magnetic actuating means for turning said sprocket wheel step by step in either direction at will by interrupted magnetic action, electro-magnetically controlled locking devices for said wheel adapted to hold the same against reverse movement and circuit controlling means cooperating with said locking devices and actuating magnets to throw out of action the locking device for holding the wheel against reverse movement in one direction coincidently with the energization of the magnetic actuating means producing motion in the opposite direction.

5. In an apparatus for raising and lowering windows, the combination with a wheel operatively connected with the window, of electro-magnetic means for propelling said wheel in either direction step by step at will, two locking dogs acting respectively to lock the wheel against rotation in opposite directions, electro-magnetic means, and means for controlling the same at will to throw one or the other of said locking dogs out of action according to the direction of movement of said wheel desired for raising or lowering the window.

6. In an apparatus for raising and lowering windows, the combination of two ratchet wheels having their teeth reversely arranged, a magnetic step by step actuating means for each wheel, a retaining pawl for each wheel and electro-magnetic means for moving either pawl at will from operative relation to its wheel.

7. In an apparatus for raising and lowering windows, the combination substantially as described of a pair of actuating wheels mounted to revolve together and having their teeth reversely arranged as described, an actuating pawl for each wheel, electro-magnetic means for reciprocating each pawl and comprising an electro-magnet provided with means for automatically interrupting

the flow of current through the coils thereof to produce a step by step action, circuit closing devices for closing the circuit of either magnet at will, locking devices for locking the wheels against rotation, electro-magnetic means for controlling the position of said locking devices and means for bringing said electro-magnetic means into action simultaneously with the closure of circuit of said actuating magnets.

8. In an apparatus for raising and lowering windows, the combination substantially as described of a pair of ratchet wheels having teeth reversed, an electro-magnetic reciprocating actuating device for each wheel, a retaining pawl for each wheel and electro-magnets operating on said pawls respectively to throw one or the other out of action at will.

9. In an apparatus of the character described, the combination of a sprocket wheel, a chain, a window connected to the chain, two toothed wheels connected with the sprocket wheel an actuating pawl for each toothed wheel and an operating magnet for each pawl provided with an automatic circuit closer and breaker for producing a reciprocating motion of the pawl at will for imparting a step by step movement to either wheel to raise or lower the window as required.

10. In an apparatus for raising and lowering windows, the combination with a pair of ratchet wheels having reversely arranged

teeth and mounted to revolve together, a reciprocating actuating pawl for each wheel, an actuating magnet operating intermittently to reciprocate the pawl, a retaining pawl for each wheel and electro-magnets acting on said retaining pawls to throw one or the other out of action at will.

11. In an apparatus for raising and lowering windows, the combination of a toothed wheel operatively connected with the window to raise and lower the same, electro-magnetic impulse devices operating on said wheel to move the wheel in one direction step by step to raise the window so long as the connection for said devices with a suitable generator is maintained, similar devices for rotating said wheel step by step in the opposite direction under similar control in order to lower the window, two locking devices adapted respectively to hold said wheel against reverse movement in the operations of raising and lowering the window respectively and means for automatically throwing said locking devices respectively out of action during the raising or lowering movement.

Signed at New York, in the county of New York and State of New York, this 15th day of June, A. D. 1917.

HARRY EMERY NORWOOD.

Witnesses:

F. B. TOWNSEND,
IRENE LEPKOWITZ.