

July 8, 1924.

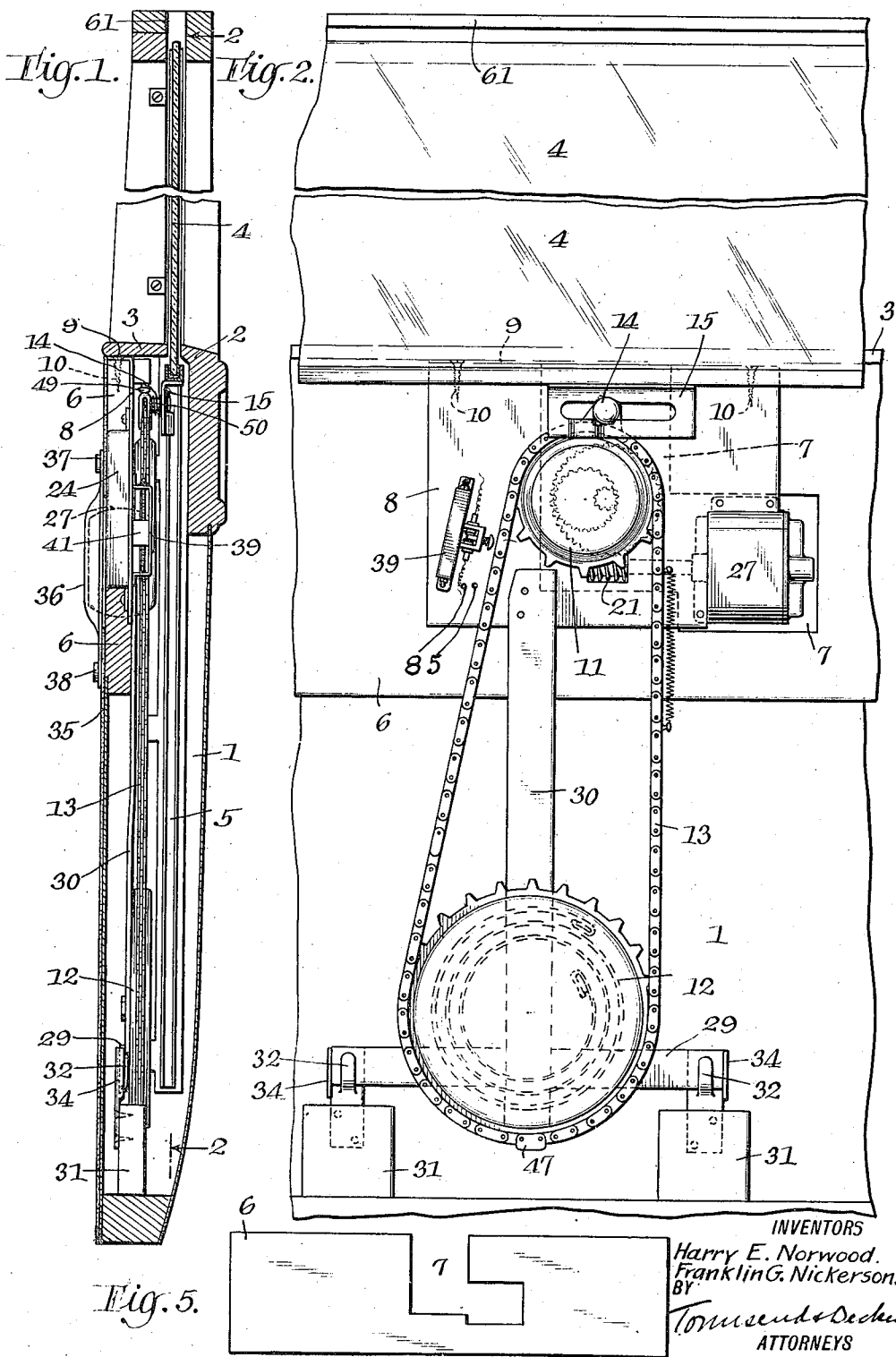
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H. E. NORWOOD ET AL

ELECTRICALLY OPERATED RAISING AND LOWERING MECHANISM FOR WINDOWS

Filed June 11, 1918

3 Sheets-Sheet 1



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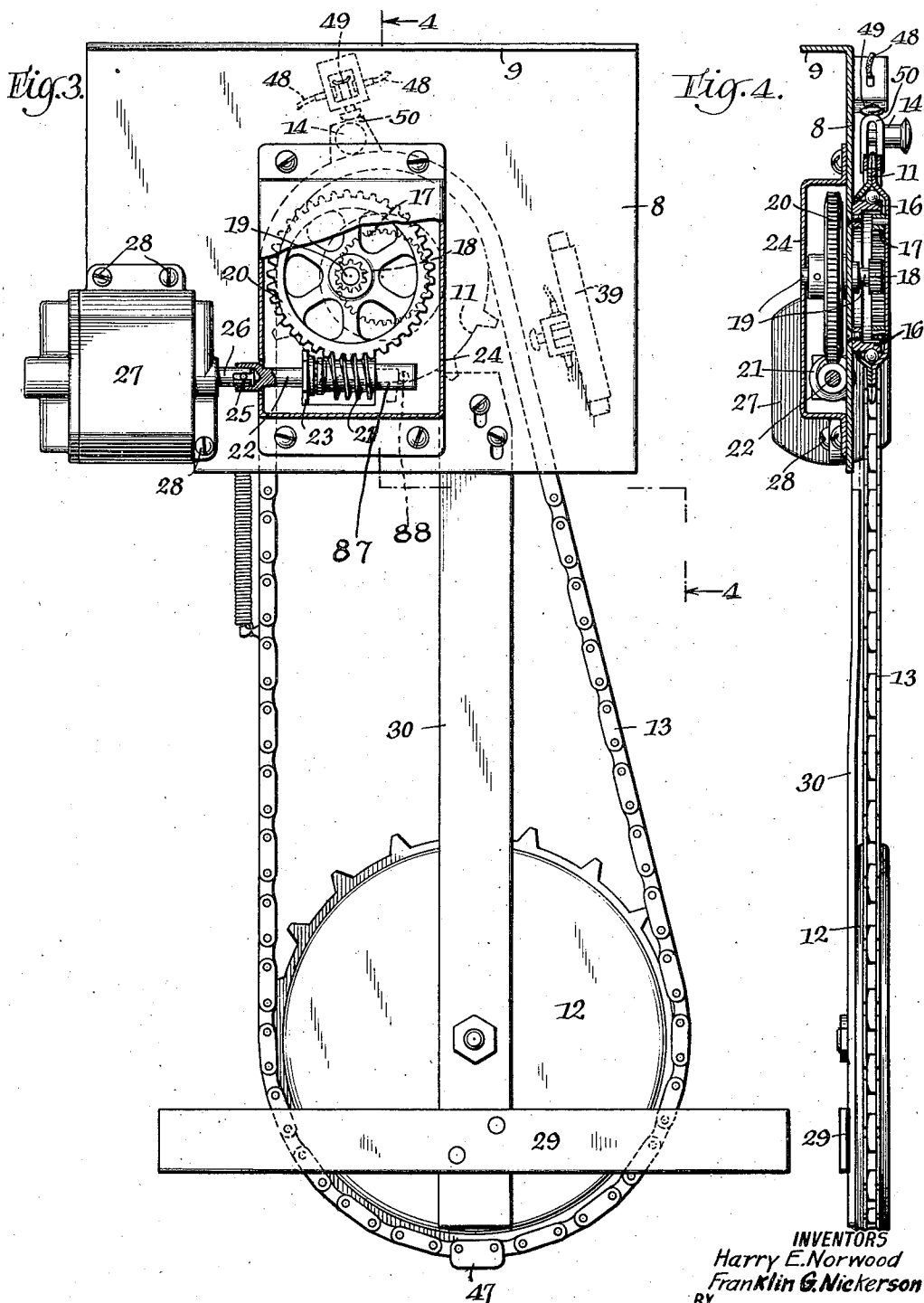
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ELECTRICALLY OPERATED RAISING AND LOWERING MECHANISM FOR WINDOWS

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Fig. 6.

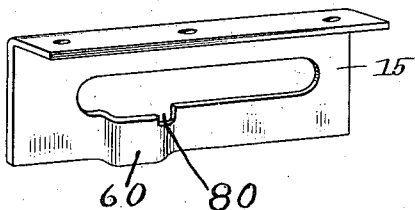


Fig. 7.

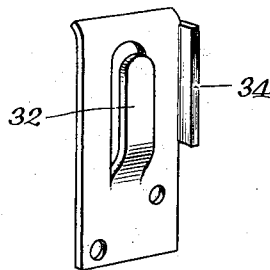


Fig. 8.

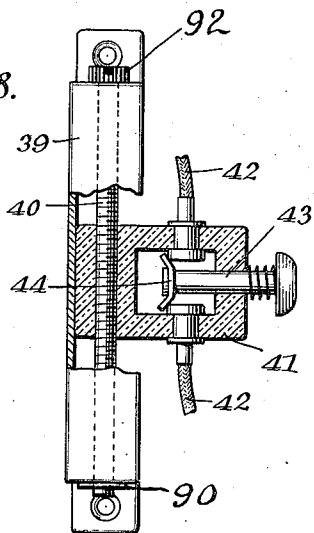


Fig. 9.

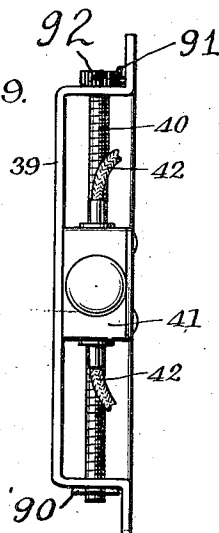
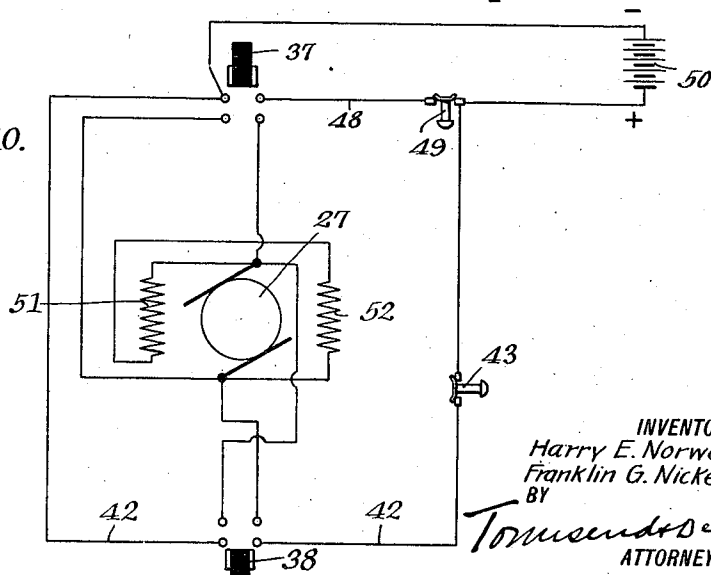


Fig. 10.



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UNITED STATES PATENT OFFICE.

HARRY EMERY NORWOOD, OF NEW YORK, AND FRANKLIN G. NICKERSON, OF BROOKLYN, NEW YORK, ASSIGNORS TO PERFECT WINDOW REGULATOR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

ELECTRICALLY-OPERATED RAISING AND LOWERING MECHANISM FOR WINDOWS.

Application filed June 11, 1918. Serial No. 239,411.

To all whom it may concern:

Be it known that we, HARRY E. NORWOOD and FRANKLIN G. NICKERSON, citizens of the United States, and residents of the borough of Manhattan, in the county of New York and State of New York, and borough of Brooklyn, in the county of Kings and State of New York, respectively, have invented certain new and useful Improvements in Electrically-Operated Raising and Lowering Mechanism for Windows, of which the following is a specification.

This invention relates to apparatus for raising and lowering a window to any desired position, in which position it is automatically locked and has for its object to provide simple, efficient and compact means whereby the desired raising and lowering movement of the window is effected by an electric motor.

While the invention is not limited to any particular use it is particularly designed for raising and lowering the windows in closed automobile bodies and to this end the object is to so organize and arrange the various parts that they will permit of being concealed within the side of the body below the window to which the parts are connected.

A further object of the invention is to provide an organization and arrangement of parts that will permit the withdrawal of the entire operating mechanism for replacement or repair without removing the upholstery of the car body.

To these ends the invention consists in the combination with the window of a chain or belt drive comprising an upper and lower sprocket and a continuous belt or chain passing around said sprockets and connected with the window and an electric motor connected with the upper sprocket and adapted to rotate the same to raise or lower the window.

The invention further consists in the provision of means for automatically stopping the motor when the window has reached its furthest intended closed as well as open position.

The invention still further consists in so mounting and organizing the operative parts that they can readily be removed without removing the upholstery on the inside of the car.

In the accompanying drawings, Fig. 1 is a transverse section through an automobile closed body door having our invention applied thereto.

Fig. 2 is a rear elevation of the operating mechanism for raising and lowering the window, the view being obtained by cutting away the outer part of the door on the line 2—2 Fig. 1.

Fig. 3 is an enlarged front elevation of the operating mechanism detached from the door.

Fig. 4 is a partial section and side elevation of the said mechanism, the section being taken on the irregular line 4—4 Fig. 3.

Fig. 5 is a front elevation of the lockboard to which the operating mechanism is mounted, the same being shown on a reduced scale.

Fig. 6 is a perspective view of the preferred form of plate used to connect the window with the operating or driving mechanism.

Fig. 7 is a perspective view of one of the clips used to detachably secure the lower end of the mechanism.

Fig. 8 is a front elevation and partial section of the adjustable circuit breaker.

Fig. 9 is a side elevation of the same.

Fig. 10 is a diagrammatic representation of the electric circuits.

1 indicates the well of the door of an automobile and is that part into which the window drops when lowered. Within this well the operating mechanism for raising and lowering the window is mounted. 2 indicates the rail on the outside of the door while 3 indicates the sill on the inside of the door. 4 indicates the window adapted to reciprocate in side guides or channels 5, said window entering the well 1 between the rail 2 and sill 3.

6 indicates the lock-board by which the upper end of the operating mechanism is held, said lock-board forming part of the framework of the door as is usual. The lock-board is cut out as indicated at 7, Fig. 5, to provide space for the operating parts and to permit their removal as subsequently described.

8 indicates a plate upon which the upper parts of the mechanism are mounted and to which all the parts of the mechanism are secured. The said plate bears against the sur-

face of the lock-board 6 within the well 1 and is provided with a flange 9 along its upper edge. The flange 9 seats on the upper edge of the lock-board and is suitably secured thereto as by screws 10.

The driving mechanism for raising and lowering the window comprises an upper sprocket 11, a lower sprocket 12 and a continuous belt or chain 13 passing over said sprockets. The drive chain carries a pin or stud 14 which works in a slot in a plate 15 depending from and secured to the lower edge of the window 4. Upon rotation of the sprockets the chain, through its connection with the window by the pin 14, causes the window to be raised or lowered in a manner now well known in this art.

The upper sprocket 11 is mounted on a ball race 16 secured to the plate 8 as shown in Fig. 4, the sprocket being provided with a hollow body within which is mounted an internal gear ring 17 which rotates with and forms part of the sprocket.

18 indicates a pinion meshing with the gear 17 and is mounted on a shaft 19 which passes through the plate 8. The shaft 19 is provided at its other end with a gear wheel 20. The gear 20 is rotated by a worm gear 21 mounted on a shaft 22 supported in a bracket 23 secured to the plate 8. The outer end of the shaft is supported in a bearing 87 provided with a ball 88 for taking the end thrust of the shaft. A casing 24 secured to the plate 8 encloses the worm 21 and gear 20 thus protecting the parts and affording a receptacle for heavy grease or other lubricant for the parts to run in. The worm shaft 22 projects through the casing 24 and outside the casing is detachably coupled in any suitable manner at 25 to a shaft 26 of a reversible type electric motor 27. The motor 27 is mounted on the plate 8 by screws 28.

29 indicates a cross-bar connected to the plate 8 by bar 30 upon which latter bar the lower sprocket 12 is supported. The sprocket 12 houses the usual coiled spring for counterbalancing the weight of the window 4 as now well understood in this art, but which has an additional function when employed in the apparatus herein described wherein an electric motor is used for raising the window as will now be explained. By the use of this assisting spring assisting the electric motor in overcoming gravity to raise the window the electric load on the motor for raising and lowering may be substantially equalized. This is important inasmuch as it permits the use of a battery of comparatively small power, much less than would be required if the duty were imposed on the motor of raising the whole load. Consequently a motor of very small dimensions may be employed which is important in view of the location of the motor in the

wall of the well containing the operating mechanism.

31 indicates blocks mounted on the lower framework of the door and to each of which is secured a spring clip 32 (see Fig. 7). The ends of the cross-bar 29 are engaged by the spring clips 32 and which thereby detachably support the lower end of the operating mechanism. Ears 34 projecting laterally from the outer edge of each clip 32 form stops and locating devices to properly position this end of the mechanism by engaging the end edges of the cross-bar 29.

Owing to its necessary size the motor 27 protrudes through a suitable opening formed in the inner wall 35 of the door. This opening is closed and the motor casing is concealed by a cover plate 36 secured to the door in any suitable manner. Suitable means are provided for electrically controlling the action of the motor to cause it to reverse its direction of motion or in other words to apply power on movement in either direction under the influence of the power current therefor supplied from any suitable source. These electrical controlling means may consist of push-buttons 37 and 38 preferably mounted on this cover plate, the button 37 closing the proper circuit to cause the motor to turn in one direction by the electrical power and cause the window to be raised by the positive action of the motor rotating in one direction being located at the top and the button 38 forming a circuit closer adapted to control or close a circuit whereby the motor will function under electric power to turn in the opposite direction and by positive action lower the window to lower the window, said latter button being preferably disposed at the lower part of the plate. Both these buttons or circuit closers are of any suitable type, there being many well known styles suitable for this purpose, and by preference each maintains the circuit closed so long as it is pressed inward. Upon release the circuit closer automatically breaks.

To provide for the possibility of a person keeping either one of the circuits closed, by continuing pressure on the respective button, after the window has been completely closed or completely lowered, we preferably provide means for automatically breaking the active circuit when the window reaches the limit of its travel in each direction. This may be effected in any suitable manner but by preference we provide a separate circuit breaker for the up and down travel of the window and mount both of them on the plate 8.

The circuit breaker for stopping the motor when the window has reached its lowermost position is indicated in position in Figs. 2 and 3 and in detail in Figs. 8 and 9. Preferably it consists of a suitable bracket 39 mounted on the plate 8 and provided with

an adjusting screw 40 which passes loosely through holes in the bracket 39. The lower end is held by a split washer 90 and a spring finger 91 bears against the knurled head 92 of the screw to prevent rattle and turning of the screw due to vibration. Threaded on the screw 40 is a block of insulation 41 to which two terminals of circuit wire 42 are secured. A rod 43 protruding through the block is provided at its inner end with a plate 44 which normally completes the circuit across the terminals of the wires 42, a spring 45 maintaining it in this position.

The outer end of the rod 43 is provided with a head 46 which, when the window reaches its lowermost position, is engaged by a lug 47 carried by the chain 13 and by said lug the rod 43 is pushed inward and the circuit broken. This circuit remains broken until the raising button or circuit closer is actuated when the upward travel of the window allows the rod 43 to again move outward and complete the connection between the terminal of the wire 42. To allow for variations in travel of the window the time of breaking the circuit may be carefully adjusted by means of a screw-driver acting to turn the screw 40. The screw-driver is readily inserted by removing the sill 3. To permit adjustment of the position of the circuit breaker bodily to take care of different distances between the sprockets 11 and 12 whereby the angle of the chain 13 on the side of the circuit breaker varies, a plurality of holes 85 are provided in the plate 8 for fastening the lower end of the circuit breaker bracket 39 in different positions, the bracket swinging about the upper fastening screw.

The circuit for the raising movement of the window is automatically broken when the window has reached its uppermost position by means of a circuit breaker indicated at 49, Figs. 3 and 4. This circuit breaker operates in a similar manner to the one previously described except that no adjustment is necessary. It is actuated by the lug 50 which carries the pin 14 and is, as in the case of the previously described circuit breaker, mounted on the plate 8.

By reference to the diagram Fig. 10 it is thought the circuit arrangement of the mechanism will be perfectly clear. The circuit for raising the window is indicated by the wires 48 and for lowering the window by the wires 42. 50 indicates the source of supply for the motor 27 which supply is preferably the usual storage battery carried by the car. 51 and 52 indicate the field windings of the motor.

As will be obvious from the above description the window may be raised or lowered to the desired extent by merely keeping the proper button pressed until the window has reached the desired position. On releas-

ing the pressure on the button the circuit is broken and the window comes to rest immediately and is locked in that position owing to the worm and gear drive between the motor and the sprocket 11.

To remove the operating mechanism for repairs or replacement or to permit removal of the glass, the window is run up until it is in the uppermost position of its travel at which time the head of the pin 14 is in line with an offset 60 in the plate 15. A notch or cut 80 in the offset permits the head of the pin to enter the offset. The cover plate 36 is removed and the buttons 37 and 38 disconnected. The removal of the plate 36 permits access to the screws 28 of the motor 27 which are withdrawn and the motor can then be removed owing to the detachable coupling 25. The sill 3 is removed and the window is then withdrawn upward through the opening 61 in the top of the door. In cases where no opening in the top of the door is provided or where the window is in other parts of the car than the door, the window may be removed by providing two part guides as described in United States Patent No. 1,218,130, dated March 6th, 1917.

After withdrawal of the window, the screws 10 are removed and the plate 8 carrying with it the entire operating mechanism is then lifted out of the well, the lower part readily withdrawing from the spring clips 32. The re-installing of the mechanism by reversing the operations described for removal is obvious.

While we have shown and described our invention as applied to the door window it will be understood that it is equally applicable to any of the windows of the car and that various modifications and equivalents may be resorted to within the spirit and scope of the invention as set forth in the appended claims.

Also instead of the return wire circuit as shown in Fig. 10 the usual single wire system with one side of the line grounded may be employed.

What we claim as our invention is:—

1. In an apparatus for raising and lowering windows, the combination with the window, of a wheel, a belt running on said wheel and directly connected with and supporting the window, a gear connected to and rotating with said wheel, a shaft carrying a pinion meshing with said gear, a gear wheel on said shaft, an electric motor whose shaft is directly geared to said gear wheel for rotating said gear wheel in either direction, and electrical controlling means for causing said motor to rotate in either direction by electric power so as to positively raise and lower the window by power applied by said motor.

2. In an apparatus for raising and lower-

- ing windows, the combination with the window, of a sprocket wheel provided with an internal gear, a belt or chain running on said wheel, a pin or stud carried by said chain and engaging the window or part carried thereby, a shaft geared to said internal gear and driven by a worm gear and worm, an electric motor adapted to rotate said worm in either direction, and electrical controlling means for causing said motor to rotate in either direction by electric power so as to positively raise and lower the window by power applied by said motor.
3. In an apparatus for raising and lowering windows, the combination with the window, of upper and lower sprocket wheels, a gear carried by the upper sprocket wheel, a shaft carrying the gear wheel of a worm gear and driving the sprocket wheel gear directly, a chain running on said sprocket wheels, an electric motor driving said worm gear directly for rotating it in either direction and electrical means for controlling the action of said motor under the influence of electric current to cause it to reverse its direction of rotation at will and to apply a positive raising and lowering force to said window.
4. In an apparatus for raising and lowering windows, the combination with the window, of an upper sprocket wheel carrying an internal gear ring, a worm gear driven shaft geared directly to said ring, a lower sprocket wheel containing a counterbalance spring, a drive chain passing over said sprockets and operatively connected with the window, an electric motor, means for reversing at will the rotation of said motor under the action of the electrical power for rotating the worm gear in either direction to positively raise and lower the window and a worm gear connecting the upper sprocket to said motor.
5. In an apparatus for raising and lowering windows, the combination with the window, of upper and lower sprocket wheels, a gear train a wheel of which is carried by the upper sprocket, a chain passing over said wheels and operatively connected with the window, an electric motor adapted to rotate in either direction associated with the upper sprocket, means for causing said motor to rotate at will in either direction under the influence of electrical power, and a worm gear one shaft of which carries a gear of said gear train meshing directly with a gear on the sprocket, while the other shaft is driven directly by the motor.
6. In an apparatus for raising and lowering windows, the combination with the window, of upper and lower sprocket wheels, a chain passing over said wheels and operatively connected with the window, a worm gear connected with the upper sprocket and an electric motor detachably connected with said worm gear, a lock board by which the operating mechanism is held in position and a plate carrying the mechanism and detachably secured to said lock board to permit mechanism operated by the motor to be withdrawn through an opening in the edge of the casing.
7. In an apparatus for raising and lowering windows, the combination with the window, of upper and lower sprocket wheels, a gear ring on the upper sprocket, a chain passing over said wheels and operatively connected with the window, an electric motor connected to the upper sprocket wheel through a worm gear a shaft of which is geared directly to said ring and means for automatically stopping said motor when the window reaches the end of its travel in both directions, said means being adjustable to allow for variations in the travel of the window.
8. In an apparatus for raising and lowering windows, the combination with the window, of a chain drive operatively connected therewith, an electric motor adapted to operate said chain drive in either direction through a worm gear and a circuit breaker, said circuit breaker being adjustable for variations in the travel of the window controlled by the movement of said chain and adapted to stop said motor automatically when the window reaches the end of its travel in either direction.
9. In an apparatus for raising and lowering windows, the combination with a window, of upper and lower sprocket wheels, a chain passing over said wheels and operatively connected with the window, an electric motor connected to the upper sprocket wheel through a worm gear and a circuit breaker adapted to stop said motor when the window has reached the end of its travel, said circuit breaker being adjustable in position for differences in distance between the sprockets.
10. In an apparatus for raising and lowering windows, the combination with a window, of upper and lower sprocket wheels, a chain passing over said wheels and operatively connected with the window, an electric motor connected to the upper sprocket wheel through a worm gear, a circuit breaker in the circuit of said motor having a contact adjustable to time the breaking of circuit by the window and bodily adjustable for differences of distance between the sprockets and means carried by said chain for operating said circuit breaker.
11. In an apparatus for raising and lowering windows, the combination with a window, of upper and lower sprocket wheels, a chain passing over said wheels and operatively connected with the window, an electric motor connected to the upper sprocket

5 wheel through a worm gear, a plate detach-
ably mounted in the well enclosing the oper-
ating mechanism and withdrawable ver-
tically therefrom, a circuit breaker in the
circuit of said motor and mounted on said
plate and a projection carried by said chain
for operating said circuit breaker to stop
the motor.

10 12. In an apparatus for raising and low-
ering windows, the combination with the
window, of a plate secured to the frame-
work below the window, a sprocket wheel
mounted on said plate, a chain running on
said wheel and operatively connected with
15 the window, a worm and gear for rotating
said sprocket and an electric motor detach-
ably secured to said plate and detachably
connected with said worm gear to permit
the motor to be removed sidewise and allow
20 the plate with the attached mechanism to be
lifted out of its position below the window
opening.

13. In an apparatus for raising and low-
ering windows, the combination with the
25 window, of a plate secured to the frame-
work below the window and a driving mech-
anism secured to and carried by said plate
and comprising a pair of sprockets, a chain
passing over said sprockets and operatively
30 connected with the window and an electric
motor adapted to rotate said sprockets
through a worm gear to positively raise and
lower the window, said motor being detach-
ably secured to said plate and having its
35 shaft separably connected with the worm
gear.

14. In an apparatus for raising and low-
ering windows, the combination with the
window, of operating mechanism therefor
40 located in the well below said window and
comprising a pair of sprockets, a chain pass-
ing around said sprockets and detachably
connected with the window and an electric
motor mounted in the side wall of the well
45 and detachably connected to one of said
sprockets through a worm gear, said entire
operating mechanism being adapted to be
withdrawn from the well as a unit after
detachment of said motor.

15. In an apparatus for raising and low- 50
ering windows, the combination with the
window, of operating mechanism therefor
located in the well below the window
and comprising upper and lower sprocket 55
wheels, a chain passing around said wheels
and detachably connected to the window
and an electric motor detachably connected
to the upper sprocket wheel through a worm
gear and means at the bottom of the well
for detachably supporting the lower end of 60
said operating mechanism, said operating
mechanism being removable from said well
as a unit after detachment through an
edge opening thereof of said motor.

16. In an apparatus for raising and low- 65
ering windows, the combination with a
wheel operatively connected to the window,
of an internal gear ring on said wheel, a
worm gear the shaft of one member of
which carries a pinion gearing with said 70
ring and a driving electric motor having
its shaft coaxial with and driving the shaft
for the other member of said worm gear.

17. In an apparatus for raising and low- 75
ering windows, the combination of operat-
ing mechanism connected to the window, a
driving electric motor, a plate mounted in
the well below the window and carrying
the operating mechanism and having the
driving motor removably secured to it, the 80
motor shaft being also provided with a sep-
arable coupling between it and the driving
mechanism and means for detachably secur-
ing the plate in position in the well below
the window, whereby on separation of the 85
motor from the plate and removal of it side-
wise through an opening in the wall, said
plate with attached mechanism may be with-
drawn through the mouth of the well.

Signed at New York, in the county of 90
New York and State of New York, this
fourth day of June A. D. 1918.

HARRY EMERY NORWOOD.
FRANKLIN G. NICKERSON.

Witnesses:

A. S. BROWN,
WM. G. PHILLIPS.