Oct. 20, 1931. A. L. HANSEN 1,827,746

WINDOW REGULATOR FOR VEHICLE BODIES

Filed Dec. 14, 1927 3 Sheets-Sheet 1

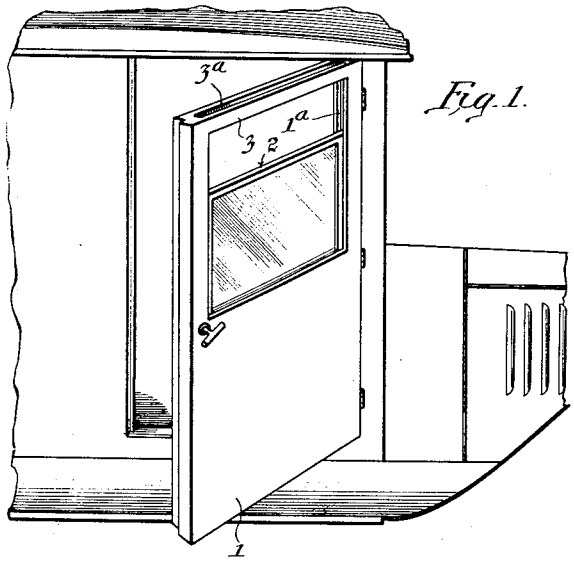


Fig. 1.

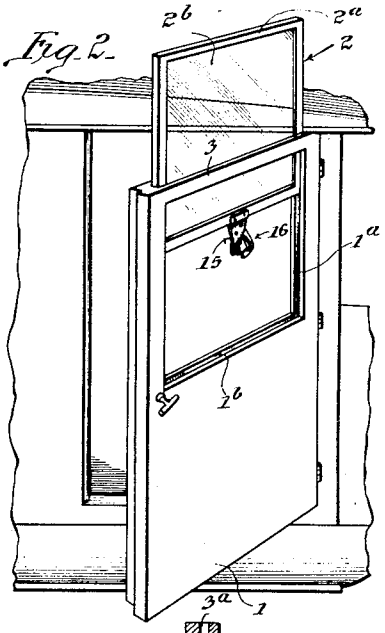


Fig. 2.

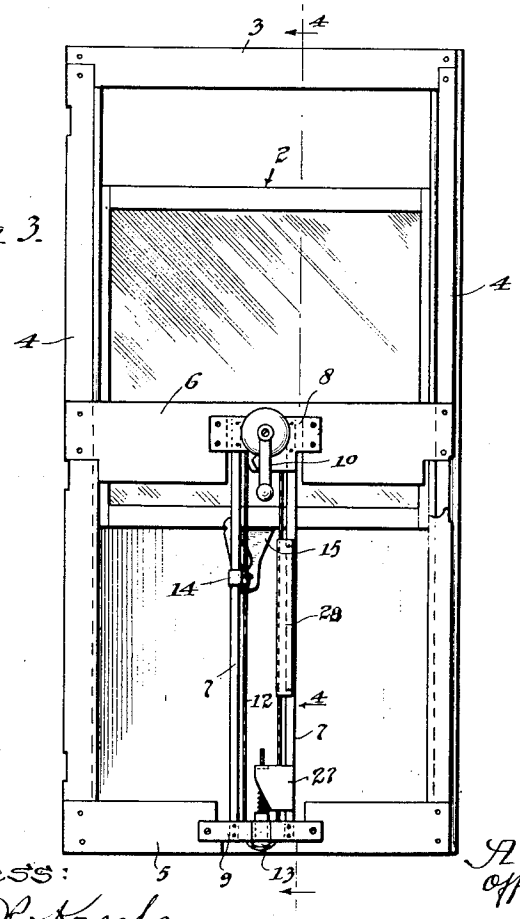


Fig. 3.

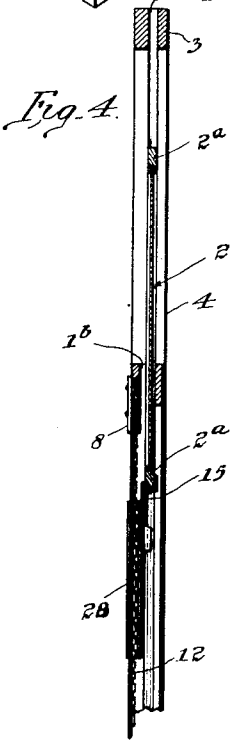


Fig. 4.

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WINDOW REGULATOR FOR VEHICLE BODIES

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Fig. 5

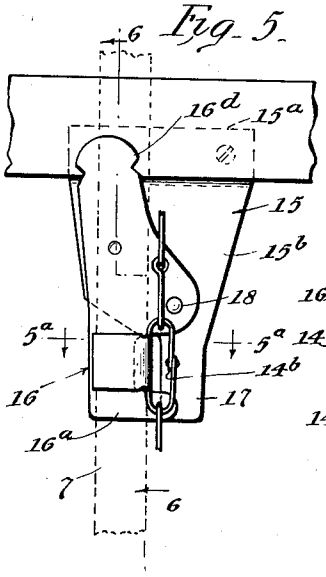


Fig. 6

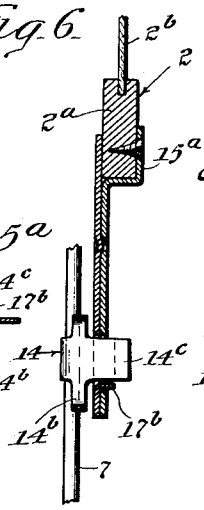


Fig. 5a

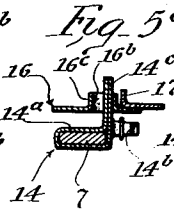


Fig. 7

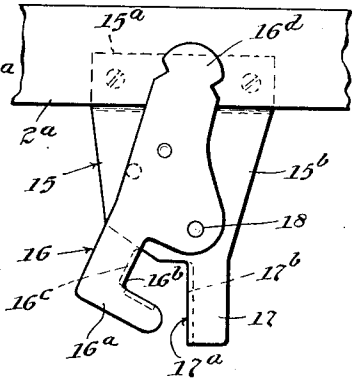


Fig. 8

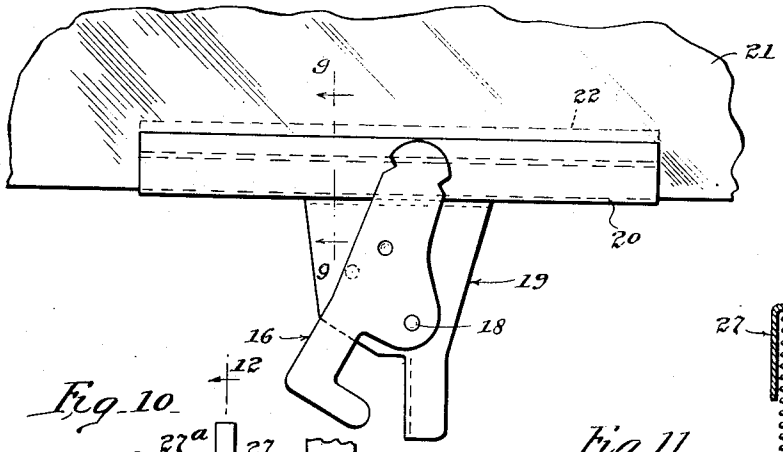


Fig. 9

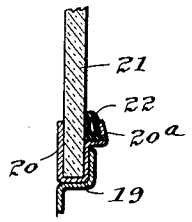


Fig. 10

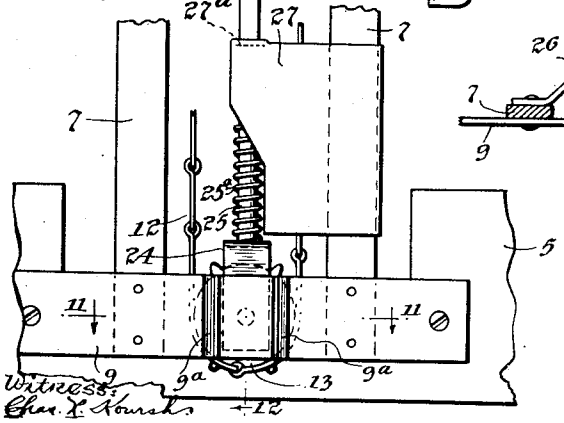


Fig. 11

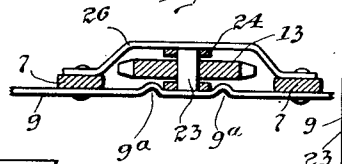
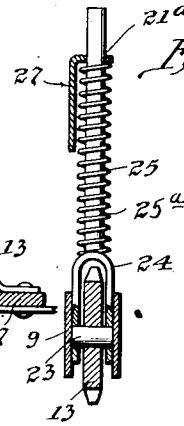


Fig. 12



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WINDOW REGULATOR FOR VEHICLE BODIES

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Fig. 13.

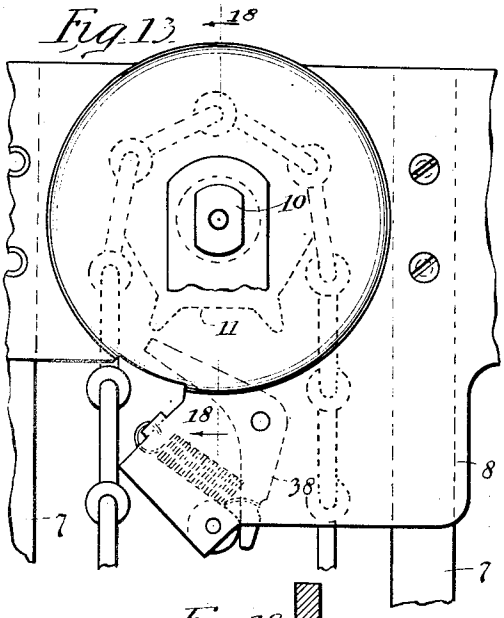


Fig. 14.

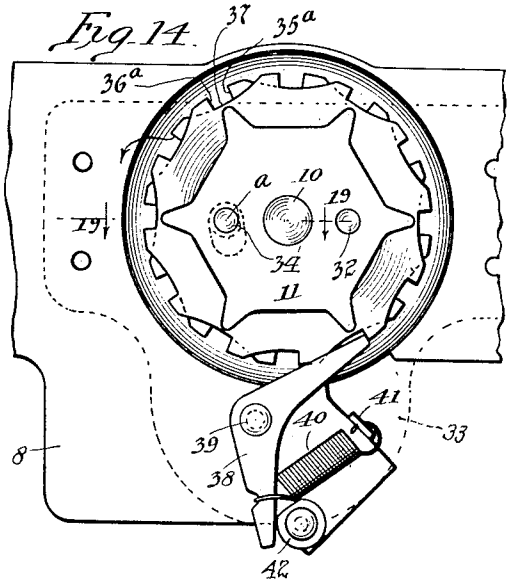


Fig. 18.

Fig. 16.

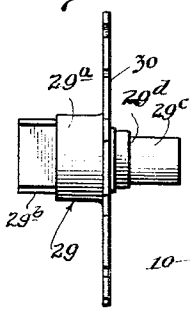


Fig. 17.

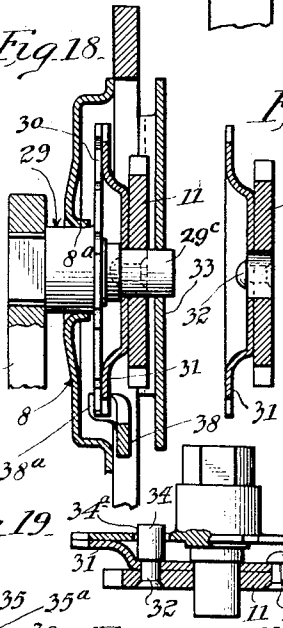


Fig. 15

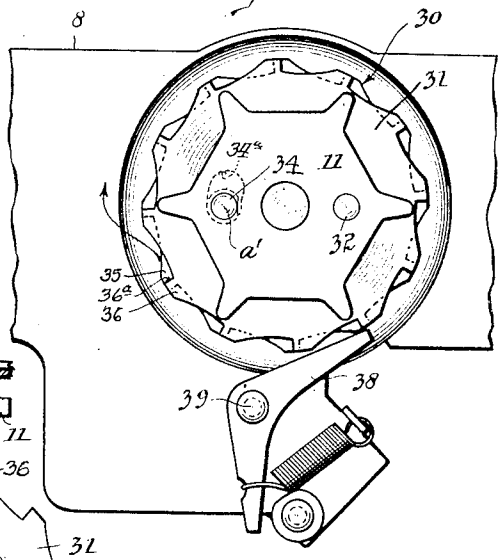


Fig. 19.

Fig. 20.

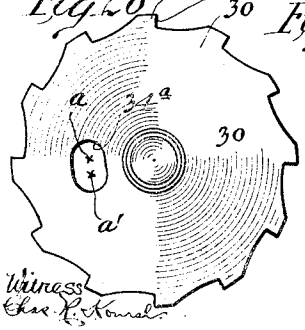
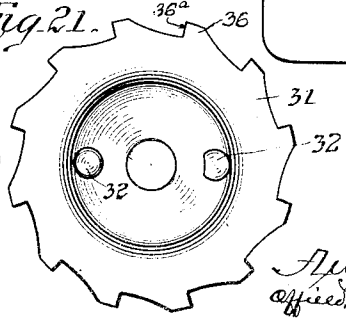


Fig. 21.



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Patented Oct. 20, 1931

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UNITED STATES PATENT OFFICE

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WINDOW REGULATOR FOR VEHICLE BODIES

Application filed December 14, 1927. Serial No. 239,857.

This invention relates to window regulators for vehicle bodies, and more particularly to devices for raising and lowering the sliding windows in the body of the vehicles of the closed type.

The object of the invention is to provide a window regulator of simple and compact design, which can be conveniently and readily installed into a door frame and capable of easy and rapid manipulation and dependable operation.

A further object of the invention is to provide a construction for a window regulator having its operating parts confined within a narrow compass thereby permitting a material reduciton in the thickness of the frames in which they are mounted.

A further object of the invention is to provide an improved form of connection between the window panel or frame and the regulator thereby facilitating the operation of door assembly.

And finally, the object of the invention is to provide a novel mechanical movement in the nature of a pawl and ratchet, especially suitable for window regulators whereby the window is held against downward sliding movement other than by the manipulation of the operating lever.

The several novel features of the invention are hereinafter more fully disclosed, in connection with the accompanying drawings, in which

Figure 1 is a general view of a vehicle body showing a door window equipped with one of the regulators.

Figure 2 is a view similar to Figure 1 showing the window disconnected from the regulator and in the position for removal from or insertion into the door frame.

Figure 3 is an enlarged view of a skeleton door frame showing the window and regulator installation.

Figure 4 is a view in vertical section taken on line 4—4 of Figure 3.

Figure 5 is an enlarged detail view in front elevation showing the connecting members between the window frame and the regulator.

Figure 5*a* is a detail view in cross section taken on line 5*a*—5*a* of Figure 5.

Figure 6 is a view in vertical section taken on line 6—6 of Figure 5.

Figure 7 is a view in front elevation of the window frame connecting member in open position and disconnected from the regulator.

Figure 8 is a view similar to Figure 7 showing a modified form of connecting member for use with plate glass panels.

Figure 9 is a view of the panel connecting member shown in Figure 8 in vertical section as taken on line 9—9 thereof.

Figure 10 is an enlarged detail view of the lower sprocket assembly of the regulator.

Figure 11 is a view in horizontal section taken on line 11—11 of Figure 10.

Figure 12 is a view in vertical section taken on line 12—12 of Figure 10.

Figure 13 is a general view in front elevation of the upper sprocket and pawl and ratchet assembly from the crank side.

Figure 14 is a general assembly view similar to Figure 13 from the opposite or inner side, and showing the panel and ratchet mechanism in locked position.

Figure 15 is a view similar to Figure 14 showing the pawl and ratchet mechanism in released position.

Figures 16 and 17 are side or edge views of the two ratchet wheels removed from the ratchet assembly.

Figure 18 is a cross-sectional view of the upper sprocket assembly taken on line 18—18 of Figure 13.

Figure 19 is a detail view of the sprocket assembly as taken on line 19—19 of Figure 14; and

Figures 20 and 21 are views in front elevation of the ratchet wheels shown in Figures 16 and 17, respectively.

Referring to Figures 1 and 2, the regulator is shown as applied to a door 1 of a vehicle body of any standard construction and designed either for commercial or pleasure vehicles, the chief distinction being the fact that the body of a pleasure vehicle is more elaborately finished and heavy plate glass panels are used for the windows. As shown, the upper half of the door is provided with a square opening and the lower half enclosing a hollow space or well in which the

regulator is housed and into which the window is lowered. For the purpose of this disclosure, the sides of the window opening are rabbeted as at 1*a* and slotted along its lower edge as at 1*b*. Within the window opening is a sliding window 2 consisting of a frame 2*a* and a glass panel 2*b*. This window slides in the rabbets or grooves 1*a*, 1*a* in the sides of the door frame, the same preferably having a top rail 3 with a slot 3*a* extending vertical through it to permit the window to be inserted or removed through the top, as shown in Figure 2. This feature will again be referred to.

Figures 3 and 4 show more in detail the construction of the door frame, consisting of the usual vertical frame members 4, 4, the top rail 3, a corresponding bottom rail 5 and an intermediate cross rail 6, the top of which is level with the bottom of the window opening. The details of the door frame construction are not of particular importance, although with the present regulator design the thickness of the door can be decreased materially and its construction otherwise simplified, as will later be pointed out.

Referring now to the window regulator, the same is mounted within the lower part of the body or door frame, as shown in Figures 3 and 4, and occupies a space just to one side of the vertical plane of the window 2 adjacent the inside of the frame. Generally speaking, the regulator is a unitary structure or device in the sense that it is assembled complete for installation. As such, it comprises a frame consisting of two vertical parallel bars 7, 7 spaced apart say, 3 or 4 inches, and fixed at their ends to upper and lower transverse plates 8 and 9 respectively. These members form a rigid frame which is secured to the door frame by means of screws which pass through the ends of the bearing plates, both of which lie flatwise against the outer faces of the bottom and intermediate frame members 5 and 6; portions of these frame members being cut away or recessed so that bearing plates lie substantially flush with the frame members and the moving or operating parts offset inwardly from their surfaces.

The upper plate 8 of the regulator frame supports the operating crank 10 which is exposed on the inside of the door, and is the only visible element of the regulator when this door is assembled complete. This crank rotates a sprocket wheel 11 mounted on the opposite side of the plate 8, and carries an endless sprocket chain 12. Interposed between the sprocket wheel 11 and the crank 10 is an intermediate pawl and ratchet device which will be later described in detail. For the present then, the sprocket wheel 11 is operated by the crank handle 10, and supports the upper end of the endless chain 12 which passes over the same with its two leads extending downwardly just inside of the vertical bars 7, 7 of the regulator frame. Supported by the lower plate 9 is another or companion sprocket 13, free to turn as the chain travels over it. This sprocket is not fixed to the lower plate 9, however, but is more or less floating through the medium of a vertical tension adjustment, hereinafter to be described, and adapted to keep the chain 12 under constant tension.

At a predetermined point in one of the leads of the chain a window connecting member 14 is inserted (Figures 3, 5, 5*a* and 6), said member consisting of a sleeve 14*a* slidable on the adjacent bar 7, and an integral link 14*b* which is inserted in a break made in the chain at the desired point. At the junction of the sleeve and the link is a finger or projecting lug 14*c* extending inwardly at right angles to the plane of the chain and into the path of the window. This lug is formed by bending the marginal portion of the strip from which the sleeve is formed at a right angle and in the direction already indicated, and as shown in Figure 5*a*.

The connection with the window is made through a clip 15 secured to the lower rail of the window frame 2*a*. This clip consists of a plate 15*a* screwed or otherwise attached to the frame at its upper edge and projecting downwardly several inches below the frame and a lever 16 pivotally mounted on the plate (Figures 5, 6 and 7). The plate has an L-shaped portion 15*a* along its upper edge fitting against one face and the under edge of the frame rail to bring the projecting portion 15*b* into the plane of the opposite face, as shown in Figure 6.

The projecting portion 15*b* tapers toward its end and terminates in a downwardly extending finger 17 along one side and forming an inverted L-shaped notch 17*a* facing laterally and flanged about its margins as at 17*b* (Figure 5*a*). The lever 16 is pivoted to the plate 15 at 18 just above the finger 17, and extends below said plate in the form of an L-shaped finger 16*a* which provides a laterally facing U-shaped notch 16*b* facing toward the flanged L-shaped notch 17*a* of the finger 17, and likewise having its edges flanged as at 16*c*. The upper portion of the lever has the form of a blade 16*d* extending upwardly from the pivot pin 18 and lying flatwise against the adjacent face of the window frame rail 2*a*. As shown in Figures 5 and 7, the clip 15 has detachable connection with the chain 12 through the sliding sleeve 14. Thus by forcing the lever arm 16*d* over to the right as in Figure 7, an opening is formed between the fingers or jaws 17 and 16*a*, thus permitting the projecting lug 14*c* of the sleeve 14 to be inserted between them. Swinging the lever 16 in the opposite direction closes the fingers, thus forming a rectangular slot in which the lug 14*c* is securely held, as shown

in Figures 5, 5*a* and 6. Figure 2 shows the window frame released from the regulator concealed within the lower part of the door, and further suggests the simplicity of the operation of installing the windows. In the ordinary construction a door has to be torn down to a considerable extent in order to remove the window, but with the present construction the window can be disconnected from the regulator without disturbing any parts of the door, and hence by slotting the top rail of the door as at 3*a*, the ease of installing or removing windows in this manner is manifest.

Figure 8 and 9 show a slightly modified form of clip to be used with solid window panels of plate glass as used in closed pleasure vehicles. In this case the upper edge of the plate 19 is welded or riveted to a metal channel strip 20 into which the lower edge of the glass panel 21 fits. One edge of the channel strip has an L-shaped offset 20*a* in which a strip of resilient material 22, such as rubber, is inserted. Otherwise the function and purpose of the clip is the same as before described.

Referring now in greater detail to the mounting for the lower sprocket including the chain tension adjustment, the lower sprocket wheel 13 is journalled on a pin 23 extending between the ends of an inverted U-shaped yoke 24 which straddles the sprocket and is mounted at the lower end of a rod 25 (Figures 10, 11 and 12). The yoke rides or slides in a guideway formed between the lower plate 9 and a strap 26 extending crosswise between the bars 7, 7 of the frame, and riveted at its ends thereto—the rivets also passing through the plate 9, as shown in Figure 11. The plate 9 is provided with indented ribs 9*a*, 9*a* spaced apart to form a vertical guide for the adjacent arm of the yoke 24. Fixed to one of the bars 7, just above the sprocket mounting, is a bracket 27 of sheet metal, extending inwardly toward the other bar 7 and having at its top edge a flange 27*a* bent over and drilled to form an opening through which the end of rod 25 of the yoke projects. A coil spring 25*a* is mounted on the rod 25 and bears against the flange 27*a* and the yoke 24 and acts to force the sprocket mounting downwardly and thus maintain the chain under sufficient tension to eliminate lost motion and prevent contact of the chain with the bars 7, 7. As will be observed, the plate 27 is mounted on the bar opposite the bar on which the connecting sleeve 14 slides (Figure 3), the latter bar being thus free for the movement of the sleeve throughout its full height. If desired, a guide 28 for what may be termed the return or non-active lead of the chain may be mounted along the right-hand bar 7 above the bracket 27 (Figure 3). the same being a strip of metal with a channel spaced outwardly from the bar and facing toward the same. This guide acts to confine the chain and guide its movement in a straight line.

Referring now to Figures 13 to 21, the pawl and ratchet mechanism intermediate the operating crank handle 10 and the upper or drive sprocket 11 will now be discussed in detail. The crank or handle 10 is fixed to a shank or stub shaft 29, the same having an enlarged cyclindric bearing portion 29*a* just inwardly from a squared shank 29*b* on which the handle 10 is mounted, said bearing portion being journalled in a bearing 8*a* in the plate 8. Immediately adjacent the enlarged bearing portion 29*a* is fixed a ratchet disc 30 (Figures 16 and 20) which will be presently described in greater detail. Beyond the ratchet disc 30, the shank extends for perhaps three-quarters of an inch in a reduced end 29*c* with a shoulder 29*d* at its base of about one-eighth of an inch in width. Mounted on the reduced end portion 29*c* of the shank is a companion ratchet disc 31, and the upper sprocket wheel 11, these two members being riveted together as a unit, as shown in Figures 17 and 19, and both having registering apertures at their centers which fit the reduced end 29*c* of the shaft 29. In assembling the ratchet disc 31 and sprocket wheel unit 11 on the shaft 29, the ratchet wheel 31 is positioned adjacent the fixed ratchet disc 30, the two being of the same diameter and have flatwise contact with each other about their peripheral portions. The outer or loosely mounted ratchet disc 31 is dished or recessed at its central portion in the direction of the sprocket wheel 11 and rivets 32 passing through the disc and said sprocket wheel adjacent the central openings, as shown in Figure 19. The assembling of the upper sprocket and ratchet mechanism is completed by a rear bearing plate 33, which is riveted to the bearing plate 8 and forms a bearing for the reduced end 29*c* of the shaft 29.

The two ratchet discs 30 and 31 are adapted for a predetermined relative rotative movement through the medium of a pin and slot connection, a pin 34 being carried by the loosely mounted disc (preferably in the form of an extension of one of the rivets 32 connecting the ratchet disc 31 with the sprocket 11) and engaging a slot 34*a* formed in the fixed sprocket disc 30 (Figure 20). The slot is elongated circumferentially of the disc, but extends only through a comparatively small arc so that the relative angular movement between the two ratchet discs is but a small fraction of the circumference, say about 15°. Thus with the pin 34 engaging the slot 34*a*, the loose disc 31 with the sprocket wheel 11 can rotate in opposite directions through an arc of about 15° relative to the companion disc fixed on the shaft 10.

About the peripheries of the companion or complementary ratchet discs 30 and 31 are

series of ratchet teeth 35 and 36 respectively, of the same number, shape and spacing, but reverse to the direction in which the teeth face. Thus the teeth 35 of the disc 30 (Figure 20) have radial edges 35*a* facing in a clockwise direction, and the teeth 36 of the disc 31 (Figure 21) have radial edges 36*a* facing in a counter-clockwise direction. Otherwise the teeth are identical in contour, the portions immediately behind the radial edge of each tooth extending circumferentially for a short distance and then slope inwardly to the base of the radial face of the tooth just behind, and so on. It is also to be noted that there is a predetermined relation between the pitch of the teeth, i. e., the angular distance between corresponding points of two adjacent teeth and the relative angular movement between the ratchet discs. To illustrate: There are shown in Figures 20 and 21 twelve (12) teeth on each disc, so that the angular distance between the radial edges of two adjacent teeth is 30°. Now, if the point *a* (Figure 20) is the center of the pin 34, at one extremity of the relative rotative movement, and *a'* is the same center when shifted through 15°—the angular extent of the slot 34*a*—then the angular displacement of one tooth relative to the corresponding tooth on the other disc is one-half the pitch of the teeth or 15°.

This is more clearly illustrated in Figures 14 and 15. In Figure 14 the center of the pin 34 is at *a* and the discs are so positioned that a rectangular or U-shaped notch 37 is formed between each pair of radial edges 35*a* and 36*a* of the two sets of ratchet teeth. In Figure 15 the discs have been shifted so that the pin 34 is at the opposite end of the slot 34*a* with its center at *a'*, that is, the disc 30 remains stationary, the disc 31 is turned through 15° in a clockwise direction, the angle through which the latter is shifted being just enough to close the gap or notches 37 between the radial edges 35*a* and 36*a*, with the result that the peripheries of the discs now presenting a succession of alternate high and low points connected by sloping edges.

Coacting with the ratchet discs is a pawl 38 located just below and having the form of a bell crank lever mounted on a pivot pin 39 anchored in the plate 8, and positioned intermediate the ends of the pawl. The end of the pawl adjacent the discs 30 and 31 is bent at right angles to form a detent 38*a* (Figure 18) bearing edgewise against the peripheries of the discs. A coil spring 40 is connected at one end to the lower or free end of the pawl, and is connected at its opposite end to a lug 41 bent upwardly at the adjacent edge of the bearing plate 8. A stop member 42 is mounted on the plate 8, adjacent the lower end of the pawl, and acts to limit its movement in the direction in which the tension of the coil spring 40 is exerted.

Considering the action with reference to Figures 14 and 15, in which the parts are just reversed with respect to their positions in Figure 13, the upward movement of the window is brought about by the rotation of the crank in a clockwise direction, as indicated by the arrow in Figure 14. Now, since the innermost disc 30 is fixed to the crank handle shaft 29, it will shift in a counter-clockwise direction relative to the loose (outermost) disc 31 through the angle of 15° permitted by the pin and slot connection, thus bringing the pin 34 to the following end of the slot 34*a* with its center at *a*. This movement carries the ratchet teeth of the disc 30 through an angular distance equal to one-half the pitch of the teeth, so that their radial edges form the notches 37 around the two peripheries of the discs, as shown in Figure 14. The shifting of the discs having been completed and the notches formed, the entire sprocket assembly will continue to turn counter-clockwise and as a unit so long as power is applied to the crank to raise the window. But it is to be noted that the locking arm of the pawl extends tangentially to the periphery of the now unitary ratchet discs, and in the same direction as the discs are turning, with the result that the detent 38*a* simply clicks over the teeth without engaging the notches 37, and the window slides up without interference.

To lower the window the crank handle is turned in the opposite or clockwise direction, as indicated by the arrow in Figure 15. The force again being applied to the innermost ratchet disc 30, there is another angular shifting of said disc relative to the loose or outermost disc through 15° as limited by the pin and slot, the pin 34 now being at the lower and trailing end of the slot 34*a* with its center at *a'*. Again the teeth shift, but this time to a position such that their radial edges slightly overlap, thus closing the notches 37 and presenting a waved periphery of relatively shallow projections and depressions, as shown in Figure 15. As before, the continued rotation of the crank in a clockwise direction carries the entire assembly as a unit, but the detent of the pawl simply rides over the peripheries of the discs, since there are no notches to engage. However, the direction of rotation is such that were the notches 37 open, the pawl would immediately lock the discs against further rotation, in fact this is what occurs when a force is applied to lower the window other than by turning the crank. This action will now be explained: Let it be assumed that the window is fully or partially raised and pressure is applied to the top edge of the window in an effort to lower it, or the weight of the window plus the vibration of the vehicle causes it to slide downwardly. Such a force is manifestly transmitted toward the crank, being first exerted on the chain and thence

through the ratchet discs to the crank handle, the latter remaining stationary. Thus any downward movement of the window causes the chain 12 to turn the sprocket 11 and the loose ratchet disc 31 in a clockwise direction, and relative to the stationary or innermost ratchet disc 30, so that the notches 37 are formed as in Figure 14. But now the rotation of the sprocket assembly is in a direction such that the detent of the pawl 38 will engage the first notch 37 presented to it, and there will be an immediate locking of the parts from further movement. In short, the ratchet mechanism acts automatically to prevent the movement of the window in a direction to open it and by a force other than that applied at the handle, thus effectually preventing access to the vehicle from the outside as well as the sliding of the window under its own weight. The locking of the window, however, does not require any manual manipulation in order to release it, inasmuch as the pawl is automatically thrown out by turning the crank to either raise or lower the window, or by raising the window without using the crank. In other words, the window regulator permits the window to slide freely with or without using the crank, except in one direction and by a force applied to the window.

In mounting the window regulating mechanism in the frame of a door for instance, it may either be located with the crank centered midway between the side edges of the window or slightly offset from the center, so as to bring the active lead of the chain 12 (to which the window is connected) at the center of the window. Either arrangement is practical, although locating the point of connection in line with the center of the window is perhaps more conducive to smoothness of action as there is less possibility of the window tilting in the door frame.

The advantages of a window regulator construction of the type herein disclosed are numerous. In the first place, the compactness and simplicity of construction is desirable, and particularly the materially reduced transverse space required for its installation. This feature is of importance to the vehicle body builder as it makes it possible to design the body and doors of reduced thickness, as very little space need be allowed for housing the window regulator. The detachable connection between the window and the regulator leads to economy in door construction since the windows can be inserted through the top rail of the door, with plain rabbeted side frame members to carry the window, thus doing away with the sash strips which are ordinarily used because the window has to be inserted into the opening.

Another feature is the relatively quick action of the regulator in closing or opening the window. In the form herein disclosed but four turns of the crank are required to move the window its full height, whereas from twelve to sixteen turns are required in the ordinary regulator of the crank-operated type.

And finally, the pawl and ratchet control is a novel feature since it positively locks the window in any position to which it is raised, and prevents it from being lowered in an attempt to gain entrance from the outside of the vehicle or to gradually slide downwardly by vibration of the vehicle. Another and perhaps unique feature of the regulator is the fact that the window can be raised quickly by pushing it up without operating the crank. This is desirable in commercial vehicles, although perhaps not necessary or possible in a pleasure vehicle in which plate glass without frames is used. So free running is the regulator that it offers but little resistance to the closing of the window in a fraction of the time required to operate the crank.

Having set forth a preferred embodiment of my invention,

I claim:

1. In a clutch, the combination of a rotative driving member, a driven member journalled on said driving member, a pair of ratchet discs, one fixed to said driving member and the other to said driven member, said discs having complementary ratchet teeth and connected together for a limited relative angular displacement in opposite directions, the teeth of said disc at one extremity of the relative displacement being in substantial coincidence and at the other extremity being spaced apart to form notches, and a spring-pressed pawl bearing against the peripheries of said discs and acting to engage a notch to lock said driven member against rotation in one direction by a force applied thereto independently of said driving member.

2. In a clutch mechanism, the combination of a driving member, a driven member loosely journalled on said driving member, a pair of ratchet discs having flatwise contact at their peripheral portions, one being mounted on said driving member and the other fixed to said driven member, said discs having complementary teeth with radial edges facing in opposite directions, and means permitting a predetermined rotative movement between said discs whereby said teeth overlap at one extremity and spaced apart at the other extremity of the relative movement of said discs to form notches and a spring-actuated pawl bearing against the peripheries of said ratchet discs and normally adapted to ride freely over the teeth of said discs when said driven member is rotated in either direction by said driving member or when said driven member is rotated in one direction independently of said driving member, but engaging one of said notches to lock said driv-

ing member from turning in the opposite direction when force is applied thereto independently of said driving member.

3. In a clutch mechanism, the combination with a driving member, a driven member loosely journalled in said driving member, a pair of ratchet discs, one fixed to said driving member and the other to driven member, said ratchet discs having complementary ratchet teeth with radial edges facing in opposite directions, and a pin-and-slot connection permitting relative rotation of said discs through an arc substantially equal to one-half the pitch of said teeth whereby the same are spaced apart at one extremity of the relative movement of said discs to form peripheral notches and a spring actuated pawl bearing against the peripheries of said discs and normally permitting said driven member to be turned in either direction by force applied to said driving member or to be turned in one direction by a force applied thereto independently of said driving member, but acting automatically to lock said driven member from turning in the opposite direction by engaging a notch formed between complementary ratchet teeth on said discs.

Signed at Chicago, Ill., this 9th day of December, 1927.

AUGIE L. HANSEN.