Jan. 26, 1960 H. E. VAN VOORHEES 2,922,672

DOOR LATCH FOR PILLARLESS AUTOMOBILE

Filed Aug. 15, 1957 9 Sheets-Sheet 1

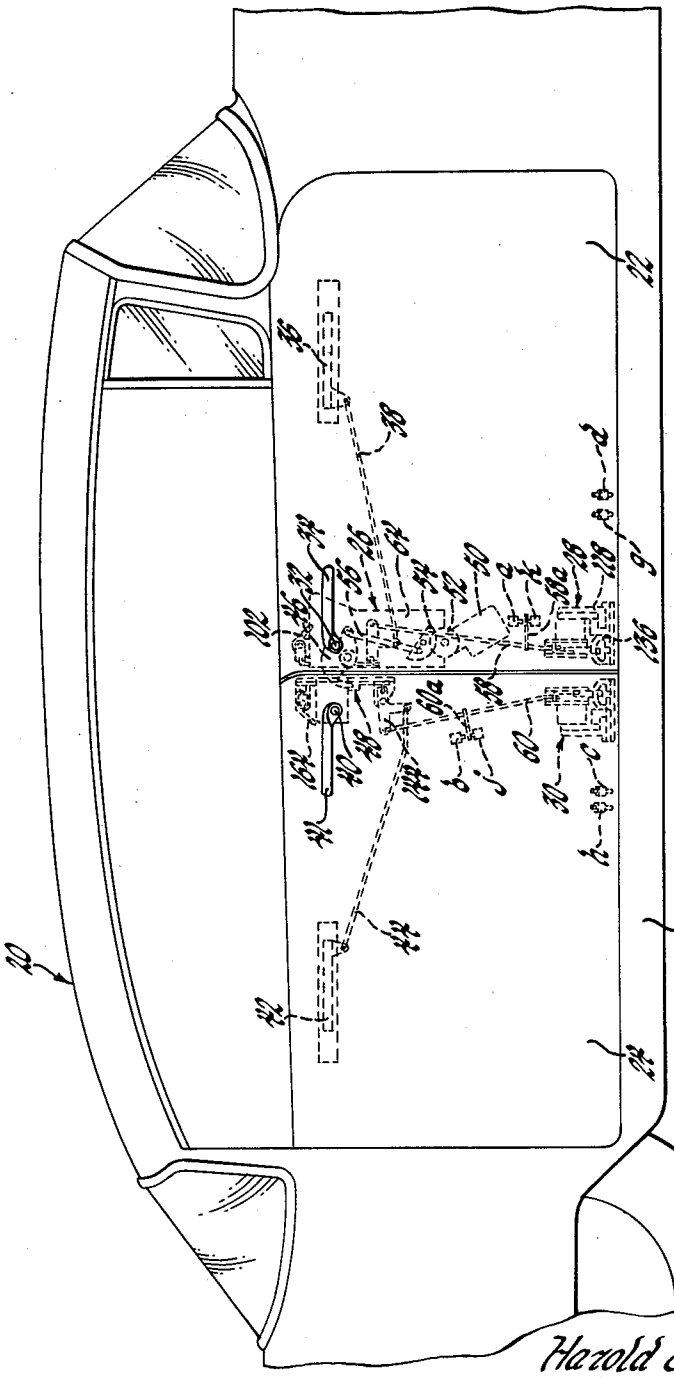


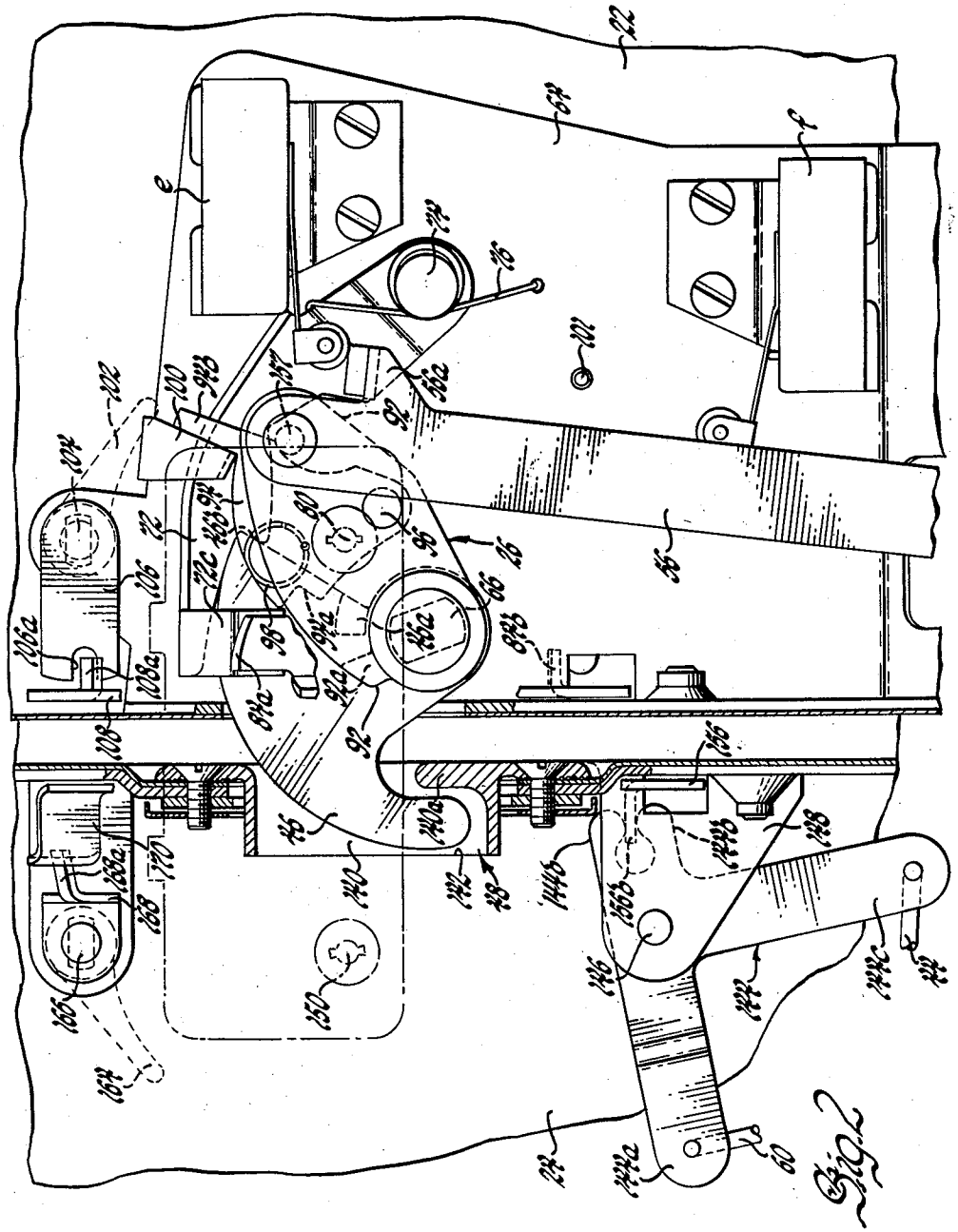
Fig. 1

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DOOR LATCH FOR PILLARLESS AUTOMOBILE

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DOOR LATCH FOR PILLARLESS AUTOMOBILE

Filed Aug. 15, 1957 9 Sheets-Sheet 3

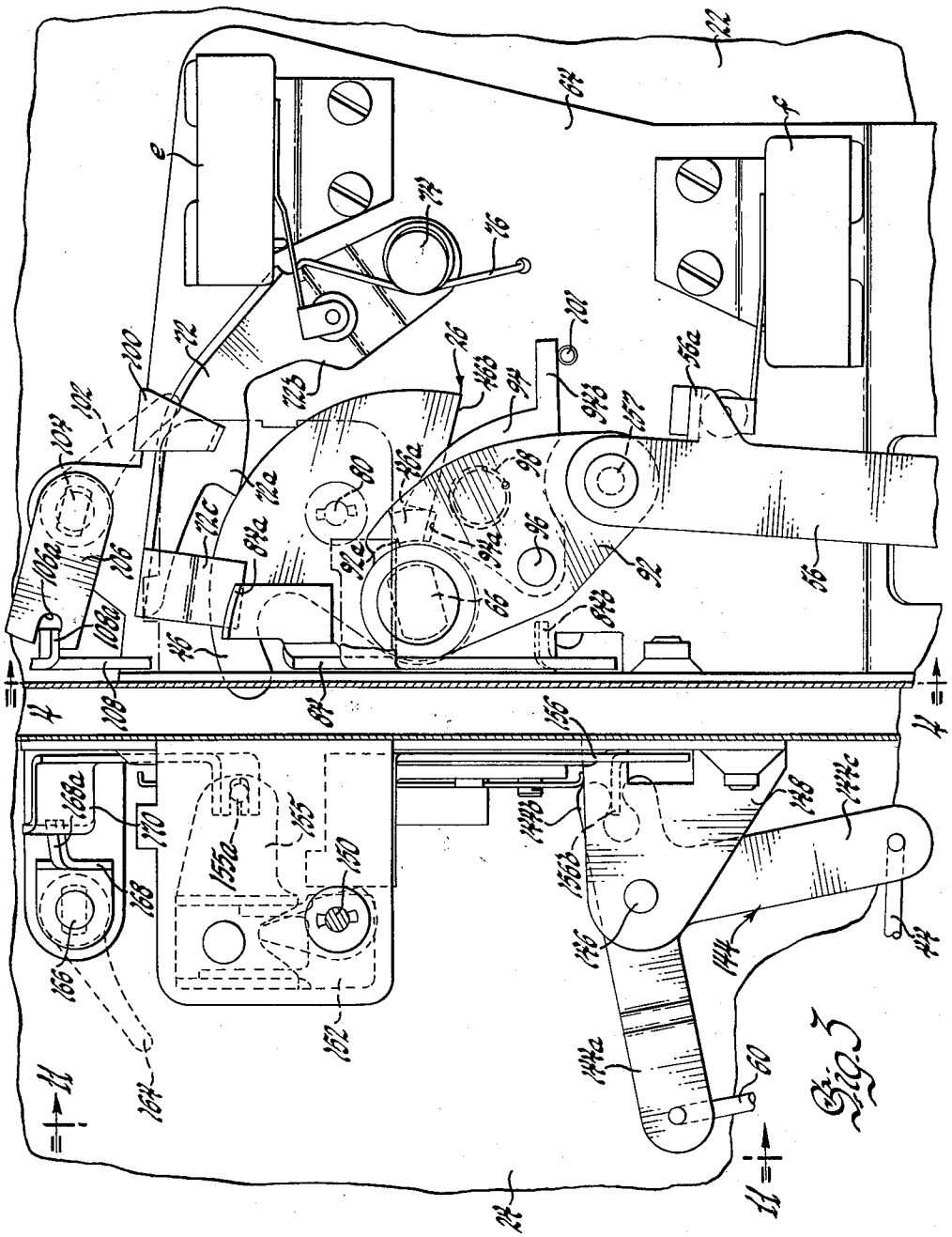


Fig. 5

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DOOR LATCH FOR PILLARLESS AUTOMOBILE

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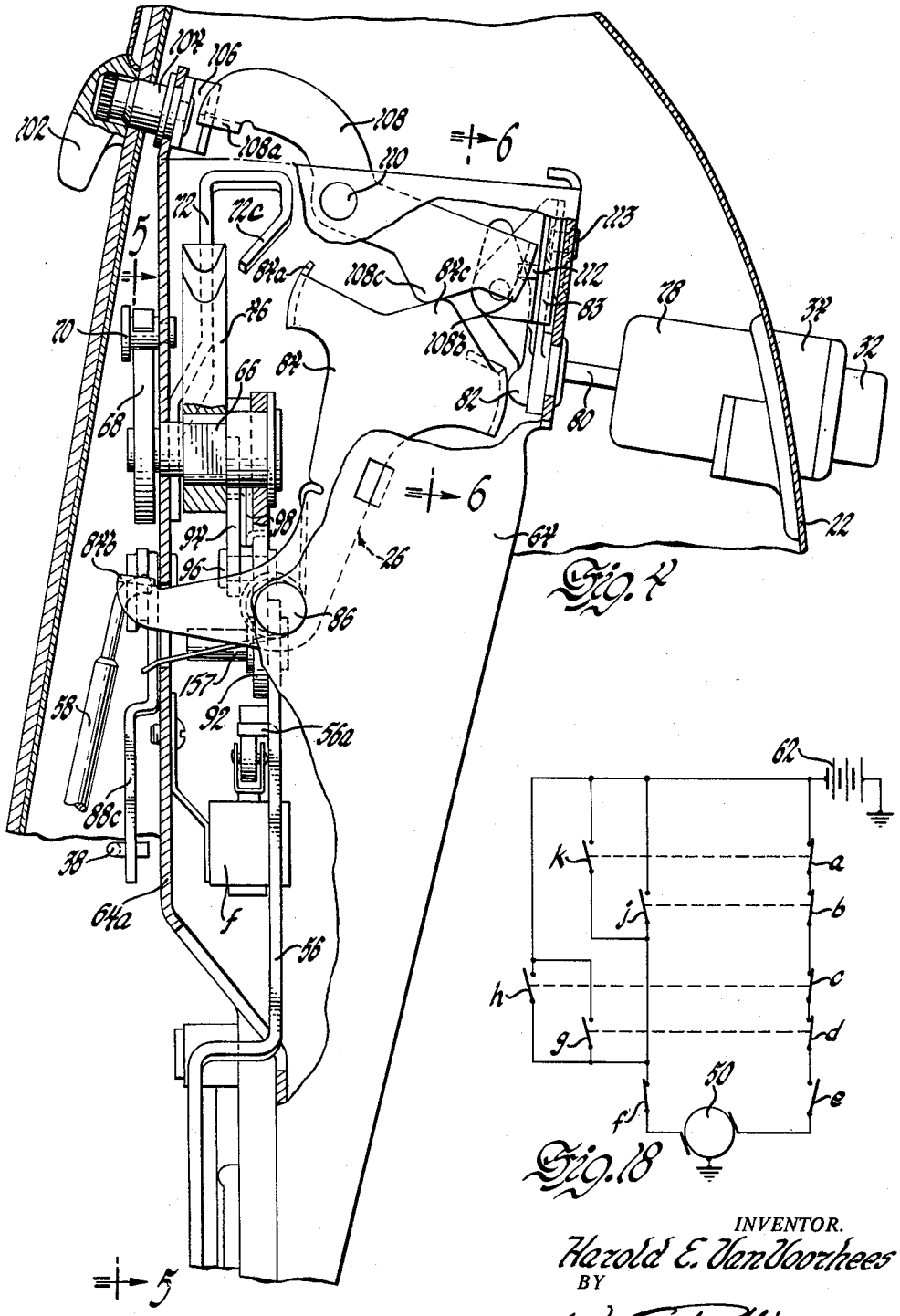


Fig. 1

Fig. 1B

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DOOR LATCH FOR PILLARLESS AUTOMOBILE

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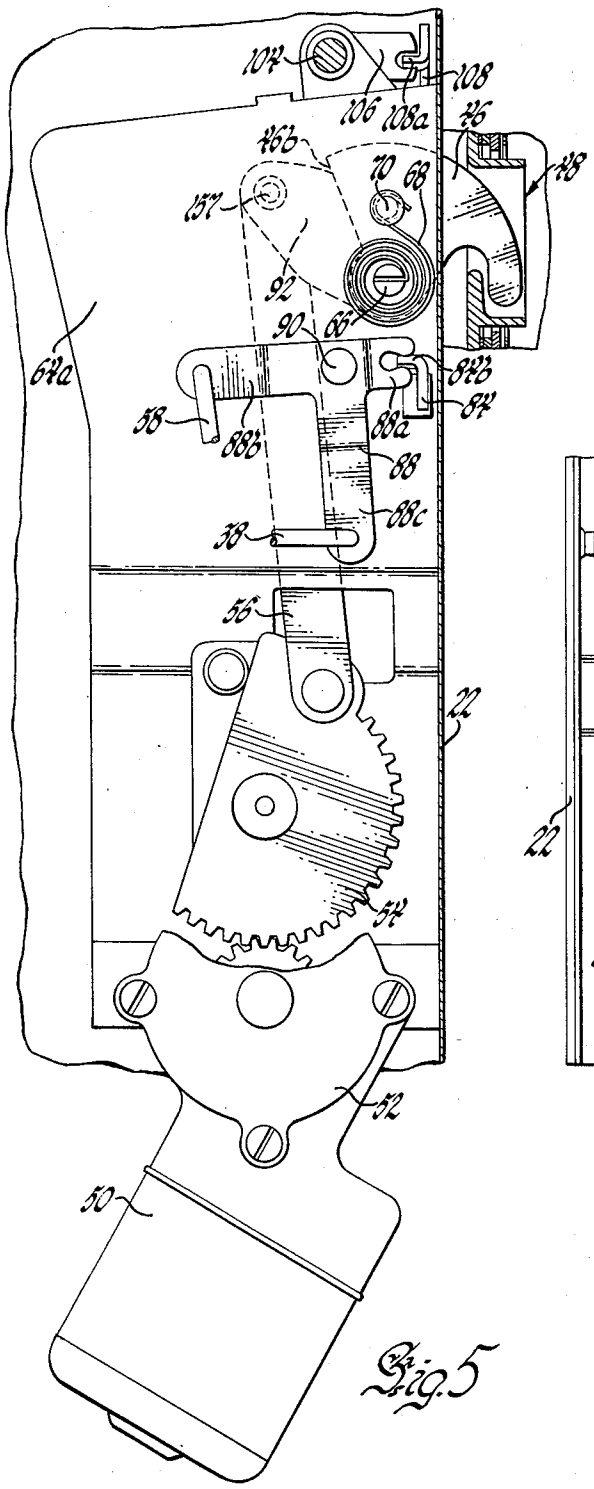


Fig. 5

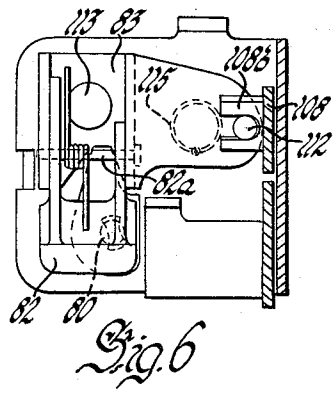


Fig. 6

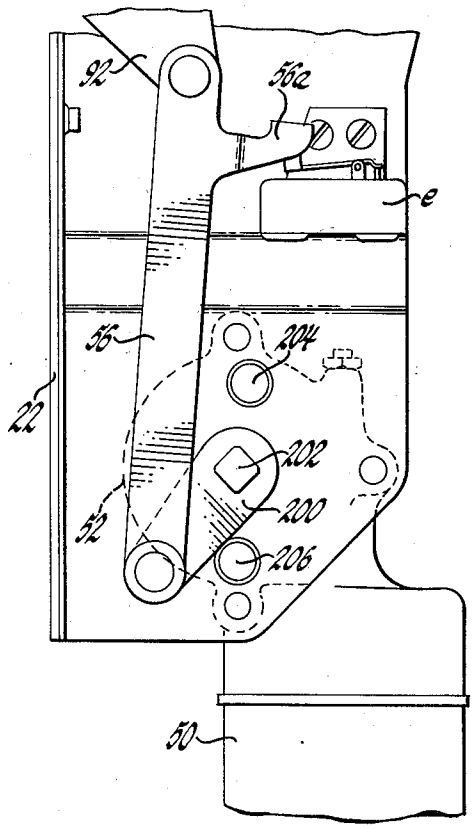


Fig. 7

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DOOR LATCH FOR PILLARLESS AUTOMOBILE

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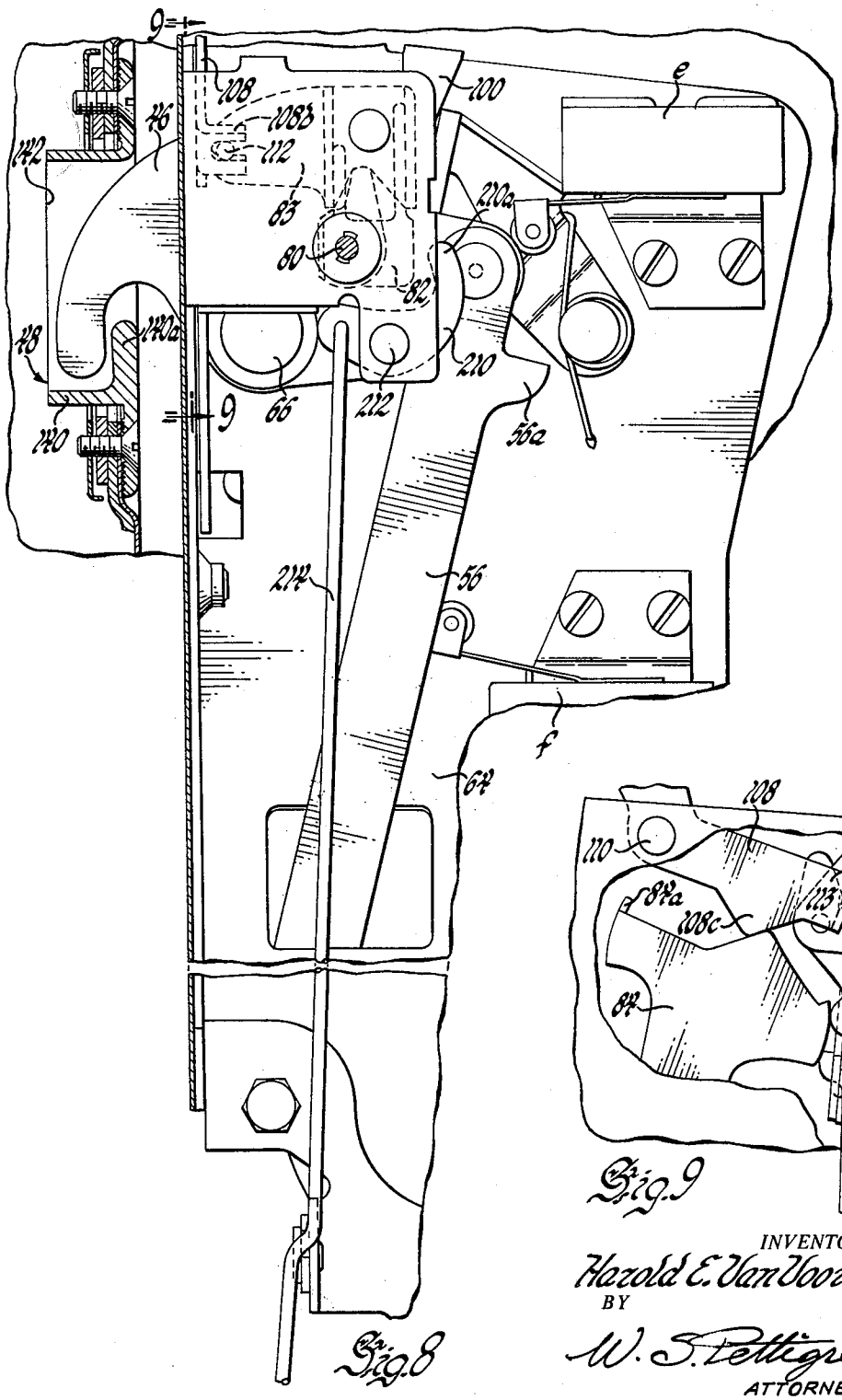


Fig. 8

Fig. 9

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DOOR LATCH FOR PILLARLESS AUTOMOBILE

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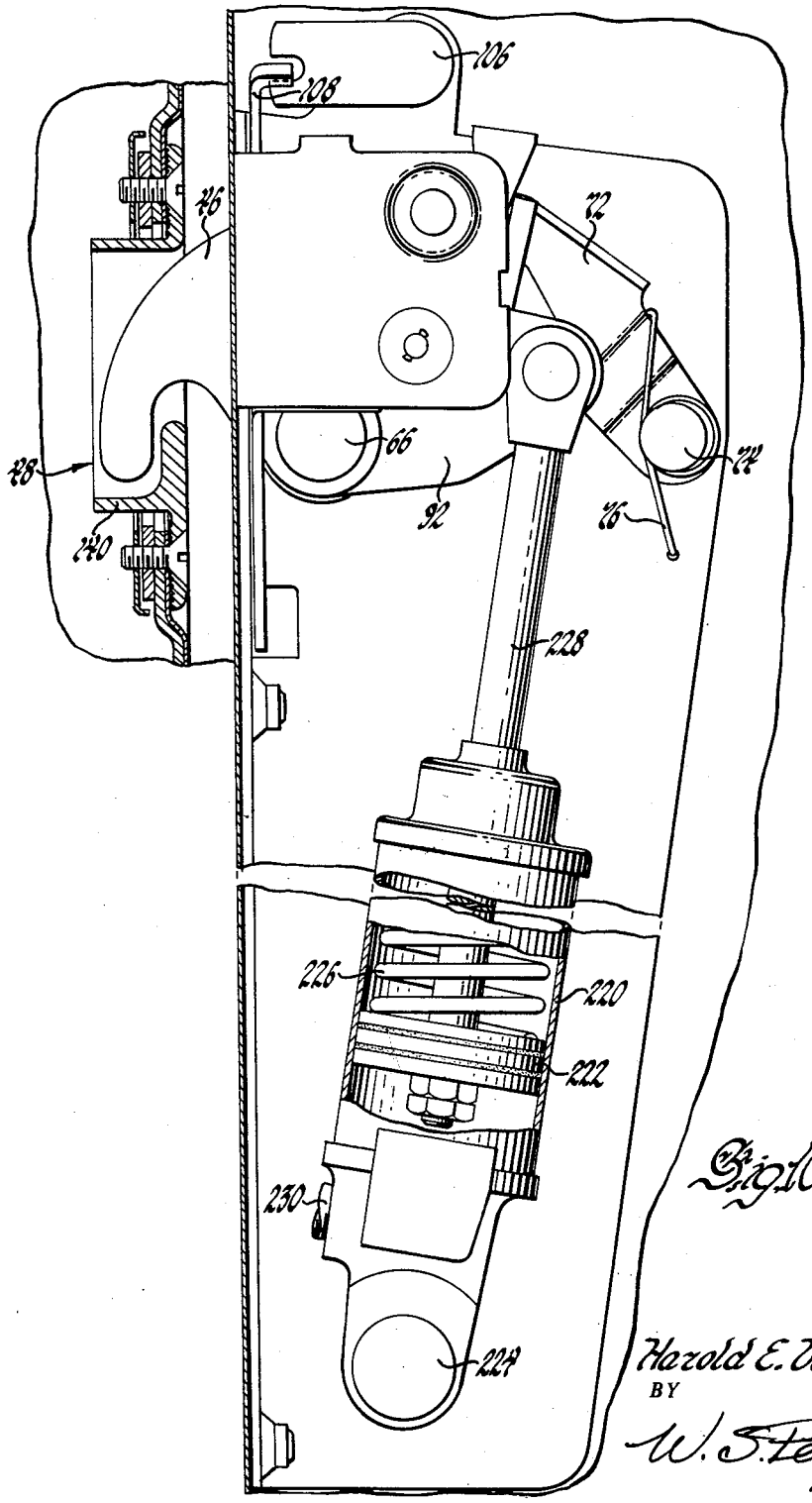


Fig. 10

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DOOR LATCH FOR PILLARLESS AUTOMOBILE

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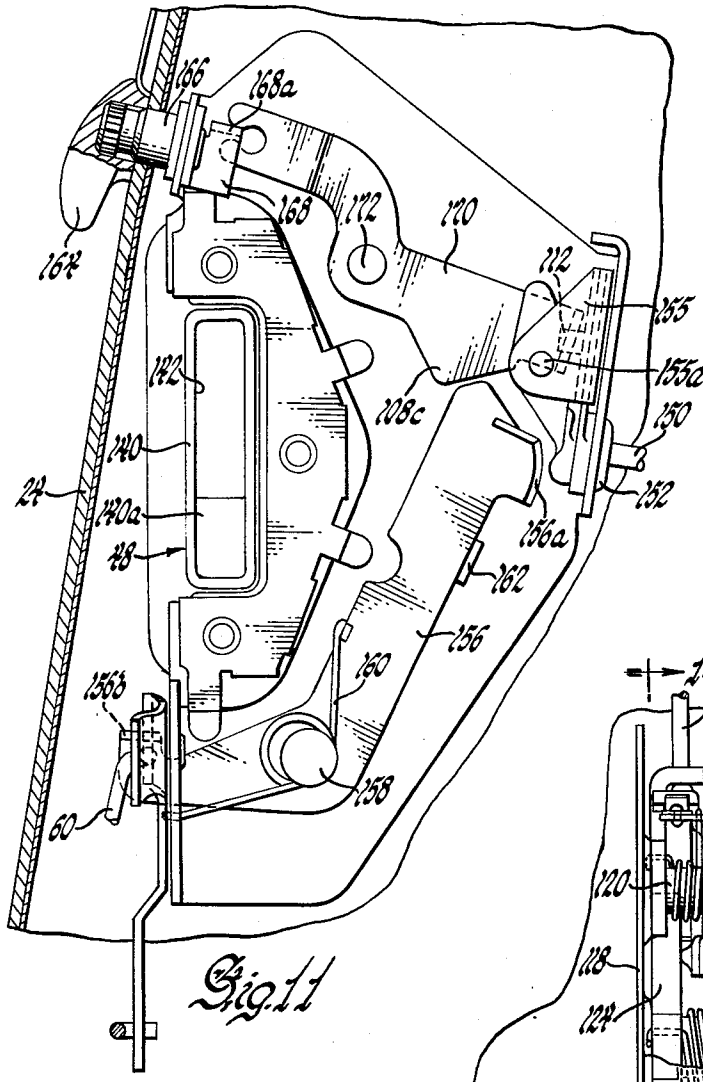


Fig. 11

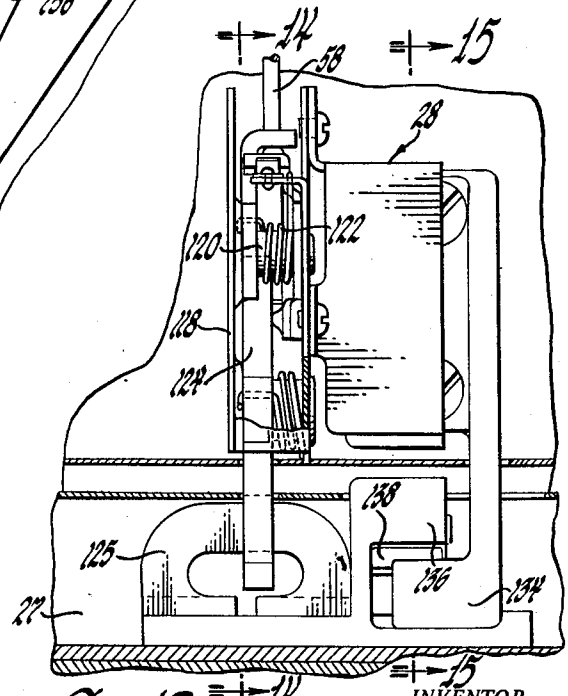


Fig. 12

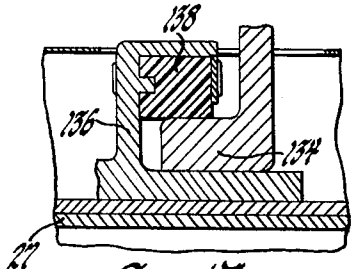


Fig. 13

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DOOR LATCH FOR PILLARLESS AUTOMOBILE

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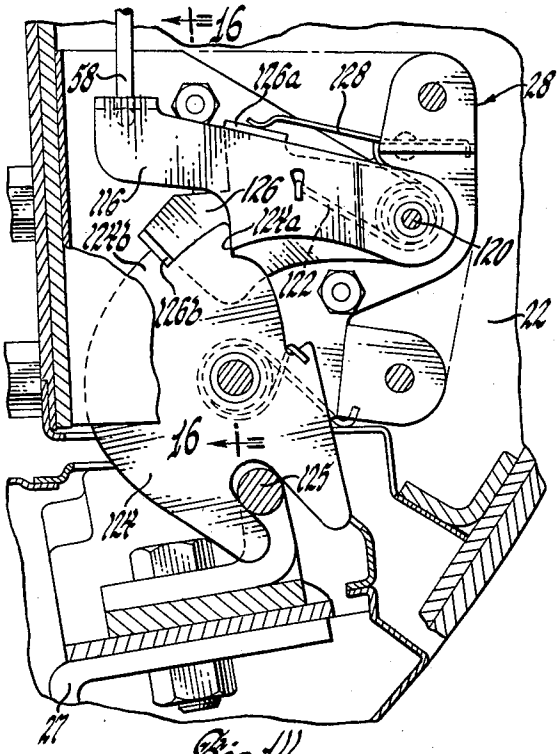


Fig. 14

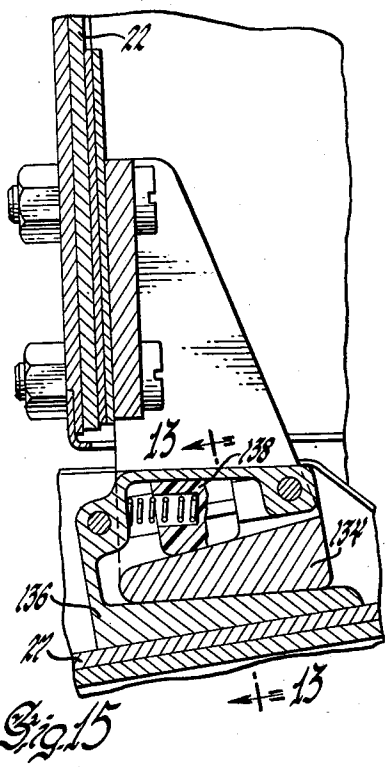


Fig. 15

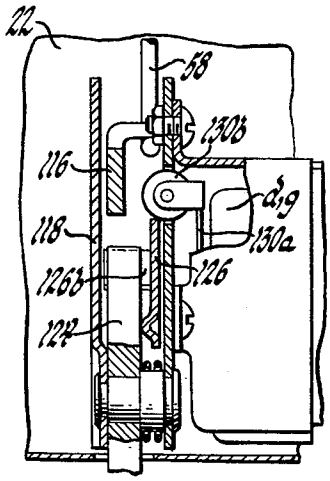


Fig. 16

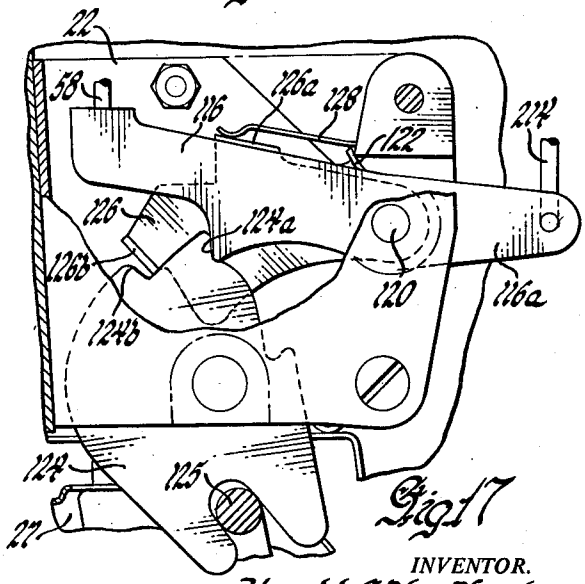


Fig. 17

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Patented Jan. 26, 1960

2,922,672

DOOR LATCH FOR PILLARLESS AUTOMOBILE

Harold E. Van Voorhees, Grosse Pointe Woods, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application August 15, 1957, Serial No. 678,272

8 Claims. (Cl. 292—11)

This invention relates to automobile door latching means, and more particularly to improved latching means for a pillarless four-door automobile.

One feature of the invention is that it provides improved door latching means; another feature of the invention is that it provides an improved mechanical and motor operated latch; still another feature of the invention is that the latch may be operated mechanically without operation of the motor, as in the event of power failure; a further feature of the invention is that it provides novel means for latching the front and rear doors to each other and to the automobile sill and rocker panel; another feature of the invention is that it provides a latching system for a pillarless automobile wherein the front and rear doors are latched to each other with a hook type latch insuring that the doors cannot be pulled apart; still another feature of the invention is that it provides for locking the doors without the use of a key; yet a further feature of the invention is that, in one form, the door may be locked by the inside lock operator while the door is open and the door may then simply be slammed shut and be locked without a key; yet a further feature of the invention is that, in another form, a conscious act on the part of the operator (as depressing the outside push button) is necessary to accomplish keyless locking; and another feature of the invention is that there is a main latch common to the front and rear doors, with mechanical means for releasing the latch to open the front door to insure instantaneous release of the latch and electrical means for releasing the latch to open the rear door to avoid the necessity of a complicated mechanical linkage system.

Other features and advantages of the invention will be apparent from the following description and drawings, in which:

Fig. 1 is a fragmentary side elevation of an automobile having the improved latching means, structure which underlies the outer panels of the automobile doors being shown in broken lines;

Fig. 2 is an enlarged vertical longitudinal section taken inside the outer front and rear door panels, the latch being shown in side elevation and partly in section with the latch bolt in latching position;

Fig. 3 is a view similar to Fig. 2 but with the bolt in retracted position;

Fig. 4 is a transverse vertical section through the front door taken along the line 4—4 of Fig. 3;

Fig. 5 is a vertical longitudinal section taken along the line 5—5 of Fig. 4;

Fig. 6 is a detail section through part of the latch operating means taken along the line 6—6 of Fig. 4;

Fig. 7 is a fragmentary view of the latch drive means in a modified form of the invention;

Fig. 8 is a view similar to Fig. 2 but showing a modified form of keyless locking;

Fig. 9 is a vertical section taken along the line 9—9 of Fig. 8;

Fig. 10 is a view similar to Fig. 2 but showing another modified form of the invention;

Fig. 11 is a view showing the rear door operating means of Fig. 3 taken along the line 11—11 thereof;

Fig. 12 is a sectional view showing a portion of the sill latch;

Fig. 13 is a detail section through a portion of the rocker panel taken along the line 13—13 of Fig. 15;

Fig. 14 is a section showing the sill latch in elevation, taken along the line 14—14 of Fig. 12;

Fig. 15 is a similar section taken along the line 15—15 of Fig. 12;

Fig. 16 is a section through the bolt and detent of the sill latch taken along the line 16—16 of Fig. 14;

Fig. 17 is a view similar to Fig. 14 but showing a modified form of sill latch for use with the main latch of Fig. 8; and

Fig. 18 is a schematic diagram of an electrical circuit for operating the latch means.

This door latch is particularly designed for a pillarless four-door automobile of the type generally designated as 20 in Fig. 1. The automobile has a front door 22 hingedly mounted at its front side on the body and a rear door 24 hingedly mounted at its rear side on the body, and the free edges of the doors lie closely adjacent each other when the doors are closed. The hinge mountings for the doors may be conventional and are not illustrated. The doors are of the so-called convertible type which do not have a window frame, so consequently there is no means for latching the doors to the side roof rail of the automobile. The doors 22 and 24 are latched to each other adjacent the belt line of the automobile by a main latch designated generally as 26, and the front door is latched at its lower rear corner to the automobile sill or rocker panel 27 by a subsidiary sill latch designated generally as 28, while the rear door is latched at its lower front corner to the sill by a subsidiary sill latch designated generally as 30. The front door may be opened from the outside by means of a push button 32 mounted in a fixed gripping handle 34, or the door may be opened from the inside by means of a remotely located handle 36 connected to the main latch through an actuating rod 38. The rear door may be opened from the outside by means of an outside push button 40 mounted in a fixed gripping handle 41 or the door may be opened from the inside by means of a remotely located inside handle 42 connected to the rear door latch operating means through a rod 44.

General description

The front door 22 carries the main door latch 26, which latch has a pivotally mounted hook-shaped bolt 46 which is operated mechanically through a spring or electrically through a motor and which is adapted to engage in a striker 48 on the rear door 24 to latch the front and rear doors together. A reversible motor 50 is connected through a conventional type gear box 52 to a driving gear sector 54 which pivotally mounts an actuating link 56. At its upper end, the actuating link is connected to the main latch 26 for moving the bolt between a projected or latched position as shown in Figs. 2 and 5 and a retracted or unlatched position as shown in Fig. 3. As will appear from the description of the electrical system, the motor 50 has a retracting circuit and a latching circuit. When the front door is opened, the bolt is released mechanically, but when the rear door is opened the bolt is released through the motor driven actuating link 56. When both doors are closed, the bolt is swung to latched position through the motor driven actuating link 56.

There is also a mechanically operated subsidiary sill latch 28 at the bottom of the front door 22 and an iden-

tical sill latch **30** at the bottom of the rear door **24**. These sill latches, which are shown in Figs. 12–16, anchor the bottom of the respective doors to the sill or rocker panel **27**.

When the front door inner remote handle **36** or outer push button **32** is operated to open the door, the sill latch is released mechanically through a rod **58**. At the same time a motor switch in the sill latch is operated to close the retracting circuit to the motor **50**. A motor driven linkage moves to retract the main latch bolt **46**, although the bolt is actually more quickly retracted through a linkage mechanically coupled to the push button and remote handle. Since the bolt is released mechanically when the front door is opened, the door can be opened in the event of power failure.

Operation of the rear door push button **40** or inside remote handle **42** pulls up on a rod **60** to trigger the rear door sill latch **30**. At the same time, a switch is actuated to close the retracting circuit of the motor **50** in the front door and release the main latch bolt to unlatch the rear door from the front door. There is no mechanical main latch release means for opening the rear door.

Upon closing the door, door still switches are actuated to operate the motor **50** and project the bolt **46** to its latched position. The electrical circuit includes interlocks to prevent the bolt **46** from being moved to latched position when either door is open.

Operating circuit

In order to control the reversible motor **50** there are six single throw switches in the front door and four single pole, single throw switches in the rear door. The ten switches are arranged in pairs, each pair having a common actuator. As shown in Fig. 1, in the front door there is a pair of motor switches *a* and *k*, the switch *a* being normally closed and the switch *k* being normally open. Normal conditions are taken to be when both front and rear doors are closed and the main latch is latched. The front door also carries a pair of motor limit switches (see Figs. 2 and 3) *e* (normally open) and *f* (normally closed) and a pair of sill switches *d* (normally closed) and *g* (normally open). In the rear door there are a pair of motor switches *b* (normally closed) and *j* (normally open) and a pair of sill switches *c* (normally closed) and *h* (normally open).

The motor switches operate the motor **50** to control the main latch **26** when one of the doors is opened by the front or rear inner or outer operating means; the limit switches deenergize the motor when the bolt projecting or bolt retracting cycle is completed; and the sill switches operate the main latch when the door is slammed shut and also provide an interlock to prevent projection of the bolt **46** unless both doors **22** and **24** are closed so that the bolt and striker are in their proper interengaged positions. If the bolt were projected when one of the doors was open, closing that door would cause the side of the striker to smash the side of the bolt, damaging the parts without consummating the latching operation.

Assuming both doors to be closed, which is the condition shown in the wiring diagram in Fig. 18, the front door can be opened either by its handle **36** or by its outside push button **32**. Manipulation of the front door handle or the front door push button mechanically releases the bolt **46**, as later will be described, so that the bolt moves through the force of a spring out of latching engagement with the striker **48**; however it is necessary to operate the motor to locate the parts in position to move the bolt back to latching position. At the same time, the rod **58** which connects the main latch to the still latch triggers the sill latch **28** so that the door can be opened. The conventional sealing weather strip mounted on the body around the edge of the door opening will kick the door slightly open when both bolts (the main latch and the sill latch) are released. As the rod **58** moves to trigger the sill latch, an actuator **58***a* on the rod **58** opens switch *a* in the motor latching circuit and closes switch *k* in the motor retracting circuit. In Fig. 18, the latching circuit comprises that portion of the diagram located at the right of the motor **50** and the retracting circuit comprises that portion of the circuit located at the left of the motor **50**. Both circuits are connected to the automobile battery **62**.

When the actuator **58***a* closes switch *k*, a retracting circuit is completed through motor switch *k* and limit switch *f* to energize the motor **50** so that the gear sector **54** drives the actuating link **56** downwardly to a position in which it can pick up the bolt (which is now retracted) so that the motor can drive the bolt back to projected position when the door is closed. As the motor **50** pulls the actuating link **56** down, a switch operating lug **56***a* on the link moves away from limit switch *e*, allowing it to close. Since switch *a* is now open, the latching circuit is not energized. When the door is manually pulled open, sill switch *d* in the latching circuit is opened and sill switch *g* in the retracting circuit is closed, this latter switch providing a holding circuit around switch *k* so that the motor **50** remains energized even though switch *k* closes when the actuating rod **58** moves back to its normal position when the door handle or push button is released. When the actuating link **56** reaches its fully retracted position, lug **56***a* operates limit switch *f* in the retracting circuit to break the circuit to the motor **50**.

When the front door **22** is slammed shut (assuming the rear door **24** to be shut) sill switches *d* and *g* are returned to the condition shown in the wiring diagram, switch *d* being closed and switch *g* being open. These switches are operated by movement of the bolt on the sill latch to its latched position as the door is closed. In Fig. 16 the switches *d* and *g* are shown as being located in a single housing. Both switches are controlled by a common operating arm **130***a* and roller **130***b* controlled by a switch operating lever **126** on the sill latch. If desired, the motor switches *a*, *k* may be mounted on the sill latch **28** and be operated in a manner similar to switches *d*, *g*. Since the motor limit switch *e* is now closed and since motor switch *a* also is closed, a latching circut is closed through switches *a*, *b*, *c*, *d* and *e* to energize motor **50** and drive the bolt **46** back to its latched position as shown in Figs. 2 and 5. When the bolt reaches this latched position, the lug **56***a* on the actuating link **56** opens limit switch *e* to break the circuit to the motor.

In order to open the rear door, either the inside or outside operating mechanism may be manipulated to pull up on the rod **60** which is connected to the rear sill latch **30**. An actuator **60***a* on the rod **60** opens switch *b* in the latching circuit of the motor **50** and closes switch *j* in the retracting circuit, thereby energizing motor **50** to retract the bolt **46**. When the bolt reaches its retracted position, the lug **56***a* on actuating link **56** opens limit switch *f* to break the retracting circuit. When the rear door moves away from the rocker panel so that the bolt in the rear sill latch **30** moves from latched to unlatched position, rear sill switch *c* in the latching circuit is opened and rear sill switch *h* in the retracting circuit is closed, this latter switch providing a holding circuit around the motor switch *j* so that the motor **50** continues to be energized even though the rod **60** is returned to its normal posiiton when the manual operating mechanism is released. Sill switches *c* and *h* may be arranged and operated similarly to sill switches *d* and *g* in the front door.

When the rear door is slammed shut (assuming the front door to be closed), sill switch *h* is opened and sill switch *c* is closed, this latter switch completing a latching circuit through motor **50** to drive the bolt **46** to latched position.

Since the bolt **46** latches the front door **22** to the rear door **24**, the bolt must remain retracted so long as either door is open. Assuming both doors to be open and the front door to be slammed shut, the sill switch *c* in the rear door will still be open so that motor **50** cannot be energized despite the fact that all the other switches in the latching circuit are closed. When the rear door is closed, sill switch *c* will close and motor **50** will be energized.

Main latch

The main latch **26** which is carried by the front door is mechanically triggered to open the door upon operation of either the outside push button **32** or the inside remote handle **36**. When the door is closed, the latch bolt is driven to latched position by the motor **50**. Consequently, upon opening the door (despite the fact that the latch bolt is triggered mechanically), it is necessary to drive the motor in unlatching direction to arrange the latching parts in position to pick up the bolt mechanism when the bolt is to be projected. As shown best in Figs. 2, 3, 4 and 5, the hook-shaped bolt **46** is pivotally mounted on the latch frame **64** by a rotatable stud **66**. A coil spring **68** has its inner end anchored on the stud **66** and its outer end hooked to a pin **70** projecting from a flange part **64***a* of the latch frame. The spring yieldably urges the bolt toward the unlatched position of Fig. 3 and the bolt is held in latched position by a foot **72***a* on a detent **72** which is pivotally mounted on a stud **74** on the latch frame and which is urged by a spring **76** into blocking relation with a shoulder **46***b* on the bolt.

The outside push button **32** is slidably mounted in conventional manner in a lock cylinder housing **78** and a push rod **80** projects out of the inner end of the lock cylinder for engagement with a pivoted operating pawl **82** which is mounted on a pin **82***a* on a shiftable locking carriage **83**. When the push button is depressed, the pawl swings against the operating lever **84** which is pivoted on a stud **86** on the latch frame, swinging the operating lever in a counterclockwise direction in Fig. 4 so that a turned flange **84***a* on the operating lever engages a turned portion **72***c* at the free end of the detent **72** and swings the detent out of blocking relation with the bolt, whereupon the spring **68** pivots the bolt from the latch position of Figs. 2 and 5 to the unlatched position of Fig. 3. In Fig. 4 the detent is shown in unlatched position. When in latched position, the portion **72***c* of the detent is located down closer to the flange **84***a* of the operating lever.

Simultaneously, a flange **84***b* at the lower end of the operating lever **84** swings a remote lever **88** in a clockwise direction as the parts appear in Fig. 5. Referring to Fig. 5, the remote lever has three arms and is pivotally mounted at **90** on the latch frame adjacent the intersection of these arms. The remote lever has a short generally horizontally extending arm **88***a* with a slotted end receiving the flange **84***b* of the operating lever **84** and an oppositely extending generally horizontal arm **88***b* on the remote lever is connected at its end to the rod **58** which extends down to the sill latch. The third arm **88***c* of the remote lever **88** extends downwardly from the pivot **90** and is connected to the rod **38** for operation by the inside remote handle **36**.

As pointed out earlier, the subsidiary sill latch **28** is released through the rod **58** simultaneously with release of the main latch bolt **46** and this operation closes the motor retracting circuit so that the motor operates to locate the parts in their proper position to pick up the bolt **46** and drive it back to latched position. When the motor runs, the driving gear sector **54** is turned in a clockwise direction in Fig. 5 to pull down on the actuating link **56**. At its upper end, the actuating link is pivotally connected to an actuating lever **92** which is pivoted at its other end on the stud **66**. The lever **92** has a lug **92***a* which may pick up a lug **46***a* projecting from the bolt to move the bolt to unlatched position. An actuating pawl **94** is pivoted on a stud **96** projecting from the actuating link **92** and an overcenter acting spring **98** connects the parts **92** and **94** for holding the pawl **94** in an operative position or an inoperative position on the link **92**. The pawl has a notch **94***a* adapted to make driving connection with lug **46***a* projecting from the bolt when the pawl is in operative position as shown in Fig. 3. When the pawl is in inoperative position as shown in Fig. 2, the pawl is out of the way of the lug **46***a* and the pawl is disconnected from the bolt. A tail **94***b* on the pawl **94** is adapted to engage a stop block **100** when the parts approach latched position as shown in Fig. 2 to cause clockwise movement of the pawl **94** relative to the actuating lever **92** and move the notch **94***a* on the pawl away from the lug **46***a* on the bolt. When the pawl approaches the position of Fig. 3, the tail **94***b* strikes a stop block **101** on the frame to flip the pawl back to an operative position.

In order to lock the door, there is a flip lever **102** keyed to a stud **104** which is pivotally mounted on the inner door panel. An inside flip lever **106** on the inner end of the stud has a free end formed with a slot **106***a* receiving a flange **108***a* on the inner end of a locking lever **108** which is pivoted intermediate its ends on a pin **110** to the lock frame. The outer end of the locking lever has a turned flange **108***b* with a slot which receives a pin **112** projecting from the shiftable carriage **83** which is pivotally mounted on the latch frame at **113**. This outside locking lever is adapted to be swung either upon rocking movement of the lever **108** or upon turning movement of a key in the key cylinder operating through the push rod **80** to shift the carriage **83** between locked and unlocked positions. A spring **115** holds the carriage in either position. Upon inside or outside locking operation, the carriage **83** swings to move the pivoted operating pawl **82** out of alignment with a flange on the operating lever so that the outside push button merely "free wheels" when depressed and the door cannot be opened from outside. As shown in Fig. 4, the locking lever **108** and the operating lever **84** have complementary projections **108***c*, **84***c* adapted to abut when the door is locked. These abutting parts permit the door to be unlocked and opened upon operation of the inside handle **36**.

Sill latch

Figs. 12–16 show the front door sill latch to which the lower end of the connecting rod **58** is attached. As shown best in Fig. 14, the lower end of the rod **58** is connected to a detent **116** pivotally mounted on the subsidiary latch frame **118** on a pin **120** and urged by a spring **122** into holding engagement with the subsidiary latch bolt **124**. The free bifurcated end of the bolt is adapted to engage a striker **125** mounted on the rocker panel **27**. As shown in Fig. 14, the bolt has a latching shoulder **124***a* and a safety shoulder **124***b*. Underlying the detent **116** and also pivotally mounted on the pin **120** is a switch operator **126** which is urged toward the bolt by a leaf spring **128**. The switch operator **126** is formed with a flange **126***a* overlying the upper edge of the detent so that when the detent is raised, the switch operator also is raised. An arm **126***b* on the switch operator ends in a right angle flange for camming engagement with the bolt so that the operator, which may move in one direction independently of the detent, is also controlled by the bolt to operate the switches *d*, *g* at the proper time as the bolt **124** moves between latched and unlatched positions. As shown in Fig. 16, the switches are controlled by a single actuating arm **130***a* which mounts a roller **130***b* for engagement by the switch operator **126**.

Referring to Fig. 15, the lower edge of the door **22** carries a tapered guide stud **134** which, when the door is closed, enters a guide housing **136** on the rocker

panel. The spring-pressed shoe **138** in the housing abuts the upper surface of the guide stud **134** to insure tight wedging engagement and assists in holding the door firmly closed.

Rear door operating mechanism

As shown best in Figs. 2, 3, 5 and 11, the rear door striker **48** comprises a housing **140** with a forwardly opening recess **142** for receiving the bolt, said housing having a front lower wall **140***a* which, with the hooked nose of the bolt, forms an interlock to prevent the doors from being pulled apart.

Operation of the rear door outside push button **40** or the rear door remote handle **42** mechanically releases the rear door sill latch **30** and electrically operates the main latch **26** through closure of the unlatching circuit to the motor. A three-armed remote lever **144** which is pivotally mounted at the juncture of its arms on a pin **146** projecting from a mounting bracket **148**, has a rearwardly extending generally horizontal arm **144***a* which is connected to the upper end of the rod **60** which extends down to the rear sill latch **30**. A short forwardly extending generally horizontal arm **144***b* on the remote lever **144** is connected to the rear door outside push button operating mechanism and a downwardly extending arm **144***c* on the lever **144** is connected by the rod **44** to the inside remote handle **42**. Operation of the remote handle **42** or the outside push button **40** swings the lever **144** in a clockwise direction in Fig. 2 to pull up on the rod **60** and trigger the sill latch in the same manner as described in Figs. 14, 15 and 16 in connection with the front door. The outside push button operates a push rod **150** which abuts a pawl **152** pivoted on a shiftable carriage **155**. When the outer push button is depressed, the pawl swings inwardly to pick up a flange **156***a* on one arm of a bell crank **156** pivoted on a stud **158** and yieldably biased toward the pawl by a spring **160**. A stop **162** (Fig. 11) limits clockwise swinging of the bell crank. The free end of the bell crank terminates in a flange **156***b* which is received in a slot in the end of the arm **144***b* of the rear remote lever **144** so that operation of the outside push button **40** (when in unlocked condition) swings the remote lever **144** clockwise as above described. When the motor **50** runs in an unlatching direction, a cam pin **157** projecting from the actuating link pivot engages a cam follower surface **72***b* on the detent and cams the detent **72** out of latching engagement with the bolt so that the bolt may be retracted by the spring **68** or by the lug **92***a*, which may pick up lug **46***a* on the bolt. At the same time, the motor runs to pull the motor latching parts down to their unlatching position ready to engage the bolt to drive it back to latched position.

In the rear door there is no outside key lock, but there is an inside locking means comprising a flip lever **164** keyed to a stud **166** rotatably journaled in the inner door panel and mounting on its inner end a crank **168** with a flange **168***a* which seats in a slot in the bifurcated end of a lever **170** which is pivoted intermediate its ends on a pin **172**. The other end of the locking lever is connected to a pin **112** projecting from the shiftable carriage **155** so that when the flip lever **164** is operated to lock the door, the pawl **152** is swung out of the path of movement of the outer push button operator **150** and this operator merely free wheels.

Mode of operation

The front door **22** may be opened by means of the outside push button **32** or the inside remote handle **36**. When the push button is operated, it acts through the push rod **80** and the pawl **82** to swing the lever **84** which in turn picks up the remote lever **88**. Simultaneously, the lever **84** lifts the detent **72** in the main latch out of holding engagement with the bolt **46** and the bolt is retracted by the spring **68**. The rod **58** lifts the detent **116** in the sill latch free of the sill latch bolt **124** and simultaneously operates the motor switches in the manner earlier described so that the linkage associated with the motor is driven to retracted position. If the door is opened by means of the inside remote handle **36**, the same sequence of events occurs except that the handle **36** operates directly on the remote lever **88**.

The front door may be locked either by a key from the outside or by the flip lever **102** on the inside of the car. In either event, the lock lever **108** is swung to shift the carriage **83** and uncouple the outside operating parts so that the outside push button **32** free wheels.

The rear door may be opened by means of the outside push button **40** or the inside remote handle **42**. Actuation of either one of these operators swings the remote lever **144** to lift up on the rod **60** and trigger the detent in the sill latch **30**. Simultaneously, the rod **60** operates the switches *b*, *j* to start the motor on its retracting cycle whereupon the cam pin **157** lifts the detent **72** in the main latch out of engagement with the bolt **46** to permit the spring **68** to retract the main latch bolt. As the motor and its associated parts move to retracted position, the lug **92***a* picks up the lug **46***a* on the bolt and swings the bolt to retracted position if the spring **68** has not already done so.

When the doors are open, the interlock arrangement shown in the circuit of Fig. 18 prevents the latch circuit of the motor from being energized until both doors are closed so that the bolt **46** is not moved to latched position by the motor driven gear **54** until both doors are closed.

Either the front or the rear door may be opened, put in locked condition while open, and then slammed shut to lock the door from the outside without a key. Since the front door push button operator **32** is disconnected from the lever **84** and since the rear door push button operator **40** is disconnected from the lever **156**, either door will be locked by this single step (i.e., the step of placing the parts in either door in locked condition). The front door mechanism is arranged to provide for so-called automatic undogging by the inside handle, that is, when the door is locked, it still may be opened from the inside. When the inside remote handle **36** is operated to swing the remote lever **88** in a clockwise direction in Fig. 5, the operating lever **84**, which is connected to the remote lever, is swung in a counterclockwise direction so that the projection **84***c* which, in locked position, abuts the projection **108***c* on the locking lever **108**, swings the locking lever **108** up to its unlocked position. Similarly, the rear door may be opened from inside when either front or rear door is locked. Since the rear door remote handle **42** is connected directly to the rear remote lever **144**, operation of the handle swings the lever to raise up on the rod **60**. This triggers the sill latch **30** and also closes the motor retracting circuit to start the motor. As the actuating link **56** pulls down, the pin **157** cams the detent **72** out of engagement with the main latch bolt.

Modified forms

Fig. 7 shows a modified form of the invention in which the drive sector gear **54** of Figure 5 is replaced with a crank arm **200**. This arm is connected to an output shaft **202** on the gear box **52** and the free end of the arm is pivotally connected to the actuating link **56**. Stops **204** and **206** are provided on the lock plate **64***a* for abutment by the actuating arm to limit coasting of the motor after the circuit has been broken. In all other respects the structure of Fig. 7 is similar to that of Fig. 5.

Figs. 8 and 9 show a modification of the main latch to obtain two step keyless locking, i.e., keyless locking in which the parts must be placed in locked condition and also in which the operator must do a conscious act while closing the door in order to lock the door without a key. In the structure of Figs. 8 and 9, it is necessary to depress the outer push button while the door is being closed in order to achieve keyless locking. Otherwise, the locking mechanism will be moved back to unlocking condition as

the door is slammed shut. Fig. 17 shows a sill latch which is used with the main latch of Figs. 8 and 9.

In Fig. 8 an undogging pawl **210** is pivotally mounted at **212** on the latch frame. The pawl has a hook end **210***a* adapted to engage the pivoted pawl **82** under certain conditions of operation to swing the pivoted pawl **82** and the carriage **83** back to unlocked condition. The undogging pawl **210** is formed as a bell crank and its other arm is connected to a rod **214** which, as shown in Fig. 17, extends down to the sill latch and is connected to an extension arm **116***a* formed integrally on the detent. When the door is slammed shut, the operating foot of the detent will cam over the bolt teeth since the bolt pivots from unlatched position to latched position as it engages the striker. This camming action of the detent will pull down on the rod **214**, swinging the undogging pawl in counterclockwise direction in Fig. 8 so that its hook end **210***a* strikes the pivoted pawl **82** and shifts it back to unlocked position. If, however, the outside push button is depressed while the door is being slammed shut, the push rod **80** will move the pivoted pawl **82** out of the path of movement of the undogging cam so that the pawl **82** will not be shifted back to unlocked position. Consequently, if the parts are placed in locked position while the door is open and the outside push button is depressed while the door is being shut, the door will be locked without the use of a key.

Fig. 10 shows a modification in which the motor and associated parts are replaced by a hydraulic cylinder **220** mounting a piston **222**. The cylinder is pivotally mounted on the door at **224** and a compression spring **226** in the cylinder acts to drive the piston down in the cylinder. The piston rod **228** is connected at its upper end to the actuating link **92**. The lower end of the cylinder is connected by a line **230** to the brake fluid reservoir or to some other hydraulic system in the car. In other respects, the modification of Fig. 10 is similar to the arrangement earlier described. The switches in the electrical circuit may be connected in conventional manner to solenoid valves to control the operation of the piston **222** in the cylinder.

While I have shown and described several embodiments of my invention, it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. A door latching system for a pillarless automobile having a body with front and rear doors, the free edges of which lie closely adjacent each other when the doors are closed, including: a main latch on one door having a pivotally mounted bolt with a hook shaped latching nose; a striker on the other door for engaging said bolt to latch the doors together when the doors are closed, said striker having a recess with an upstanding wall behind which the nose of the bolt is received to interlock the doors against longitudinal separation; a subsidiary latch on each of said doors for latching each door to the body; first control means on the front door including a common actuator for the main latch and the front door subsidiary latch; and second control means on the rear door including a common actuator for the main latch and the rear door subsidiary latch.

2. A door latching system for a pillarless automobile having a body with front and rear doors, the free edges of which lie closely adjacent each other when the doors are closed, including: a main latch on one door having a pivotally mounted bolt with a hook shaped latching nose; a striker on the other door for engaging said bolt to latch the doors together, said striker having a recess with an upstanding wall behind which the nose of the bolt is received to interlock the doors against longitudinal separation; a subsidiary latch on each of said doors for latching each door to the body; electrical means for operating said main latch; mechanical means for operating said main latch and for operating each subsidiary latch; first control means on the front door including a common actuator for said electrical means and for the mechanical operating means for the main latch and the front subsidiary latch; and second control means on the rear door including a common actuator for said electrical means and for the mechanical operating means for the rear subsidiary latch.

3. Apparatus of the character claimed in claim 2, wherein said first-mentioned mechanical means are connected directly to the main latch, whereby the main latch is released mechanically ahead of operation by the electrical means.

4. A door latching system for a pillarless automobile having a body with front and rear doors, the free edges of which lie closely adjacent each other when the doors are closed, including: a main latch on the front door, said latch having a pivotally mounted bolt with a hook shaped latching nose, said bolt being movable between latched and unlatched positions; a striker on the rear door for engaging said bolt to latch the doors together when the doors are closed, said striker having a recess with an upstanding wall behind which the nose of the bolt is received to interlock the doors against longitudinal separation; a subsidiary latch on each of said doors for latching each door to the body; electrical means for operating said main latch; first mechanical means for operating the main latch and the front door subsidiary latch; second mechanical means for operating the rear door subsidiary latch; first control means on the front door including a common actuator for said electrical means and for the mechanical operating means for the front subsidiary latch and the front main latch; second control means on the rear door including a common actuator for said electrical means and for the mechanical operating means for the rear subsidiary latch; and electrical interlock means preventing operation of said bolt to latched position when either door is open.

5. A door latching system for a pillarless automobile having a body with front and rear doors, the free edges of which lie closely adjacent each other when the doors are closed, including: a main latch on the front door, said latch having a bolt movable between latched and unlatched positions; a striker on the rear door, said bolt engaging in said striker to latch the doors together when the doors are closed; a subsidiary latch on each of said doors for latching each door to the body; electrical means for operating said main latch; mechanical means for operating said main latch and each subsidiary latch; first control means on the front door including a common actuator for said electrical means and for the mechanical operating means for the main latch and the front subsidiary latch; second control means on the rear door including a common actuator for said electrical means and for the mechanical operating means for the rear subsidiary latch; and locking means for uncoupling the actuator in said first control means from the electrical and mechanical operating means.

6. A door latching system for a pillarless automobile having a body with front and rear doors, the free edges of which lie closely adjacent each other when the doors are closed, including: a main latch on the front door, said latch having a bolt movable between latched and unlatched positions; a striker on the rear door, said bolt engaging in said striker to latch the doors together when the doors are closed; a subsidiary latch on each of said doors for latching each door to the body, electrical means for operating said main latch; mechanical means for operating said main latch and each subsidiary latch; first control means on the front door including an inside actuator and an outside actuator, each of which is common to said electrical means and to the mechanical operating means for the main latch and the front subsidiary latch; second control means on the rear door including an inside actu-

ator and an outside actuator, each of which is common to said electrical means and to the mechanical operating means for the rear subsidiary latch; and locking means for uncoupling the outside actuator of said first control means from the electrical and mechanical operating means.

7. A door latching system for a pillarless automobile having a body with front and rear doors, the free edges of which lie closely adjacent each other when the doors are closed, including: a main latch on the front door, said latch having a bolt movable between latched and unlatched positions; a striker on the rear door, said bolt engaging in said striker to latch the doors together when the doors are closed; a subsidiary latch on each of said doors for latching each door to the body; electrical means for operating said main latch; first mechanical means for operating said main latch and said front door subsidiary latch; second mechanical means for operating said main latch and the rear door subsidiary latch; first control means on the front door including inside and outside actuators which are common to said electrical means and to the mechanical operating means for the main latch and the front subsidiary latch; second control means on the rear door including inside and outside actuators which

are common to said electrical means and to the mechanical operating means for the rear subsidiary latch; locking means including a shiftable member for uncoupling the outside actuator in said first control means from the operating means; and undogging means including an undogging lever which is mounted for movement as a function of closing of the door to shift said locking means back to coupled relationship, said locking means being movable out of the path of movement of said lever upon operation of said outside actuator when the door is being closed to retain the locking means in uncoupled relation.

8. Apparatus of the character claimed in claim 7, wherein the main latch bolt has a hook shaped latching nose and wherein said striker has a recess with an upstanding wall behind which the nose of the bolt is received to interlock the doors against longitudinal separation.

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