

July 20, 1948.

G. E. CURTISS, JR

2,445,709

LATCH

Filed Sept. 29, 1944

3 Sheets-Sheet 1

FIG. 1.

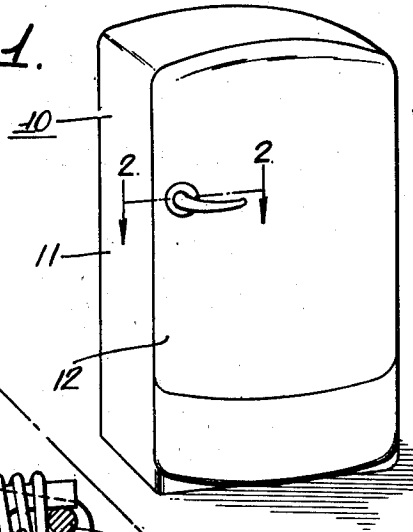


FIG. 2.

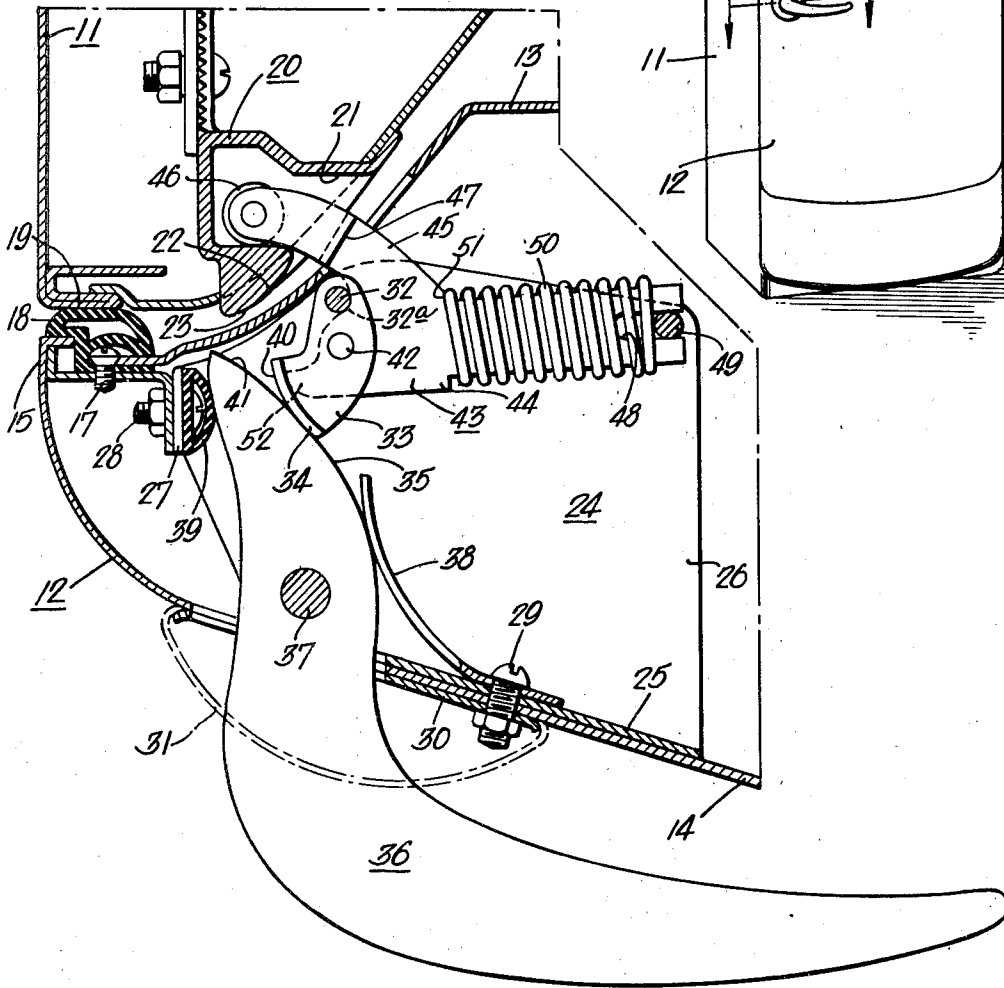
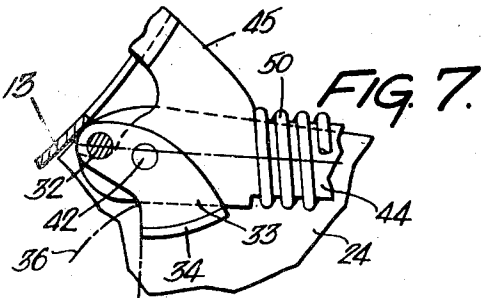


FIG. 7.

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FIG. 3.

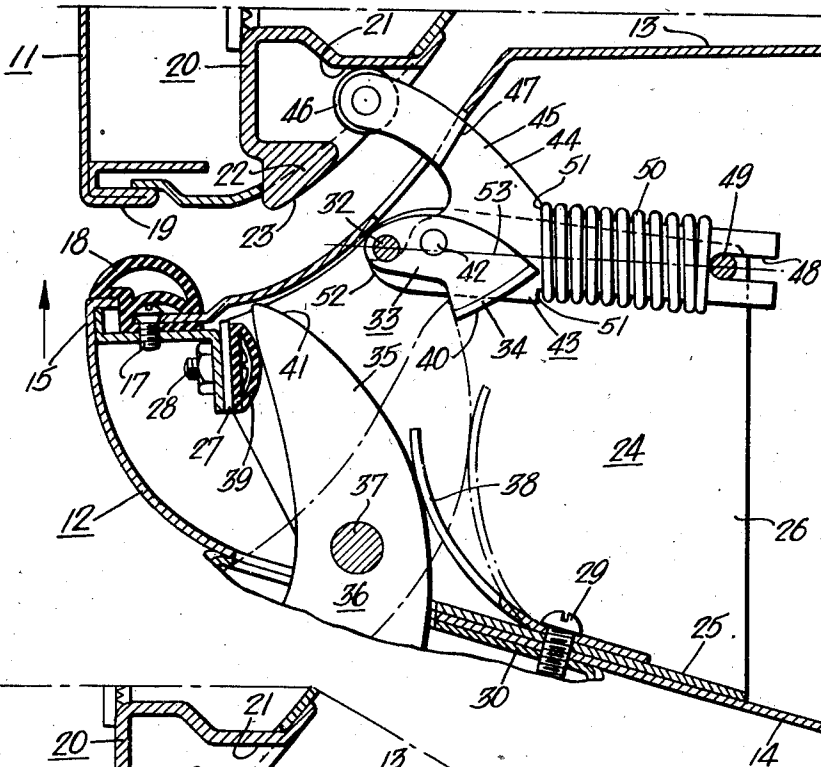
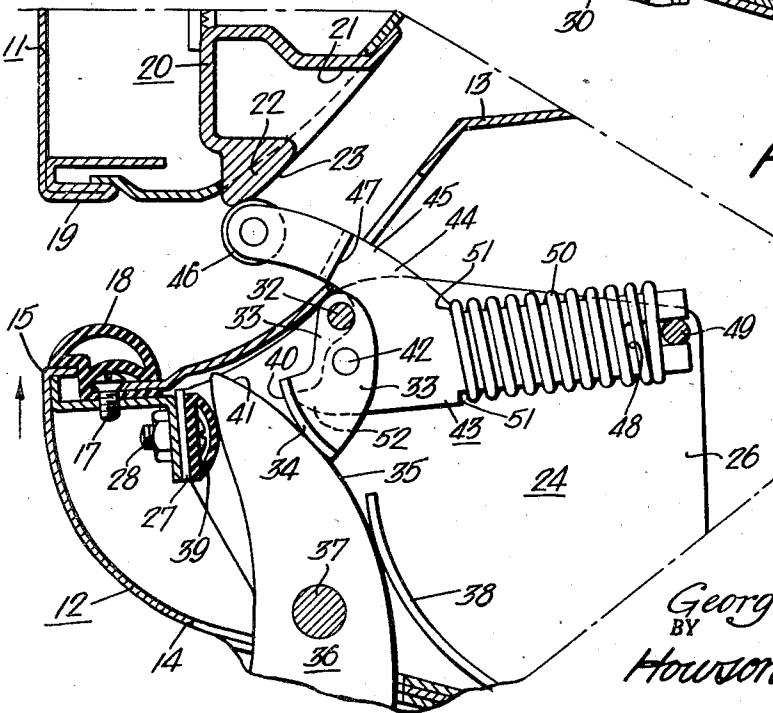


FIG. 4.



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FIG. 5.

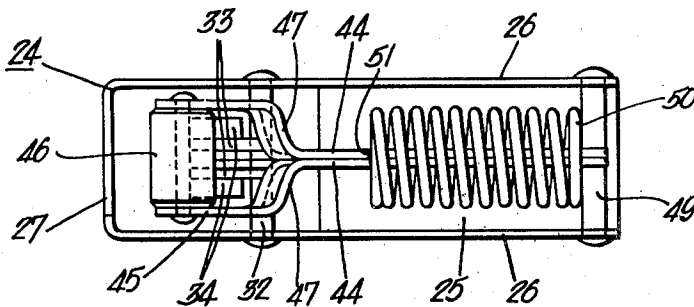
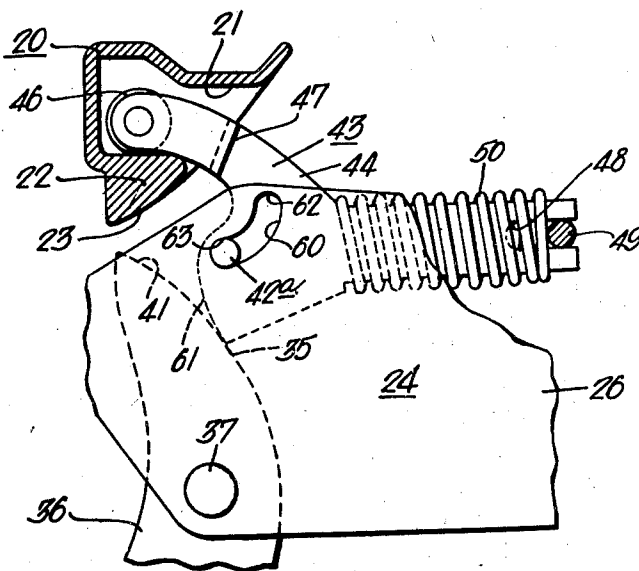


FIG. 6.



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Application September 29, 1944, Serial No. 556,402

9 Claims. (Cl. 292—332)

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This invention relates to latches of the type commonly used on refrigerator doors.

More particularly, the invention relates to latches of the type disclosed in the co-pending applications of George E. Curtiss, Jr., Serial No. 507,839, filed October 27, 1943, Serial No. 515,570, filed December 24, 1943 and Serial No. 524,096, filed February 26, 1944; that is, latch mechanisms in which a progressively increasing latching force is exerted against the bolt as it approaches its fully latched position, with the maximum available force being applied at the time when the bolt member is fully "home" and the door is completely closed. As set forth in said co-pending applications, such mechanisms result in unusually high degree of "draw in," coupled with absolute prevention of rebound.

These latches are all provided with self-cocking devices for holding the bolt in a retracted position ready to snap to an advanced operative position engaging the associated keeper when the refrigerated door is swung closed. However, each of these self-cocking devices is subject to accidental tripping while the door is still open, and in each case the handle has to be reactuated to retract the bolt to its unlatched position before the door can be closed.

The present invention has for an object the provision of a latch mechanism of the aforesaid type characterized by an ability to move into its fully latched engagement with the keeper when the door is swung closed, without regard to the bolt position, whether extended or retracted.

Another important object of the invention is the provision of such a latch mechanism wherein the amplifying force of a toggle mechanism is exerted to move the bolt to its fully latched position without regard to the bolt position when the door is swung to its closed position.

Further, it is an object of the invention to provide a latch mechanism characterized by simplicity of construction, ease of operation and prompt actuation to its fully latched position regardless of bolt position when the door is swung closed.

These and other objects of the invention hereinafter appearing will be more readily understood by reference to the several views of the accompanying drawings, in which:

Figure 1 is a perspective view of a refrigerator embodying the present invention;

Figure 2 is a sectional view on an enlarged scale taken along the plane indicated by line 2—2, Figure 1, the latch mechanism being shown in its fully latched position;

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Figure 3 is a view similar to Figure 2 showing the mechanism in its normally unlatched condition with the bolt cocked as the door is approaching its fully closed and latched condition;

Figure 4 is a view similar to Figure 3 wherein the bolt is in its uncocked position as the door approaches its fully closed and latched condition;

Figure 5 is a plan view of the latch mechanism, as illustrated in Figure 2, removed from the door;

Figure 6 is an elevational view, with parts broken away, of a modified form of the invention; and

Figure 7 is a fragmentary view of another modified form of the invention.

Referring now to the drawings and more particularly to Figures 1 and 2 thereof, numeral 10 designates a domestic refrigerator comprising a cabinet 11 with a door 12, the latter having an inner panel 13 and an outer panel 14 joined about their peripheries at 15 as by screws 17 which serve also to fasten the customary resilient sealing gasket 18 to the door at that juncture. The resilient gasket 18 on the door 12 is adapted to bear against the door jamb 19 of cabinet 11 to provide an air-tight seal between the door and the body of the cabinet when the door is closed. Door jamb 19 is equipped with an adjustably mounted keeper 20 which is provided with a releasing surface or abutment 21, and a strike 22 having a cam face 23, the purposes of which will be explained hereinafter.

As illustrated by Figures 2, 3, 4 and 5 of the drawings, the latch comprises a substantially channel-shaped support or housing 24 having a bottom wall 25 and a pair of parallel side walls 26, 26, the latter walls having at the forward ends thereof inwardly turned flange portions 27 through which a screw 28 passes to secure the forward end of housing 24 to the structure of the door 12. The right or rearward end of housing 24 is fastened through its bottom wall 25 to the inside of the outer door panel 14 as by a screw 29, this screw also securing a substantially flat member 30 to the outside of said panel 14. Member 30 serves to secure a face plate, indicated by broken lines as at 31, to the outer panel for covering the opening in the door through which a handle extends.

Pivotally mounted on a pin 32 having its ends secured to side walls 26, 26 of housing 24 is a pair of links 33, 33, each of which has an outwardly turned flange 34 adapted to be engaged by one end 35 of a handle 36 which is pivotally mounted on a pin 37 also having its ends secured in the side walls of housing 24. The handle 36 is normally

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urged in a counter-clockwise direction into a retracted position, as illustrated in Figure 2, by resilient means, such as a spring leaf 38, which in the present instance is secured to the housing 34 by the screw 29. A resilient bumper may be provided, as indicated at 39, to limit the counter-clockwise movement of the handle by the spring 38, and to reduce operational noises at that point.

It will be noted that the outer faces 40 of flanges 34, 34 are curved in an opposite direction to that of the contacting surface 41 of the handle, thereby providing smooth progressive rolling contact between these surfaces as the handle is rotated about its pivot 37 to move the links 33, 33 in a counter-clockwise direction about their pivot 32.

Pivoted to links 33, 33 as by a pin 42, at a point intermediate their ends and offset from the pin 32, see Fig. 2, is one end of an elongated latching member or bolt 43. This member preferably comprises a pair of arms 44, 44 which as seen in Figures 2, 3, and 4 have their forward ends 45 extending upwardly to embrace rotationally a self-lubricating cylinder or roller 46 which provides substantially frictionless engagement of the bolt 43 with the surfaces of keeper 20. As best seen by reference to Figure 5, the forward ends of arms 44, 44 are offset outwardly in opposed directions as indicated at 47, to provide spaced bearings for the roller 46. The rearwardly extending portion of bolt 43 is provided at its extremity with a slot 48 through which a pin 49 whose ends are secured in the walls 26, 26 of housing 24, passes to support the bolt 43 above bottom wall 25 of housing 24. Surrounding the rearward extension of member 43 and carried thereby is a coil spring 50 having its rearward end anchored against the pin 49 while the forward end thereof bears against a pair of shoulders or abutments 51 toward the forward end of member 43.

It may be noted that in Figure 2 the coil spring 50 is urging the latching member 43 forwardly to the left, into its fully latched position in which it is held against further movement by contact of member 43 with pin 32, as indicated at 32a. Spring 50 is in effect exerting pressure against the knuckle of a toggle-like linkage which includes bolt 43 and links 33, 33. The movement of this linkage is substantially that of a common two link toggle, as, when the mechanism approaches the position illustrated, less force is required from spring 50 to produce a greatly amplified force in the linkage to move the bolt into its fully latched position behind the keeper 20.

The operation of the device is as follows:

As viewed in Figure 2, the roller 46 is in latched position behind the strike 22 of keeper 20. When it is desired to open the door, the handle 36 is grasped and rotated in a clockwise direction about its pivot 37. This movement urges the contacting surface 41 of the handle against the faces 40 of links 33, 33 in a manner to rotate the links in a counter-clockwise direction about their pivot 32.

Rotation of these links, as described, moves latching member 43 against the pressure of spring 50 in a direction described by the radial movement of pin 42 about pin 32 and as guided by engagement of pin 49 in slot 48, to an extent withdrawing roller 46 from behind keeper 20, thereby permitting the door to be swung open. This movement of latching member 43 continues until a forward extension 52, on the latching

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member, contacts pin 32, at which position, as indicated in Figure 3, pin 42 has moved to, or preferably slightly past a position of dead center with respect to pin 32 and the line of thrust of spring 50 against pin 49. As illustrated in Figure 3, this dead center position is reached when the straight line between pins 42 and 49 corresponds to a parallel line 53 intersecting the axes of pins 32 and 49. Release of handle 36 by the operator permits spring leaf 38 to return the handle to its normal position as illustrated in this figure, while the latch remains in its retracted or cocked position.

To close and latch the door, the latter is merely swung toward closed position until roller 46 strikes abutment 21 (Figure 3) which causes the latching member to move downwardly to shift pin 42 back past the aforesaid dead center position so that the thrust of spring 50 may operate to urge the mechanism towards latched position. At the instant pin 42 passes the line of dead center between the thrust of the spring and the pin 32, it is urged by the pressure of the spring to move in a clockwise direction toward its latched position as illustrated in Figure 2. This movement causes the forward end 45 of the latching member 43 to move downwardly under the guidance of links 33, 33 and pin 49 to move roller 46 into contact with the keeper prior to completion of the link movement so that continued movement of the link will draw the door forcibly into its fully closed position.

Because of the particular arrangement of the spring with the latching member 43, it is readily understood that as the latching member is moved in its counter-clockwise direction, as described, the force acting to move the latching member in against the keeper to draw the door forcibly to its fully closed position, will be progressively amplified in spite of a possible slight decrease in spring thrust as the member moves to such position.

Movement of the latching member in its downward or clockwise direction is terminated when the bolt member contacts pin 32, as indicated at 32a in Figure 2, in which position pins 32 and 42 are in a straight line position with respect to the forces exerted against roller 46 so that rebound forces against the roller are exerted in a straight line against pin 32 and are thereby restrained.

Normal operation of the latch mechanism is as described above. However, when the mechanism is in the position illustrated in Figure 3 and the door is opened to an extent permitting access to the refrigerator food storage compartment, it may readily be seen that the roller end of the bolt projects outwardly of the door structure in a position exposed to inadvertent actuation by forces great enough to move pin 42 over the dead center position, as described above, such inadvertent actuation permitting spring 50 to move the bolt to its latched position while the door is still open.

It is with this condition of the latch mechanism to which the present invention is particularly directed. In contra-distinction to the devices disclosed in the co-pending applications aforesaid, the latch bolt may remain in this position while the door is swung closed and will not prevent the movement of the door to the fully closed and latched condition.

By reference to Figure 4, the operation of bolt 43 from the position illustrated to a fully latched condition without regard to the bolt position,

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whether extended or retracted, may be more clearly understood. When the door is swung toward its closed position, roller 46 contacts the cam face of the strike 23 which through the member 43 forces the links 32, 33 rotationally about pivot 32 in a counter-clockwise direction to an extent permitting the roller to move behind the keeper, after which the latching member is again advanced under the amplifying action of the spring-urged toggle-like mechanism.

It will be particularly noted that in either case, and as illustrated in Figures 3 and 4, the amplifying action of the spring-urged toggle-like latch mechanism is used to move the bolt forcibly into latching engagement with keeper 20 to draw-in the bolt to its fully latched condition.

A modified form of the invention is illustrated in Figure 6, wherein the links 33, 33 are replaced by opposed arcuate slots 60 in the side walls 26, 26 of housing 24, into which slots opposed ends of pin 42a extend to guide the latch bolt 43a to and from its latched position in a manner corresponding to that described in connection with the preferred embodiment.

Movement of the latch bolt to its unlatched position in this form of the invention, is effected by clockwise rotation of handle 36 which acts at 61 against the latch bolt. The upper extremity 62 of arcuate slot 60 corresponds to the over dead-center position of pin 42 in the previously described preferred embodiment, wherein the member is held in cocked position. Movement of the bolt to its latched position is substantially the same as that which occurs in the said preferred embodiment. The door is swung toward its closed position with sufficient force to cause the impact of the roller 46 against abutment 21 to move the pin 42a of the bolt rearwardly in the slot 60 to an extent permitting the bolt to pass behind the strike 22 after which the spring 50 urges the bolt with an increasingly amplified force into its latching engagement with said keeper so as to "draw-in" the door to its fully closed position. Rebound of the door is prevented by restraining action of the upper surface 63 of arcuate slot 60 when pin 42a is in the position illustrated in Figure 6.

Because of the novel characteristics of the invention, as described hereinabove, it may be seen that the latch mechanism does not necessarily have to include the self-cocking feature. Thus the latch bolt may be permitted to move under the influence of the spring to its extended position each time the handle is released after having moved the bolt to its retracted position, letting the cam retract the bolt when the door is swung closed.

Figure 7 illustrates a modified form of the invention wherein pin 42 does not move past the dead-center position with respect to pin 32 and the line of thrust of spring 50 against pin 49 when being retracted by handle 36. In this case the latching member returns immediately to its extended position. From its extended position the member is retracted by cam 23 when the door is swung toward its closed position enabling the roller end thereof to move behind strike 22 to latch the door as described.

I claim:

1. In a door latch, the combination with a support structure, of an elongated latch member adapted for interlocking engagement at one end with a keeper, means for anchoring the other end of the member for oscillation about a fixed axis in said structure, means affording longi-

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tudinal movement of the member with respect to said axis, a lever pivoted to said structure and having connection with the latch member at a point remote from the axis of the said pivot whereby oscillation of the lever will be accompanied by a longitudinal movement of the latch member between extended and retracted positions with respect to said keeper, a spring exerting pressure tending to advance the member into the extended position, said pivot and point of connection being arranged with respect to each other and to the axis of oscillation of the latch member so that when the member is in retracted position the said point will lie at one side of and contiguous to a straight line intersecting the said pivot and axis, and when the member is in extended position the point will lie at the other side of and relatively remote to said line, stop means for stabilizing the member in the said extended and retracted positions against the thrust of said spring, and means for manual retraction of the member from extended position.

2. A door latch in accordance with claim 1 wherein the said stop means consists of means on the member engageable with the said pivot in the respective positions of extension and retraction.

3. A door latch in accordance with claim 1 wherein the said manual retraction means consists of a handle mounted in said support structure and operatively associated with and through said lever to retract the member.

4. A door latch in accordance with claim 1 wherein the latch member when in retracted position is adapted for forcible engagement with a strike operatively associated with the keeper to displace the said point of connection over the said contiguous straight line to thereby trip the member for advancement by the spring into the extended position.

5. A door latch in accordance with claim 1 wherein the latch member when in the extended position is free for retractive actuation against the pressure of the spring by forces exerted directly on the keeper engaging end of the member.

6. In a door latch, the combination with a support structure, of an elongated latch member adapted for interlocking engagement at one end with a keeper, means for anchoring the other end of the member for oscillation about a fixed axis in said structure, means affording longitudinal movement of the member with respect to said axis, a lever pivoted to said structure and having connection with the latch member at a point remote from the axis of the said pivot whereby oscillation of the lever will be accompanied by a longitudinal movement of the latch member between extended and retracted positions with respect to said keeper, said lever when the latch member is in the extended position lying at one side of and forming an angle in the neighborhood of 90° with a straight line intersecting the axis of oscillation of the member and the axis of the pivot, whereby the said member may be retracted by forces applied thereto either directly or by way of said lever, and said lever when the member is in the retracted position lying on the other side of and substantially parallel to said line, a spring opposing retraction of said member, and stop means for stabilizing the member in said extended and retracted positions against the thrust of said spring, said member being releasable from the retracted position for subsequent actuation by the spring into ex-

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tended position by oscillation of said member to an extent displacing the lever to the side of the said straight line first named.

7. In a door latch, the combination with a support structure, of an elongated latch member adapted for interlocking engagement at one end with a keeper, means for anchoring the other end of the member for oscillation about a fixed axis in said structure, means affording longitudinal movement of the member with respect to said axis, a lever pivoted to said structure and having connection with the latch member at a point remote from the axis of the said pivot whereby oscillation of the lever will be accompanied by a longitudinal movement of the latch member between extended and retracted positions with respect to said keeper, said lever when the latch member is in the extended position forming an angle in the neighborhood of 90° with a straight line intersecting the axis of oscillation of the member and the axis of the pivot, whereby the said member may be retracted by forces applied thereto either directly or by way of said lever, and said lever when the member is in the retracted position forming an angle with said line materially less than 90°, and a spring exerting pressure on said member approximately in direction parallel to said line and tending to move the member into the extended position with progres-

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sively amplified force by an increasingly favorable leverage as the member approaches the said extended position.

8. A door latch according to claim 7 wherein means is provided for exerting force through the said lever to retract the member.

9. A door latch according to claim 7 wherein means is provided for exerting force on the said lever in direction approximately parallel to said line of intersection to oscillate the lever to retract the latch member, whereby the leverage favorable to said retraction is substantially at a maximum at the beginning of said retraction.

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