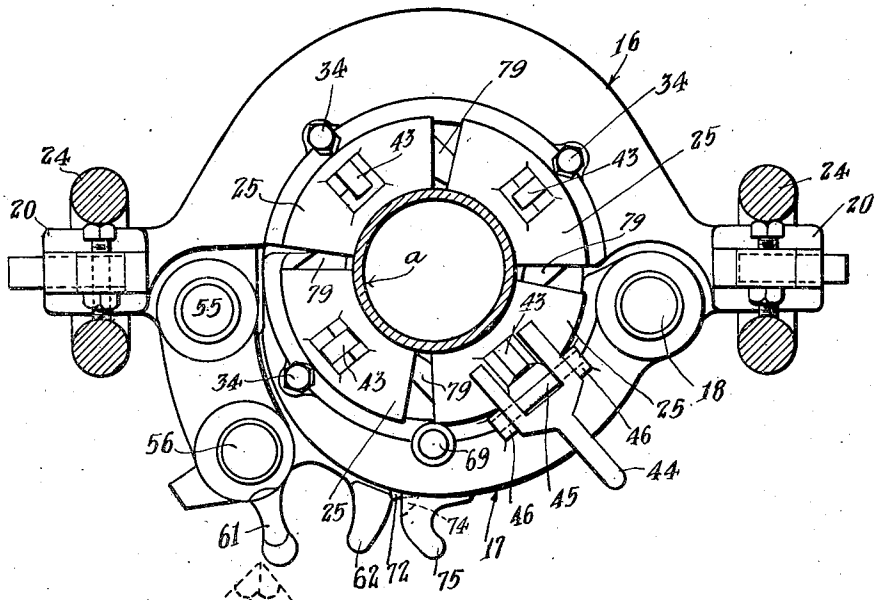
Dec. 1, 1931. N. K. SMITH 1,834,429

ELEVATOR

Original Filed April 8, 1929 3 Sheets-Sheet 1

Fig. 2



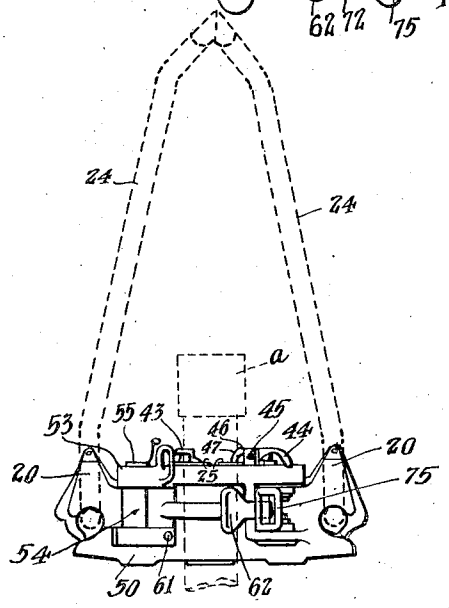


Fig. 1

Inventor
Nelson K. Smith.

By Lyon & Lyon

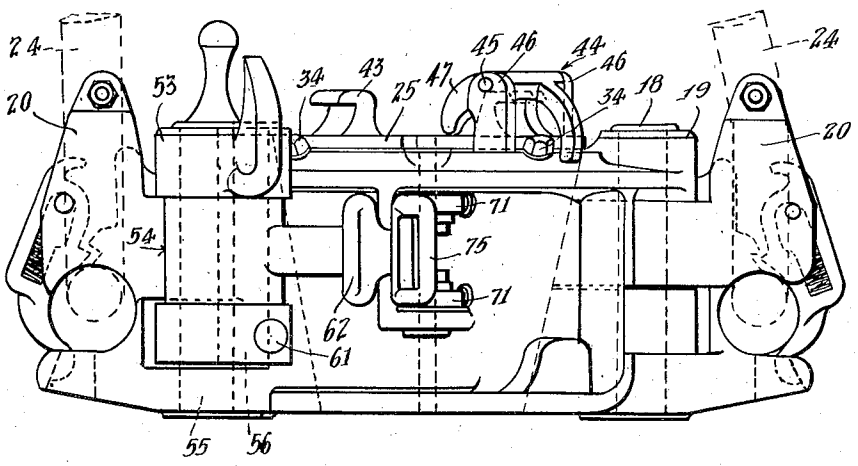
Attorneys

Dec. 1, 1931. N. K. SMITH 1,834,429

ELEVATOR

Original Filed April 8, 1929 3 Sheets-Sheet 2

Fig. 3



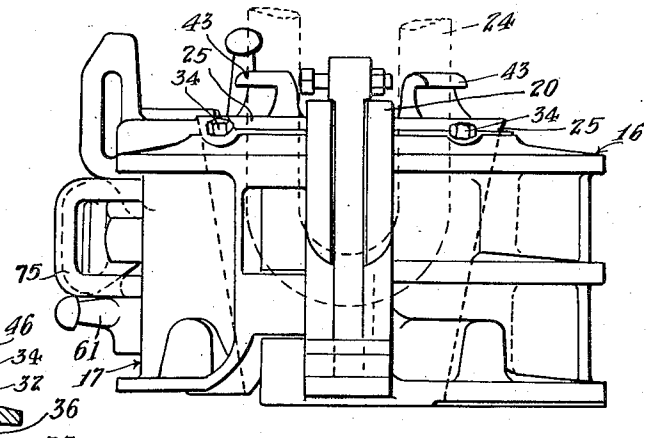
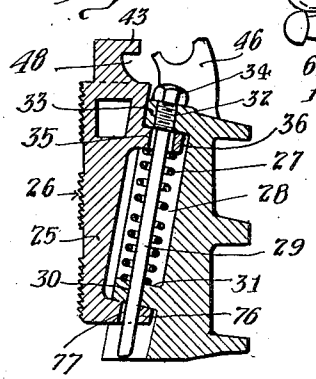


Fig. 4

Fig. 5



Inventor

Nelson K. Smith

By Lyon & Lyon

Attorneys

Dec. 1, 1931. N. K. SMITH 1,834,429

ELEVATOR

Original Filed April 8, 1929 3 Sheets-Sheet 3

Fig. 6

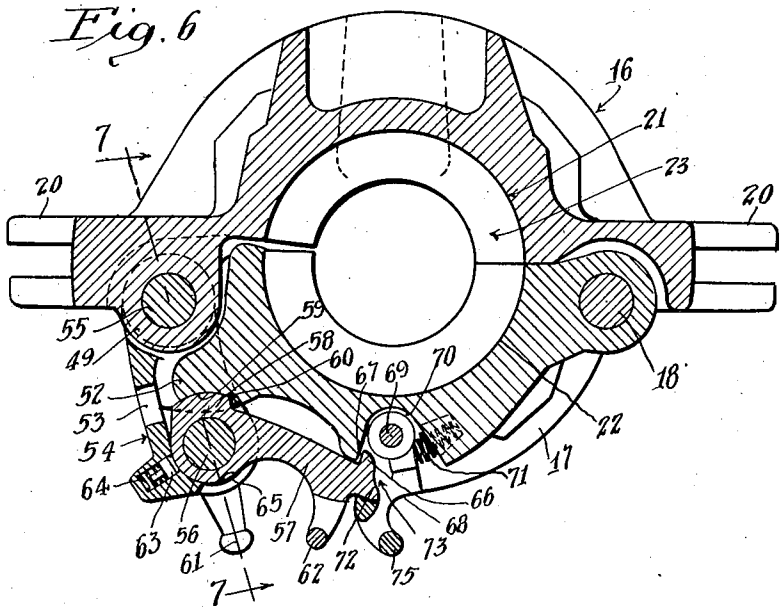


Fig. 7

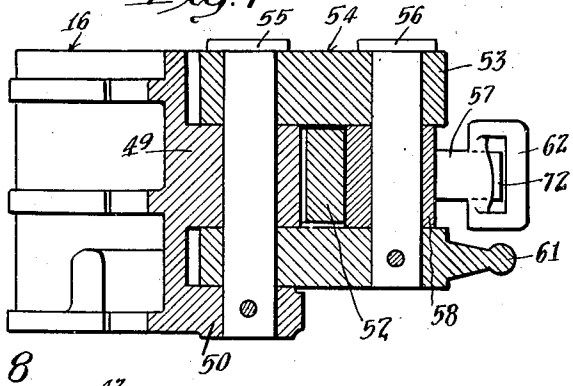
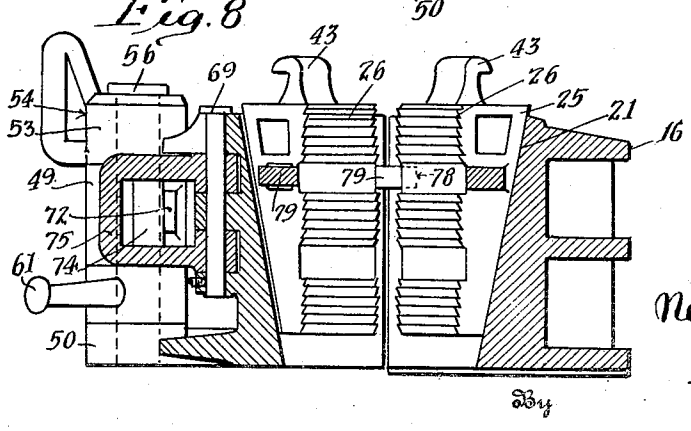


Fig. 8



Inventor

Nelson K. Smith

By Lyon & Lyon

Attorneys

Patented Dec. 1, 1931 1,834,429

UNITED STATES PATENT OFFICE

NELSON K. SMITH, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO BYRON JACKSON CO., OF LOS ANGELES, CALIFORNIA, A CORPORATION OF DELAWARE

ELEVATOR

Original application filed April 8, 1929, Serial No. 353,419. Divided and this application filed July 19, 1930. Serial No. 469,114.

This invention relates to elevators of the type employed in elevating and lowering casing, well tubing, and the like, and it relates more particularly to the construction of the latching means whereby hingedly connected jaws are held against opening, when casing or well tubing is in the elevator.

This is a division of my Patent No. 1,795,578, issued March 10, 1931, on application, Serial No. 353,419, filed April 8, 1929.

Though the invention is applicable to any elevator having hingedly connected jaws, it is especially useful in elevators of the slip type. In this type of elevator, because of the provision of slips, the weight of the suspended casing or tubing is translated into a lateral thrust and, since several thousand feet of casing or tubing are sometimes suspended from the elevator, this lateral thrust becomes exceedingly great.

It follows that the jaws must be of great strength and that the means for holding the jaws closed together must be so constructed that they will resist the lateral pressure tending to open them. Accordingly, one of the principal objects of this invention is to construct the jaws and their latching means in a manner to secure the desired strength.

Since the jaws of elevators of this type must be unlatched, opened and latched very quickly, another very important object is simplicity of construction and operation.

Another important object is to provide a latching means that will function as a triple latch.

Another object is to provide a latching means comprising a latching element that is held in latching position by a second latching element which latches the first element, and a third latching element that latches the second element, thus producing a latch in which the latching elements are arranged in a series that lock upon one another. Thus the jaws are thrice guarded against being left in a condition in which the weight of the suspended load can force the jaws open.

Other objects and advantages will appear in the subjoined detailed description.

The accompanying drawings illustrate the invention:

Figure 1 is a side elevation of a slip-type elevator constructed in accordance with the provisions of this invention.

Figure 2 is an enlarged plan view of Figure 1, the bail being in section.

Figure 3 is a front elevation of Figure 2, fragments only of the bail being indicated in broken lines.

Figure 4 is an elevation of Figure 3 from the right thereof.

Figure 5 is a horizontal section on line indicated by 5—5, Figure 3. The slips are omitted.

Figure 6 is a vertical section on line indicated by 6—6, Figure 5.

Figure 7 is a vertical section on the line indicated by 7—7, Figures 2 and 6.

Figure 8 is a vertical section on the line indicated by 8—8, Figure 2.

Referring to the drawings, there are provided a pair of jaws 16, 17 which are hingedly connected by hinge pin 18 that passes through hinge knuckles 19 provided on jaws 16, 17, said hinge knuckles interfitting.

The jaw 16 constitutes the main body of the elevator, and, accordingly, is provided at its opposite ends with suspension lugs 20.

A plane connecting the axes of the lugs 20 is slightly offset with respect to the axis of the pin 18.

The jaw 17 constitutes the gate of the elevator. When the jaws are closed, the inner semi-circular faces 21, 22 of the jaws together define a practically cylindrical opening 23, the axis of which is midway between the suspension lugs 20, and is in a plane that passes through the axes of said lugs 20. Thus, when the elevator is supported by the bail, indicated at 24 and connected with the lugs 20, the elevator will be in perfect balance when the casing or pipe is clamped in the jaws of the elevator. The jaw faces 21, 22 slope inwardly and downwardly, thus making the opening 23 conical in shape. Within the opening 23 are disposed a number of slips 25, there being, in this instance, four of said slips. Two of the slips are mounted on the face 21 and the other two on the face 22. The slips 25 are wedge-shaped, the outer faces thereof extending aslant downwardly

and inwardly so as to substantially fit the faces 21, 22 when the inner faces of the slips are substantially vertical. Said inner faces of the slips are preferably serrated horizontally, as indicated at 26, thus to provide excellent gripping faces for firmly engaging the casing or other tubular member that is to be gripped by the elevator.

The slips 25 are loosely connected with the jaws and, furthermore, are yieldingly supported on said jaws by coil springs 27, there being one spring for each slip. The springs 27 are accommodated in recesses 28 in the inner faces of the jaws, and the lower ends of said springs seat against the bottom walls of the recesses 31, as clearly shown in Figure 9. The springs 27 surround pins 29 which are disposed aslant with their lower ends engaging sockets 30 in the bottom walls 31 of the recesses 28. The upper portions of the pins 29 are threaded at 32 and are screwed through the upper walls 33 of the recesses 28. The pins are provided above the walls 33 with heads 34 adapted for engagement by a wrench. Thus the pins 29 constitute a special form of cap screw.

The pins 29 pass through holes 35 in lugs 36 that project from the outer faces of the slips near the upper ends of said slips into the upper ends of the recesses 28. The holes 35 are materially larger than the pins 29 so as to permit of inward movement of the slips, and the lugs 36 rest upon the upper ends of the springs 27. Thus, the springs 27 function to yieldingly urge the slips upwardly and outwardly until the upper faces of the lugs 36 engage the under faces of the upper walls 33 of the recesses 28. In this instance, the pins 29 project below the bottom wall 31 of the recesses 28 and through lugs or ears 76 that project laterally from the lower ends of the slips, the holes 77 in the lugs 76 being sufficiently larger than the pins 29 to permit of horizontal movement of the lugs 76 on the ears 29 so that when horizontal thrust comes on the slips the inner semicircular face of the jaw, and not the pins, will receive the thrust. The springs 27 constitute one form of spring means for yieldingly supporting the slips and yieldingly forcing said slips upwardly and outwardly.

The upper ends of the slips 25 are provided with hook-shaped handles 43 for convenience in assembling and disassembling the slips.

I prefer that the slips be caused to move downwardly together and to secure this result there are provided suitable means to loosely connect the slips to one another and, in this instance, these means include a recess 78 in one end of each slip and a lug 79 projecting horizontally from the opposite end of each slip, said lug engaging in the recess 78 of the adjacent slip.

Because of the wedging action of the slips when the load comes upon them, the vertical thrust of the load carried by the elevator is translated into a severe lateral thrust tending to force the jaws apart, and in an elevator of this type, that is, one that employs slips and a door, it is important that the elevator door be securely held against opening, and accordingly, it is well to reinforce the primary latching means with a secondary latching means and even with a third latching means. The construction employed by me not only insures against accidental opening of the door of the elevator, but the construction is such that said door is actually reinforced so that the outward thrust against the door is borne to a large extent by the latching means. The latching means I prefer to employ at present are constructed as follows:

The end of the jaw 16 that is opposite the hinge pin 18 is provided with a pair of spaced lugs, an upper lug 49 and a lower lug 50, and the jaw 17 is provided at its free end with a portion 51 that extends past the inner faces of the lugs 49, 50 and substantially meets the adjacent inner face of the jaw 16. The jaw 17 is provided with an outwardly extending latching lug 52 that, when said jaw 17 is closed, lies immediately in front of the upper lug 49. The construction of the latching means is best illustrated in Figures 6, 7 and 8. The lug 52 is adapted to project between the spaced arms 53 of a latch member 54, which is pivotally connected to the jaw 16 by a pin 55 passing through one end of the latch member 54 and into the lugs 49, 50, the arms 53 of the latch member 54 being disposed, one above and one below the lug 49, as clearly shown in Figure 7. Thus the latch member 54 is U-shaped and straddles the lug 49.

The latch member 54 does not directly engage the lug 52 of the jaw 17, but said latch member 54 carries a vertically positioned pin 56 which pivots a second latch member 57 provided with a lug 58 adjacent to the pivot 56, the position of the lug 58 being such that when the latch member 57 is in closed position, as shown in Figure 6, the lug 58 engages the lug 52. The face 59 of the lug 52 is curved and the face 60 on the lug 58 constitutes a cam face that, when the latch member 57 is swung into closed position, wedgedly forces the lug 52 toward the pin 55, thus to wedge the jaw 17 into fully closed position.

The lug 58 is positioned so that the outward thrust upon the jaw 17 tends to rotate the latch member 57 inwardly toward said jaw 17, thus insuring against any outward pressure of the jaw 17 forcing the latch member 57 out of its latching position, even though the latch member 57 were not itself securely latched by the means hereinafter to be described. The latch member 54 is pro-

vided substantially in a plane that passes through the axis of the pivots 55, 56 with a handle 61 and the latch member 57 is provided with a handle 62.

The latch member 57 may itself be latched in retracted or open position so that it will not accidentally swing closed and the means relied upon at present to accomplish this is constructed as follows:

A spring-operated detent 63 is provided in the latch member 54, the spring being indicated at 64. The detent 63 is adapted to engage in a detent seat 65 when the latch member 57 is in the open or retracted position. The latch member 57 may be latched in closed or latching position and, in this instance, two distinct latch means are provided for this purpose, and one of these latch means is constructed as follows:

The latch member 57 is provided on that face which is turned inwardly, when said latch member is closed, with a shoulder 66 adapted to cooperate with a shoulder 67 on the outer face of the jaw 17 so that when outward thrust occurs on the jaw 17, the shoulder 67 will engage under the shoulder 66 and thus lock the latch member 57 against swinging outwardly.

The second latching means for the latch member 57 may comprise a latch member 68 pivoted at 69 within a recess 70 of the jaw 17. A coil spring 71 between the jaw 17 and latch member 68 urges the latch member 68 toward the latch member 67 so that, when the latch member 67 is in its closed position with the shoulders 66, 67 juxtaposed, a lug 72 on the free end of the latch member 57 is received in a recess 73 of the latch member 68, the vertical wall 74 of said recesses 73 being adapted to engage over the outer end of the lug 72, when the latch member 68 is in latching position, so as to further hold the latch member 57 against swinging into unlatched position. The recess 73 also accommodates the shoulder 66 and when the latch 68 is pulled to the right, in Figure 6, the wall 74 of the recess 73 engages the latch member 57 so as to force said latch member outwardly toward the unlatched position. The operation of elevators in connection with well casing, drill pipe and pump tubing is too well understood in this art to make it necessary to describe the operation of this invention in relation to the elevator's suspension and raising and lowering tackle, and the various operations performed by the use of this invention. However, in brief, the actual operation of the elevator is as follows:

Assuming that the elevator is closed on a tubular member *a* with all of the latch members closed, as shown in Figure 6, and assuming that it is desired to open the door of the elevator so as to admit of the elevator being removed from the tubular member, the operator will grasp the handle 75 of the latching member 68 and retract the same, thus causing the latch member 68 to engage the latch member 57 adjacent to the shoulder 66, thus forcing the latch member 57 clockwise in Figure 6. The operator grasps the handle 62 and continues to rotate the latch member 57 clockwise to rotate the cam face 60 out of engagement with the lug face 59. As soon as this has been accomplished, the operator grasps the handle 61 and swings the latch member 54 clockwise, thus moving the lug 58 out of the path of movement of the lug 52. The operator then pulls on the handle 75 to swing the gate open. Assuming that the parts are in open position and that it is desired to place the elevator on a string of casing or pipe, the elevator will be swung into a position to receive the casing within the jaw 16, and the operator will then grasp the handle 75 and swing the jaw 17 into closed position. It is to be understood that twelve and fourteen inch casings are not uncommon and that elevators to handle such size of casing are of relatively large dimensions, and the parts involved accordingly of great weight. Accordingly, it is important that elevators made for handling such casings be constructed so that they can be readily and safely operated by one man.

When the jaw 17 has been closed, the slips 25 will all be in their raised positions with the lower ends of said slips pushed inwardly by the springs 37 so that the lower ends of said slips will be quite close to the tubular member *a*. The latch member 57 being approximately aligned with the latch member 54, or even rotated clockwise from the aligned position, the operator grasps the handle 61 and swings the latch member 54 counterclockwise into position to enter the lug 52 into the space between the arms 53 of the latch member 54, and he then grasps the handle 62 and swings the latch member 57 counterclockwise so as to cause the cam face 60 to slide upon the lug face 59, thus wedging the jaw 17 inwardly toward the tubular member. He continues to thrust the latch member 57 inwardly until its shoulder 66 is back of the shoulder 67 with respect to the axis of the pin 56, upon which axis the latch member 57 swings. In thrusting the latch member 57 inwardly into its latched position, the lug 72 thrusts the latch member 68 to the right, in Figure 6, sufficiently to admit of the lug 72 entering the recess 73 behind the recess wall 74.

It will be seen from the foregoing that the jaws 16, 17 are latched to each other by engagement of the faces 59, 60 and that outward thrust upon the jaw 17 will cause the shoulders 66, 67 to engage to thus retain the latch member 57 in its latched position and, furthermore, that the latch member 68 further holds the latch member 57 in latched position.

When the elevator is closed at least one of the slips 25 will probably engage the outer face of the casing, or, if not, it may be depressed by any suitable means to cause it to engage the casing. The means employed for this may be, for example, those described in my copending application, Serial Number 353,419, filed April 8, 1929. The elevator will now be raised sufficiently to tightly set all of the slips, the downward drag of the tubular member on the elevated slips holding said slips against upward motion while the jaws are ascending, thus wedging the slips inwardly into firm engagement with the tubular member so as to support the weight of the same when the elevator is fully raised.

When raising of the elevator thus imposes the load thereon, the jaw 17 thrusts against the cam face 60 at such an angle as to tend to turn the latch member 57 counterclockwise, thus automatically locking said latch member 57 in a latching position. If, accidently, the latch member 57 should not be quite closed the outward thrust of the jaw 17 closes it and, when the latch member 57 is fully closed it cannot be swung into unlatched position because its shoulder 66 is then engaged by the shoulder 67 or, at least, the shoulder 67 projects into the path of opening movement of said shoulder 66.

Furthermore, the latch wall 74 extends into the path of opening movement of the tip of the latch member 57, and the detent 63 yieldingly holds the latch member 57 closed or locked. Thus the latch members 54, 57 constitute one form of means to directly lock the jaws 16, 17 together, while the detent 63, shoulders 66, 67 and latch member 68 constitute a triple latching means for retaining the latch member 57 in latching position. It should be particularly noted that the faces 58, 59 and shoulders 66, 67 constitute a two-point engagement between the jaw 17 and the latch member 57.

I claim:

1. An elevator comprising pivotally connected jaws, a latch member pivotally connected to one of said jaws, a second latch member pivotally connected to the first latch member, the second latch member provided with a two-point engagement with the other of said jaws, and a means yieldingly holding the second latch member in latched position.

2. An elevator comprising pivotally connected jaws, a latch member pivotally connected to one of said jaws, a second latch member pivotally connected to the first latch member and provided with a cam face engageable with the other jaw, and a means yieldably holding the second latch member in latched position.

3. An elevator comprising pivotally connected jaws, a latch member pivotally connected to one of said jaws, a second latch member pivotally connected to the first latch member, a shoulder on the other jaw, a shoulder on the second latch member engageable behind the first shoulder relative to the pivot of the second latch member, and a means yieldingly holding the second latch member in latched position.

4. An elevator comprising pivotally connected jaws, a latch member pivotally connected to one of said jaws, a second latch member pivotally connected to the first latch member and adapted to bear against the other jaw, and a third latch member pivoted to said other jaw and provided with a wall projecting into the path of opening movement of the second latch member.

5. An elevator comprising pivotally connected jaws, a latch member pivotally connected to one of said jaws, a second latch member pivotally connected to the first latch member and provided with a lug and adapted to bear against the other jaw, and a third latch member pivoted to said other jaw and provided with a wall projecting into the path of movement of the lug in the opening movement of said other jaw.

6. An elevator comprising pivotally connected jaws, a latch member pivotally connected to one of said jaws, a second latch member pivotally connected to the first latch member and adapted to bear against the other jaw, a shoulder on said other jaw, a shoulder on the second latch member engageable behind the first shoulder relative to the pivot of the second latch member, and a third latch member pivoted to said other jaw and provided with a wall projecting into the path of opening movement of the second latch member.

7. An elevator comprising pivotally connected jaws, a latch member pivotally connected to one of said jaws, a second latch member pivotally connected to the first latch member and provided with a cam face adapted to engage the other jaw, a cooperating means between said other jaw and the second latch member to positively lock the second latch member against unlatching.

8. An elevator comprising pivotally connected jaws, a latch member pivotally connected to one of said jaws, a second latch member pivotally connected to the first latch member and provided with a cam face engageable with the other jaw, and a means to retain the second latch member with its cam face engaged with said other jaw.

9. An elevator comprising pivotally connected jaws, one of said jaws provided opposite the pivot with an outwardly projecting lug, a latch member pivoted to the other jaw at a point opposite the pivot, a second latch member pivotally connected to the first latch member and provided with a cam face engageable with said lug when both latch members are swung into positions adjacent to the

first-mentioned jaw, said cam face positioned so that an outward thrust on the first mentioned jaw tends to rotate the second latch member inwardly toward the first mentioned jaw.

Signed at Los Angeles, California, this 19th day of May, 1930.

NELSON K. SMITH.