March 9, 1943. C. F. YOUNG 2,313,416

OPERATING AND INDICATING MECHANISM FOR JAIL DOORS

Filed Jan. 28, 1941 3 Sheets-Sheet 1

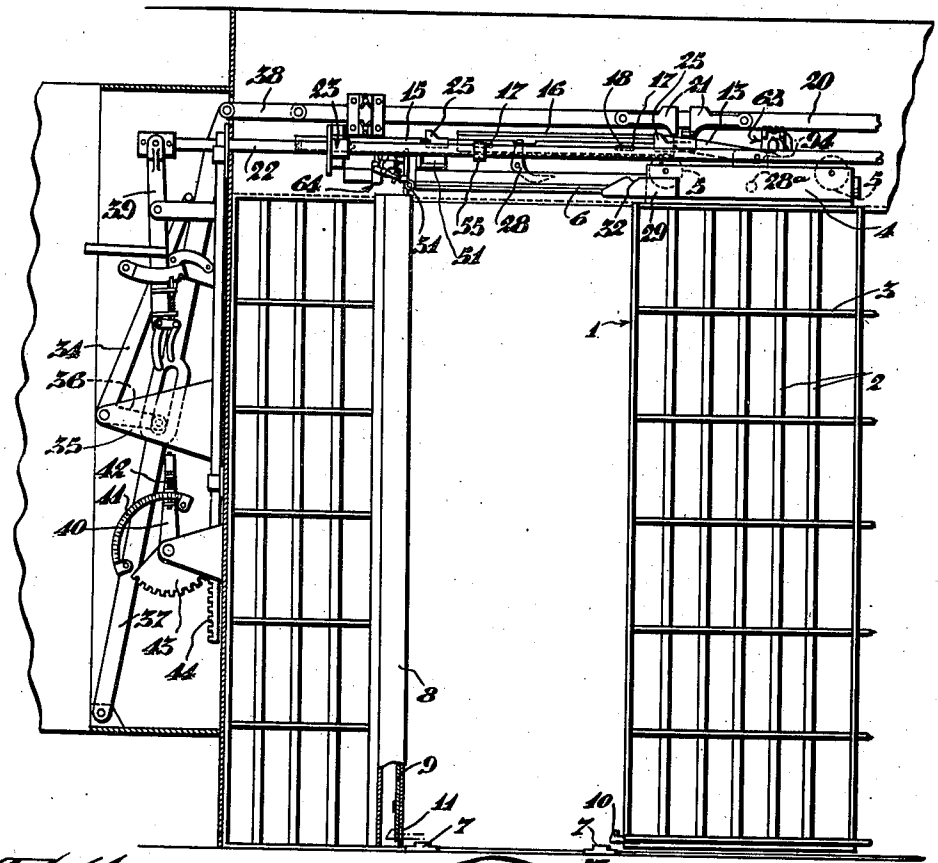


Fig. 1

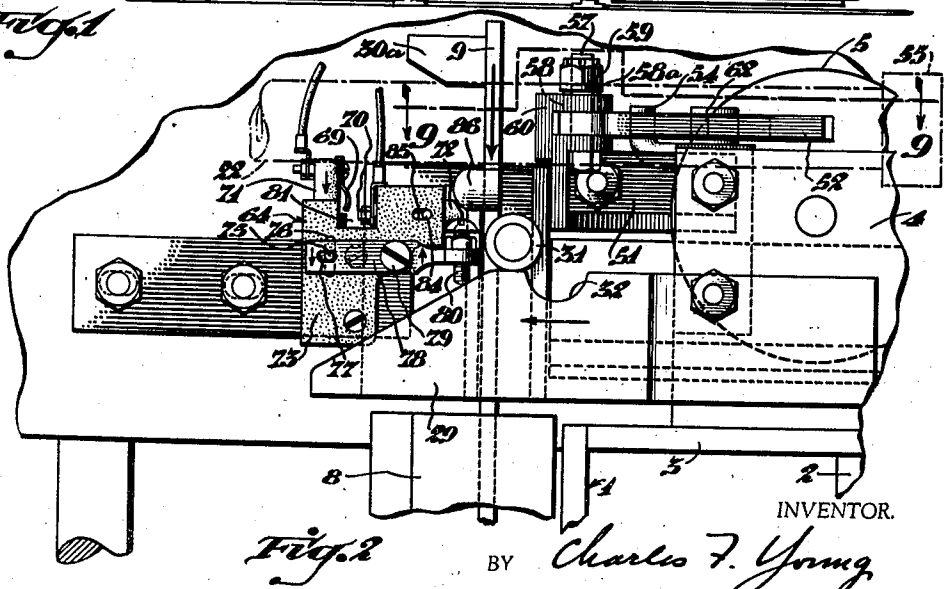


Fig. 2

INVENTOR.

BY Charles F. Young

Wood & Wood ATTORNEYS

March 9, 1943. C. F. YOUNG 2,313,416

OPERATING AND INDICATING MECHANISM FOR JAIL DOORS

Filed Jan. 28, 1941 3 Sheets-Sheet 2

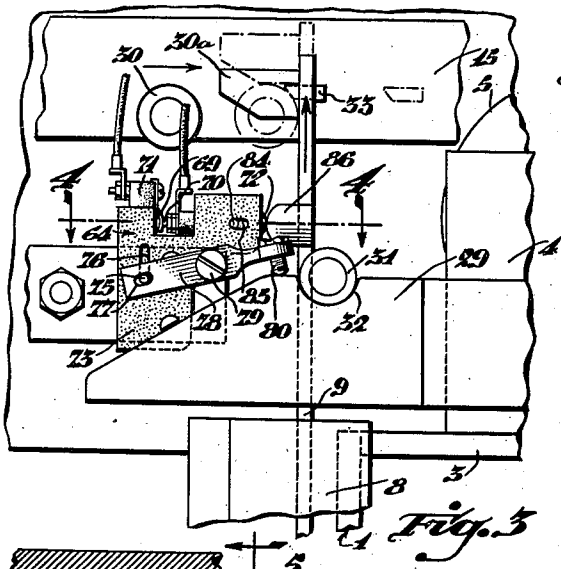


Fig. 3

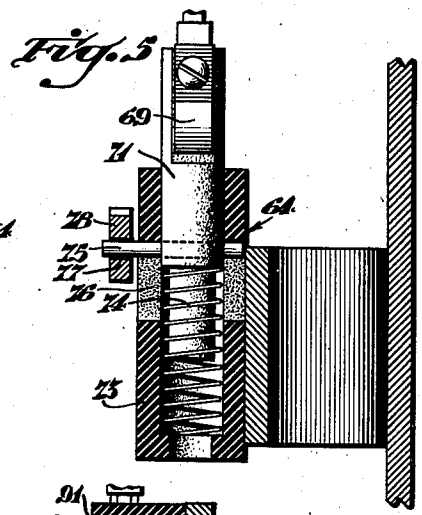


Fig. 5

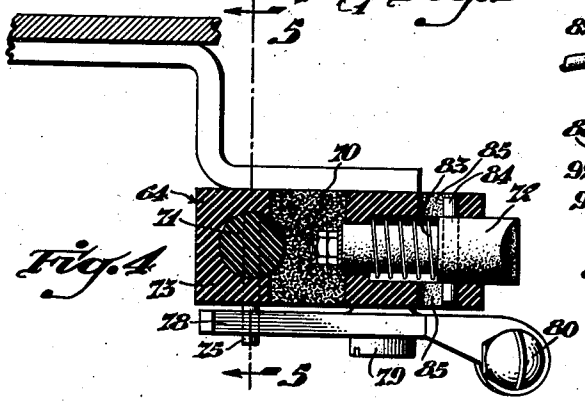


Fig. 4

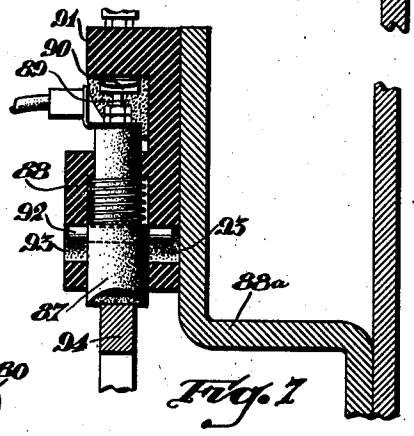


Fig. 7

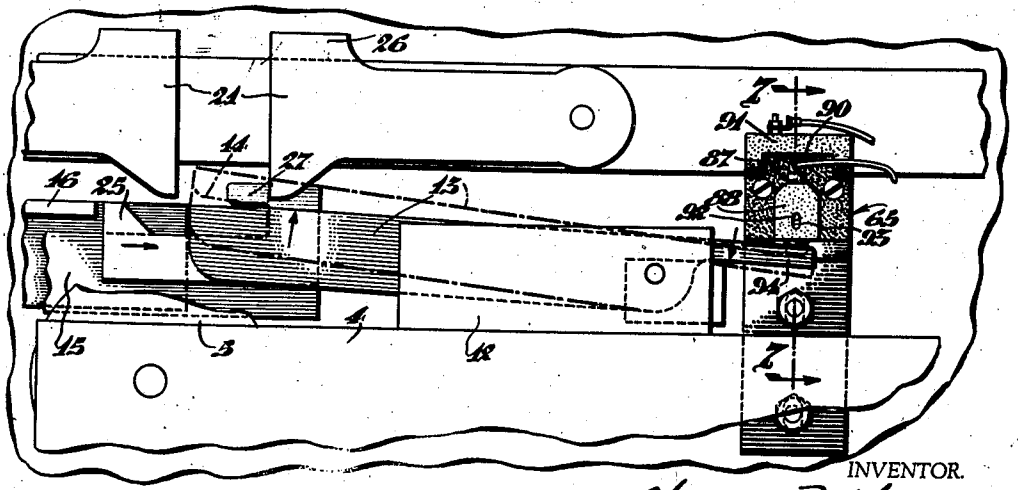


Fig. 6

INVENTOR.

BY Charles F. Young

Wood & Wood ATTORNEYS

March 9, 1943. C. F. YOUNG 2,313,416

OPERATING AND INDICATING MECHANISM FOR JAIL DOORS

Filed Jan. 28, 1941 3 Sheets-Sheet 3

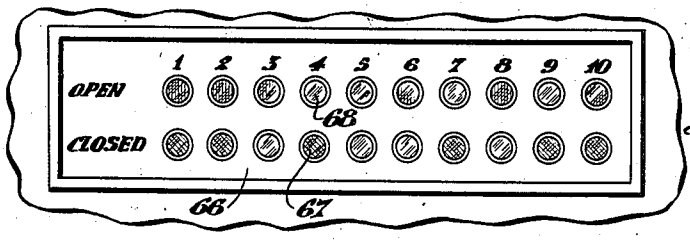


Fig. 8

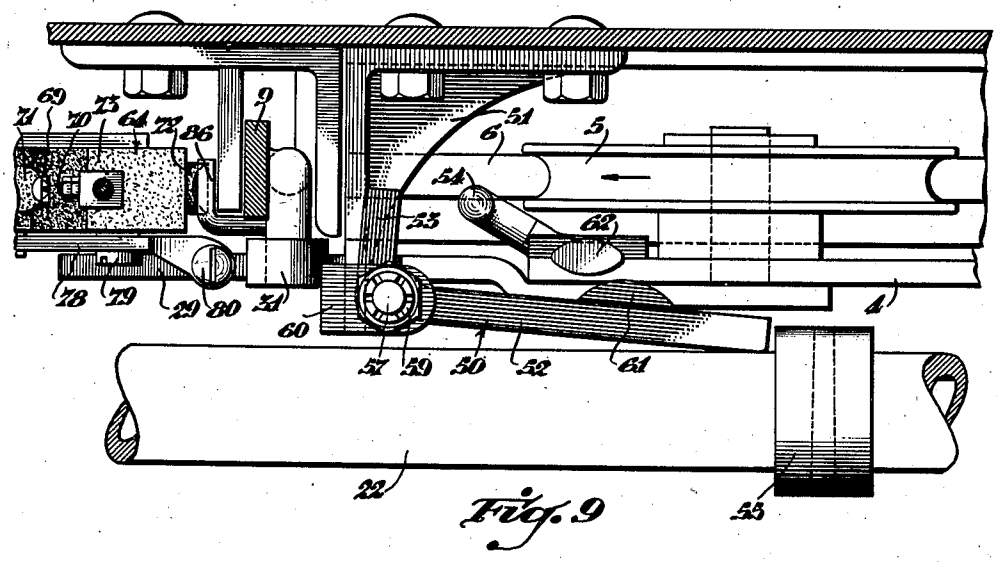


Fig. 9

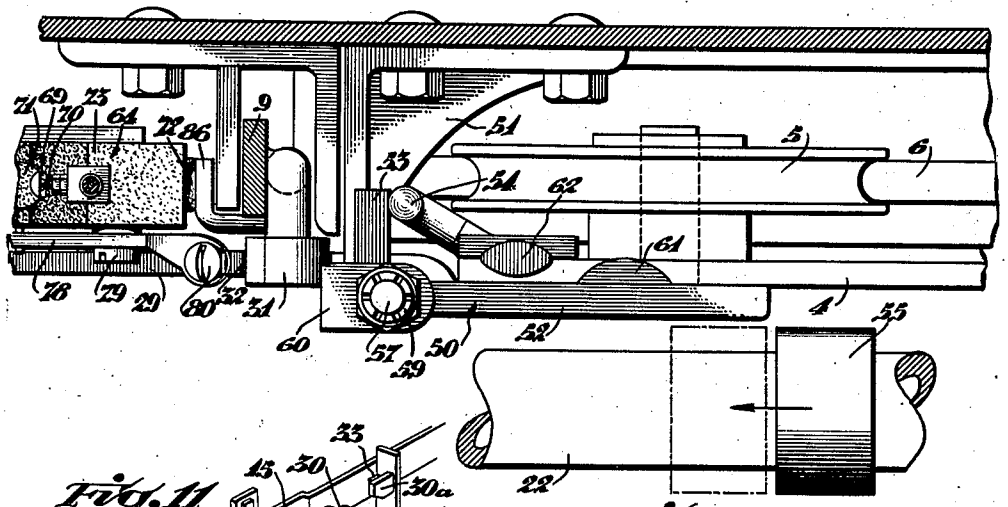


Fig. 10

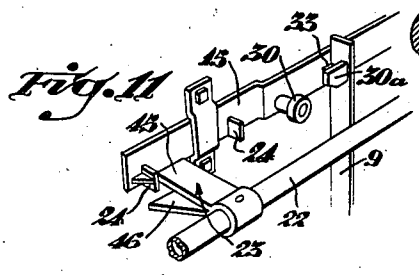


Fig. 11

INVENTOR.

BY Charles F. Young

Wood & Wood ATTORNEYS

Patented Mar. 9, 1943

2,313,416

UNITED STATES PATENT OFFICE

2,313,416

OPERATING AND INDICATING MECHANISM FOR JAIL DOORS

Charles F. Young, Covington, Ky., assignor to The Stewart Iron Works Company, Covington, Ky., a corporation of Kentucky

Application January 28, 1941, Serial No. 376,361

7 Claims. (Cl. 189—8)

This invention relates to locking and operating mechanism for sliding doors operable from a remote point or station for controlling a plurality of cell or compartment doors of penal institutions. More particularly, the invention is directed to automatic interlocking and indicating means for insuring to the operator, at his remote point of control, that all operations connected with closing and locking of the doors are complete.

In jails, prisons, and similar institutions where the cells or compartments are placed in long rows, each cell of the row is usually provided with a sliding door which opens on to a corridor common to all of a group of cells. Generally, the doors are operated from a remote point or station at the end of a row. In Patent No. 1,966,422, which issued to the present inventor on July 10, 1934, a locking and operating device for sliding doors of this type was disclosed which made it possible to open or close and lock the doors in any one row individually, in groups, or all doors simultaneously. A manually operated dead lock was provided as a safety feature. The present inventor has found that in those institutions having especially long rows of doors it becomes a matter of further safety to have some means to insure that all operations in connection with closing the doors have been completed before the dead lock is set.

In the prior Patent No. 1,966,422, the operating and locking mechanism for each cell door in a row of cells was of duplicate construction and was actuated by a common actuating shaft extending along the row of doors. The actuating shaft provided the means for latching and unlatching the doors and included a coupling means for coupling the doors to a translator mechanism for the actual opening and closing movement of the doors. The actuating shaft had a short reciprocating movement. When moved to the left, the doors were latched and when moved to the right, the doors were unlatched. The leftward movement of the actuating shaft also set the dead-lock bar. Both the actuating shaft and the translator mechanism were operated by levers installed in a control cabinet at the end of a row of cells. Therefore, it was not possible for the operator, being at the end of the cell row, to see if all of the doors were absolutely closed before the dead-lock bar was set.

It has been an object of the present inventor to provide for each cell door an interlock that is actuated by the closing movement of the door so that it is not possible to set the door locking means until the door is completely closed.

Also, another object of the invention has been to provide means for visibly indicating at a central point the condition of each door. For this purpose, a panel of lights or other indicating means including a set for each door are controlled by switches which are actuated by the movement of the doors.

Other objects and certain advantages of the present invention will be more fully apparent from the description of the drawings in which:

Figure 1 is a front view of a cell door showing the door in open position, part of the view being in section to expose certain of the locking mechanism of the present invention.

Figure 2 is an enlarged fragmentary view of the upper forward end of a cell door frame showing the door about to reach the closed position and illustrating the interlock mechanism and the switch for indicating the closed and locked position of the door.

Figure 3 is a fragmentary view taken similarly to Figure 2, but in which the door is closed and locked.

Figure 4 is a sectional view taken on line 4—4, Figure 3 further illustrating the switch, which is actuated by the door when it reaches its closed position, in open position.

Figure 5 is a sectional view taken on line 5—5 of Figure 4 further illustrating the switch.

Figure 6 is an enlarged fragmentary view of the mechanism for locking the door in its open position showing the manner in which a switch is actuated for indicating the open position of the door.

Figure 7 is a sectional view taken on line 7—7, through the switch shown in Figure 6.

Figure 8 is a diagrammatic view showing one type of panel which may be utilized to indicate, for example, by colored lights the conditions of the various doors.

Figure 9 is a sectional view taken on line 9—9, Figure 2, illustrating the interlock in position with the door opened.

Figure 10 is a view taken similarly to Figure 9, but in which the interlock has been moved to the position it takes when the door is closed.

Figure 11 is a perspective view showing one of the key connections between the slide bar of one cell door and the common actuating shaft.

To clarify the manner in which the present invention is utilized with the former structure and present a complete picture of the operation of the present device in connection with it, the draw-

ings include the essential elements of the structure disclosed in the prior Patent No. 1,966,422.

In the drawings, 1 indicates a cell door formed of vertical bars 2 and cross bars 3. The upper end of the door has an angle plate hanger 4 fixed thereon. This hanger carries a pair of rollers 5—5, rolling on a track 6. The track is suitably fixed to the door frame on the front wall of the cell. The bottom of the door is guided in suitable channel guides 7.

A channel-shaped jamb 8 is provided for engaging by the front edge of the door when the door is closed. The jamb is of hollow post construction to enclose a sliding dead-lock bar 9 which engages with a lock lug 10, extending from the forward edge of the door. The lug engages with the lock bar 9 through a slot 11 in the door jamb.

A bracket 12 is fixed to the door hanger 4 (Figure 6) intermediate the door guide rollers 5—5. A door locking and coupling link 13 is pivotally mounted on the bracket 12 and extends forwardly. At its forward end, the link 13 is provided with a laterally extended lug 14. In the lowermost position of the link, the lug 14 rests on a horizontal slide bar 15. When it is in its upper position, it slides on a stationary rail 16. The rail 16 is an angle iron which is fixed to the front wall of the cell. The slide bar 15 is mounted on the vertical limb of the angle iron by means of studs 17. Each stud engages an elongated slot 18 in the slide bar to permit the bar to be reciprocated within limits as defined by the lengths of the slots.

One of these slide bars 15 is included in the locking mechanism of each door. A translator bar 20, extending the full length of the row of cells, is provided with a number of pairs of opposingly disposed, pivotally mounted coupling pawls 21—21. There is one pair of lugs for each door.

The lug 14 at the free end of the link 13 is adapted to engage between the pawls of a pair in making a coupling connection. The slide bar 15 for each door provides the means for making this connection between the door and the translator bar. The slide bars lie parallel to and below the translator bar and are actuated by a common shaft 22 (Figure 11) extending along the row of doors. For each door, a key 23, pinned to the shaft 22, is provided. Each key engages either one of two spaced lugs 24 fixed to the slide bar (see Figure 11 of the drawings). The keys will be discussed at a later point in connection with the operation of the mechanism. The slide bar is provided at opposite ends with cam teeth 25—25, projecting upwardly from the bar for swinging the link into coupling connection with the translator bar upon sliding or shifting of the bar in one direction and uncoupling of the link when moved in the other direction. The lug 14 on the free end of the coupling link 13 is above the stationary guide rail 16 when the link is elevated to couple with the translator bar. In the normal position of the link, the lug 14 is adapted to abut respectively with either of the opposite ends of the stationary guide rail 16 in either the extreme open or closed position of the door, locking the door against translation until the coupling link is elevated to bring its free end above the ends or terminals of the stationary guide rail. This clears the coupling lug and brings it into coupling engagement with the pawls 21—21.

Each pawl is provided with a laterally extended lug 26 overlapping the upper edge of the translator bar 15 forming a stop for limiting the downward swing of the pawl. The forward end of each pawl is provided with a cam face for automatically lifting the pawl when contacting the lug 14 and allowing the lug to be engaged between the two pawls. Therefore, when the lug 14 is above the stationary rail in the coupling position, the slightest amount of movement of the translator bar will effect a coupling and prevent the link from dropping out of coupling connection until the door has reached the extreme of its travel in either direction. In its extreme open position, the door is locked against closing by a hook-shaped clasp 27 fixed to the slide bar and in relation to the rear link controlling cam tooth 25 with which the clasp is integrally joined. The clasp prevents the link 13 from being elevated unless the slide bar is appropriately shifted to release the latch from the link, which is necessary to effect a coupling connection between the link and translator bar.

A tripper dog 28, pivotally mounted on a stationary support, has an arm engaged by a roller 28a on the door for actuating the slide bar for automatically normalizing the bar by the impact or thrust imparted by the moving door to shift the cam teeth 25 to a normal position where it will permit automatic uncoupling of the link when the door reaches either extreme of travel. This arrangement is fully described in the issued patent and does not appear to require detailed description or showing here.

The dead-lock bar 9 is actuated and controlled by a wedge 29 fixed to the upper front end of the door and also by a roller 30 extending laterally from the slide bar cooperating with a cam lug 30a near the top end of the lock bar. A roller 31 fixed to the dead-lock bar is adapted to engage the wedge 29 to lift the lock bar as the door closes. At the top of the wedge a notch 32 is provided to engage the roller 31. Thus, as the door closes, the dead-lock bar is first moved up by the wedge and then drops down into locking position in the notch 32. A key 33 (Figure 3) extending laterally from the slide bar is provided as a lock for the dead-lock bar. The key 33 extends into a slot in the upper end of the bar 9 when the slide bar is in the locked position (Figure 11). Therefore, the dead-lock bar cannot be lifted until the slide bar is moved. The roller 30 engages the cam lug 30a in this same movement to lift the roller 31 from the detent to release the wedge.

The translator bar 20 is reciprocated by a hand-operated lever 34, pivotally mounted upon a bracket 35 fixed to a wall of the control cabinet, the lever having an arm 36 slidably connected with a lever 37 attached to the translator bar by a link 38. When the hand lever 34 is in the position shown in Figure 1, the translator bar is in the open-door position. When the lever is swung downwardly, the door or doors are closed.

The longitudinal, reciprocating movement of the control shaft 22 is imparted by a hand lever 39 which is pivotally connected to a bracket fixed to the wall of the cabinet. Another hand lever 40 is provided for rotating the shaft 22. This lever 40 is pivoted to swing in relation to a stationary quadrant 41 fixed to the forward wall of the cabinet. The quadrant is provided with a number of notches engageable by a spring-urged detent 42 for locking the hand lever 40 in its several positions of adjustment. The hand lever 40 carries a gear segment 43 meshing with the lower

end of a vertical rack 44 slidably mounted on the cabinet wall. The upper end of the rack 44 is in mesh with a pinion keyed on the shaft 22 (the upper rack and pinion are not shown in detail here). Therefore, when the hand lever 40 is moved, the gear rack rotates the shaft 22.

As stated above, the shaft 22 is provided with a plurality of keys 23, one for each cell door in the row. Each key, as shown in Figure 11, has a pair of fingers 45 and 46 extending between the spaced lugs 24—24 on the slide bar 15. One of the fingers, for example, 45, may be included for each door of a group for simultaneously controlling all of the doors. The other finger 46 is positioned for selective control of the particular door, and when set to a position between the lugs 24—24, provides for selective control of the selected door, independently of the other doors of a series or group or for several selected doors. Each finger 46 projects from the shaft 22 at a relatively different position from the corresponding finger of the other doors of the series for individual door control. In operation, each must be successively registered between the lugs 24—24 by rotation of the shaft 22. The shaft 22 is then shifted longitudinally to engage each respective slide bar. The quadrant 41 serves as an indicator for the setting of the fingers or keys on the shaft 22 for either individual or collective control of the doors.

The mechanism, insofar as described above, corresponds substantially to that illustrated in the aforesaid prior patent of the present inventor and accordingly, follows the same operation.

From the above it can be seen that when the shaft22 is shifted to the right, each preselected slide bar is actuated to unlatch the door which it controls. The door is unlatched from the closed position when the dead-lock bar is lifted by the roller 30 acting on the cam lug 31 and when the cam teeth 25 on the left end of the slide bar raises the lug 14 of the link 13 above the left end of the stationary guide rail 16.

The door is unlatched from the locked open position in this same manner, only in this instance, the cam tooth 25 on the right end of the slide bar raises the lug 14 of the link 13 above the right end of the stationary guide rail. As soon as the lug 14 is above the stationary guide rail 16, the door can be closed by the translator bar since the pawls 21—21 can couple with the lug 14 on the link 13.

When the shaft 22 is moved to the left, with the door in open position, the hook clasp 27 locks the lug 14 down against the right end of the stationary guide rail 16. When the door is in the closed positon, a lug (not shown here, but disclosed and described in the prior Patent 1,966,422) on the back side of the link 13 is engaged beneath a lug carried on the shifter bar to lock the link 13 down so that the lug 14 on the link abuts the left end of the stationary guide rail 16. At this same time, the dead-lock bar 9 is set and locked by the key 33 carried on the slide bar. Thus, the dead lock is set whenever the shaft 22 is shifted to the left.

In the device disclosed in the prior patent, the dead lock could be set when the door was not completely closed. The present inventor has provided an interlock for the shaft 22, operated by the door, so that the dead-lock cannot be actuated until the door is closed. This interlock comprises a bell crank 50 pivotally mounted horizontally, in this instance, on a bracket 51 fixed to the frame of the door. The bellcrank is provided with a long arm 52 and a short arm 53. A stud 54 carried on the door is adapted to engage the short arm 52 when the door is closed.

The pivot for the bell crank includes a friction device for holding the crank stationary except at such times when it is moved to one of its two positions. The device includes a pivot bolt 57 projecting upwardly through the bracket 51 and the journal for the bell crank. A bushing 58 is provided on the bolt 57 above the crank and is urged against the crank by a spring washer 58a seated against a nut 59. The bushing is journalled in one arm of an angle bracket 60, welded to the bracket 51, for supporting the crank securely (Figure 2).

A collar 55 on the shaft 22 is adapted to abut the end of the long arm 52 of the crank when the long arm is swung outwardly (Figure 9). When the long arm is disposed inwardly, the collar can pass (Figure 10). The collar 55 is so positioned with respect to the long arm 52 that it abuts the long arm and locks the leftward or locking movement of the shaft 22 just before the key 33 on the shifter bar contacts the dead-lock bar 9 to set it.

A rounded projection 61 on the inner face of the long arm of the crank is engaged by a cam 62 carried on the door near the stud 54 for swinging the long arm outwardly whenever the door is moved from the closed position. Therefore, when the door is opened, the cam 62 forces the bell crank arm 53 out into the path of the collar 55, and the dead lock cannot be set by movement of the shaft 22 until the door is again closed to reshift the bell crank.

Also operated by the cell door are a pair of switches 64 and 65 adapted to indicate to the operator the conditions of the doors. The switches are provided to complete electrical circuits to a panel of lights 66 (Figure 8). Two lights 67 and 68, preferably of different colors, are provided for each door. When the door is in the locked and closed position, the switch 64 is closed to complete a circuit to light 67. When the door is in the locked open position, the switch 65 is closed to complete a circuit to the other light 68 of the pair. When the door is between these extremes, both lights are out. The electrical circuits required by this arrangement are so simple that it is believed unnecessary to provide a diagram of them.

The switch 64 that is operated by the door when it is closed comprises two movable contacts 69 and 70 (Figures 3–5 inclusive). These contacts are carried on plungers 71 and 72 respectively, slidable in a housing 73. Both plungers and the housing are made of insulating material such as hard rubber or Bakelite. The switch is mounted on a suitable bracket which is secured to the frame of the cell door above and just to the left of the door opening.

The plunger 71 moves vertically (Figure 5) and is normally urged upwardly by a spring 74 seated against the lower end of the cylinder in which the plunger reciprocates. A pin 75 fixed in the plunger extends at right angles therefrom out through slots 76—76 in the walls of the housing. The slots define the limits of movement of travel of the plunger. The pin 75, on the outside of the housing, is engaged in a slot 77 in one end of a pivoted link 78. The link is pivoted on a screw 79 fixed in the wall of the housing. The end of the link 78 opposite the slot 77 carries a screw 80, the lower end of which is adapted to ride up on the wedge 29 to lower the plunger 71

when the door is in the closed position. The upper portion of the housing is cut out as at 81 so that when the plunger 71 is down, the contact 69 carried by it is within the cut out portion.

The second plunger 72 carries the contact 70 on its inner end within the cut out portion. This plunger reciprocates horizontally (Figure 4), in a line with the contact 69, carried on the first plunger 71 when the contact 69 is in down position. The horizontal plunger 72 is urged outwardly by a spring 83 seated against a shoulder in its cylinder and a shoulder on the plunger. The plunger 72 carries a pin 84 extending through slots 85—85 in the housing, one on each side of the plunger, for limiting its movement.

The outer or exposed end of the horizontal plunger is rounded for engagement by a half round stud 86 carried by the dead-lock bar 9. When the door is deadlocked with the roller 31 in the notch 32, the stud 86 is against the horizontal plunger 72, forcing it inwardly. At this same time, since the door is closed, the wedge 29 has lifted the outer end of the link 78 to lower the plunger 71. Thus, both contacts are aligned and a circuit to the light panel is completed. The two plunger switches provide, through the light they control, positive proof that the door is closed and locked because one plunger is operated by the door only when the door is closed and the other is operated to complete the circuit by the dead lock. When the dead-lock bar is first raised by the wedge up beyond the level of the notch 32, the horizontal plunger will be operated; but no contact is completed at this time because the vertical plunger is not in contact position since the door is not completely closed.

The switch 65, which is closed when the door is in the locked open position, comprises (Figure 6–7) one vertically reciprocating plunger 87 mounted in an insulated housing 88 mounted on a bracket 88a on the door frame at the right of and over the door opening. The plunger is made of non-conducting material and extends through the housing 88. The upper end of the plunger 87 carries a movable contact 89 adapted to engage a stationary contact 90 provided on the under side of a flange 91 at the upper end of the housing 88. The plunger is spring-urged downwardly to normally break connection between the contacts 89 and 90. A pin 92 extending at right angles through the plunger engages slots 93—93 in the housing wall to limit the movement of the plunger. The lower end of the plunger 87 is rounded and is adapted to be engaged by a projection 94 extending to the right from the end of the link 13. Therefore, with the door open, the link drops down into its locked position against the right terminus of the stationary rail 16, and the projection 94 moves the plunger 87 upwardly to make the connection between the contacts 89 and 90 (Figures 1 and 6).

A single panel of lights for one row of cells (Figure 8) can be located in the control cabinet at the end of the row and also included in a master panel in a central office for the whole institution as a part of a system of lights for every cell.

I claim:

1. A sliding door operating and locking mechanism including the sliding door for the doorway of a compartment, comprising, translator means for sliding said door to opened and closed positions, a dead-lock bar for locking said door in closed position, a slide bar mechanism including means for interlocking engagement with the dead-lock bar, a collar on said slide bar mechanism, a bell crank pivoted on the frame of the door and including a finger adapted to be interposed in the path of movement of the collar on the slide bar mechanism when the slide bar mechanism is in position after the door has been opened, said bell crank including a second finger, cam means on the door adapted to engage said first finger to force it into position interposed in the path of movement of the collar when the door has been opened, and abutment means on the door adapted to engage the second finger for moving the first finger out of interposed position to permit movement of the slide bar mechanism to a position interlocking the means thereof with the dead-lock bar for locking the door.

2. A sliding door operating and locking mechanism, including a series of sliding doors for closing the doorway of a set of compartments, comprising, a translator bar for sliding said doors to opened and closed positions, means for selectively coupling said doors to said bar, a dead-lock bar for locking each door in closed position, a slide bar for each door for controlling the door coupling means and for interlocking engagement with the dead-lock bar when shifted in one direction after the door is closed, a main operating shaft for simultaneously or independently operating said slide bars, and a device associated with each door between the door and the main shaft for preventing movement of the main shaft unless all doors are closed.

3. In a sliding door operating and locking mechanism for the sliding door for the doorway of a compartment; a switch mechanism for indicating a fully closed and locked condition of the door including in combination with the locking bar for the door and a cam mechanism on the door, a switch body, a contact carrying plunger, a lever for operating said plunger, said lever adapted to be engaged by the cam of the door for translating the contact carrying plunger to a predetermined position, a second plunger in said switch body carrying a contact disposed in the plane of the first-named contact when said first-named contact is translated by the cam, said second plunger adapted to be engaged by the locking bar when the locking bar is moved to door locking position for engaging the respective contacts and closing the circuit to a signal indicating that the door is fully closed and locked.

4. A sliding door operating and locking mechanism including, sliding doors for the doorways of a series of compartments, comprising, translator means for selectively sliding said doors to opened and closed positions, a dead-lock bar for locking each door in closed position, a slide bar for each door including means for interlocking engagement with its dead-lock bar, a rod for shifting said bars, collars on said rod for the respective doors, bell cranks pivoted on the frames of the doors and including, in each instance, a finger adapted to be interposed in the path of movement of a particular collar on the rod when the particular slide bar is in position after the door has been opened, each bell crank including a second finger, cam means on the respective doors adapted to engage said first fingers to force them into position interposed in the path of movement of the collars when the doors have been opened, and abutment means on each door adapted to engage the respective second fingers for moving said first fingers out of interposed position to permit movement of the slide bars to positions interlocking the means thereof with the dead-lock bars for locking the doors.

5. In a sliding door operating and locking mechanism including a series of sliding doors for the doorways of compartments, a common means for operating all of said doors simultaneously or independently, a locking bar for each door, means for controlling the door operating means for coupling or uncoupling the respective doors from the door operating means including a slide bar for each door having means for interlocking engagement with the locking bar, and a switch at each door including a contact shifted by closing movement of the door, said door including a cam for actuating said contact for placing it in position for switch closing, a cam member on the locking bar and a second contact in said switch moved by said cam on said locking bar when the locking bar is moved to locking position said contacts when thus moved, adapted to engage for closing the circuit to a signal for indicating a fully closed and locked condition of the door.

6. A sliding door operating and locking mechanism, including a series of sliding doors for closing the doorways of a series of compartments, comprising, a translator bar for sliding said doors to opened and closed positions, means for selectively coupling said doors to said bar, a lock for each door, a slide bar for each door for controlling the door coupling means and for interlocking engagement with the lock when shifted in one direction after the door is closed, a main operating shaft for simultaneously or independently operating said slide bars, and a device associated with each door between the door and the main shaft for preventing movement of the main shaft unless all doors are closed, said device consisting of a pivoted lever rocked to and from a position blocking movement of said shaft by movement of the door.

7. A sliding door operating and locking mechanism including the sliding door for the doorway of a compartment, comprising, translator means for sliding said door to opened and closed positions, means for locking said door in closed position, means for interlocking engagement with said door locking means, and a lever pivoted on the frame of the door and adapted to be interposed in the path of movement of said interlocking means when said interlocking means is in position after the door has been opened, said door adapted to engage the lever to force it into position where it is interposed in the path of movement of said interlocking means when the door has been opened, said door adapted to engage said lever for moving said lever out of interposed position to permit movement of the interlocking means to a position interlocking with said door locking means bar for locking the door.

CHARLES F. YOUNG.