June 19, 1934. J. A. YOUNGBLOOD 1,963,820

DOOR AND LOCK OPERATING MECHANISM

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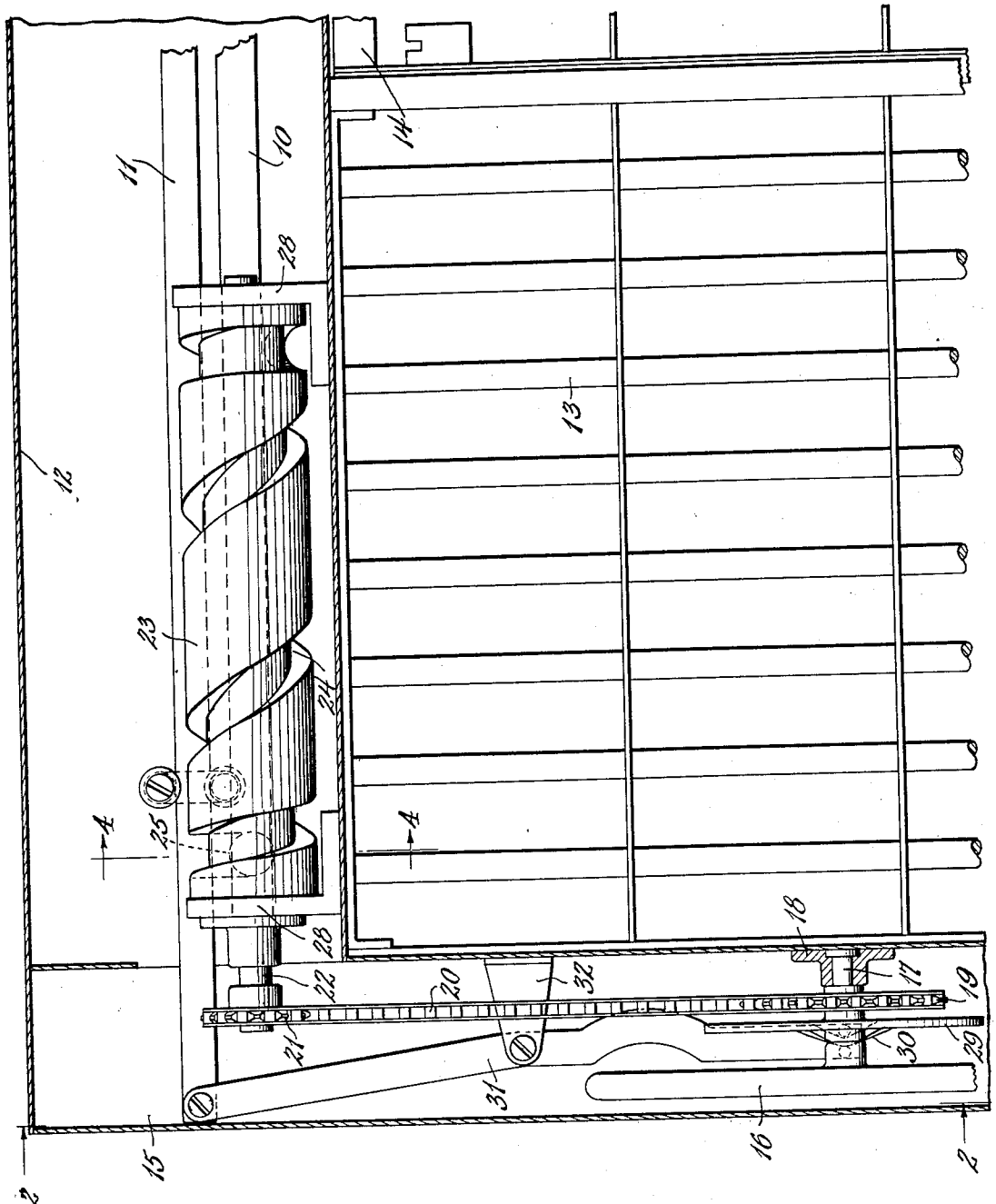


Fig. 1

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Fig. 8

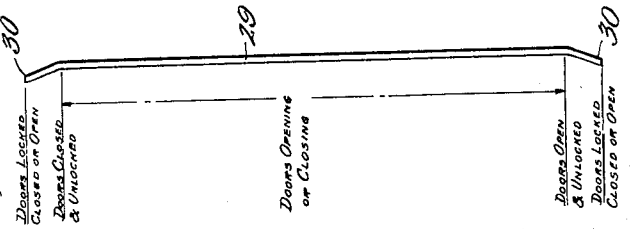
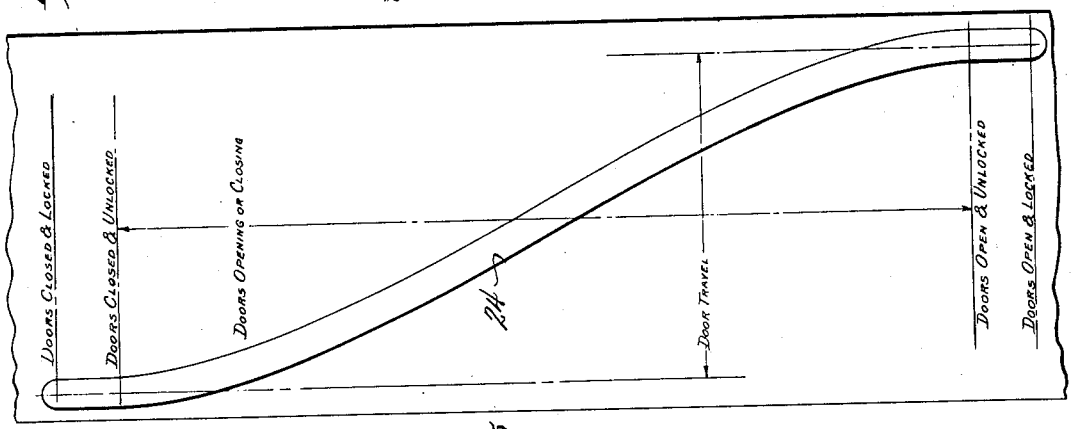
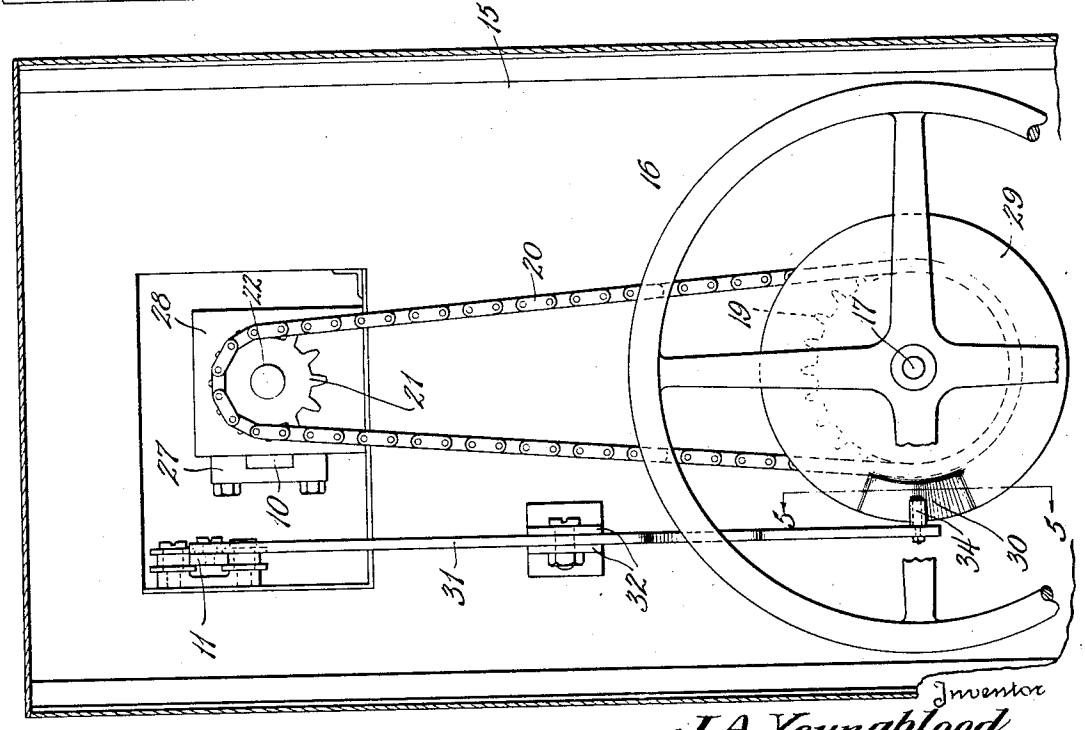


Fig. 7





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Fig. 2

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DOOR AND LOCK OPERATING MECHANISM

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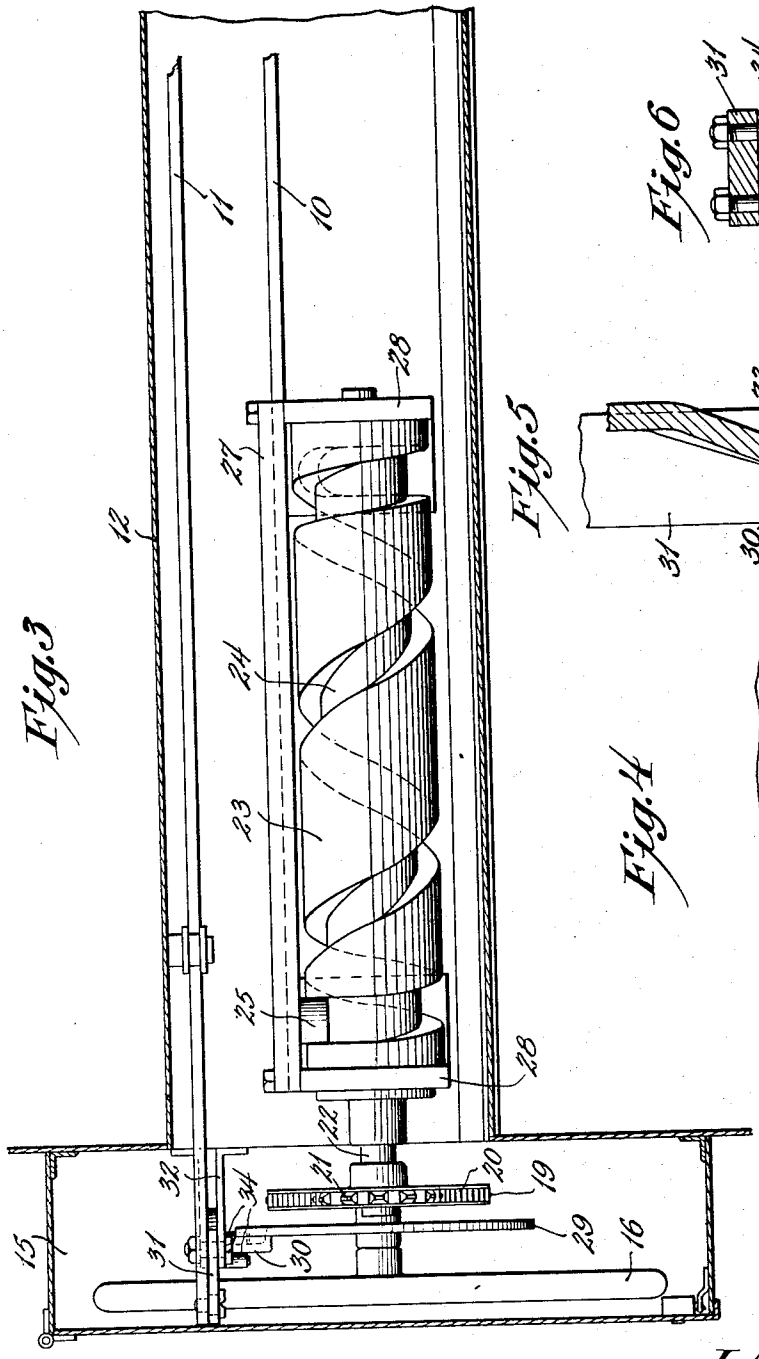


Fig. 3

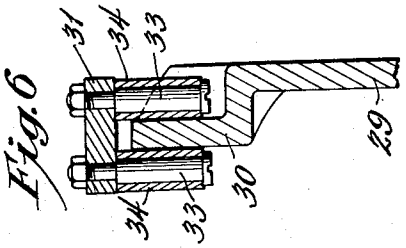


Fig. 6

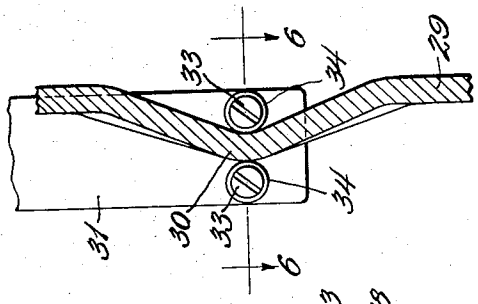


Fig. 5

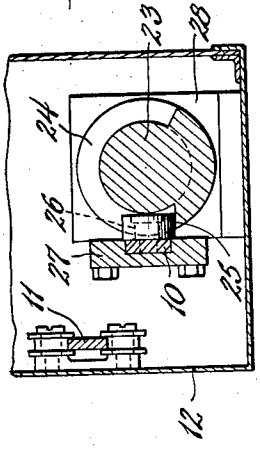


Fig. 4

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DOOR AND LOCK OPERATING MECHANISM

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Application November 11, 1933, Serial No. 697,672

7 Claims. (Cl. 189—7)

This invention relates to operating mechanism for doors and locks such as are employed in prison cell installations. One of the objects is to provide novel, relatively simple and dependable means to impart varying speeds to the cell doors during the opening and closing movements whereby a great mechanical advantage is obtained through the mechanism to overcome the inertia of the doors and whereby the doors are gradually retarded during the final stages of their opening and closing movements. Another object is to provide a durable operating device for a plurality of doors which is not subject to destructive wear and is not impaired by any resulting lost motion. A further object is to provide improved manually operable mechanism for imparting successive movements to a master door propelling bar and a lock operating bar by means of a single actuating member.

Other aims and advantages of the invention will appear in the specification, when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a fragmentary vertical sectional view showing the preferred form of mechanism applied to the end of a series of cells;

Fig. 2 is a fragmentary sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a top plan view of the mechanism, parts being shown in section;

Fig. 4 is a fragmentary sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 5;

Fig. 7 is a developed view on an enlarged scale of an operating worm for the door propelling bar; and

Fig. 8 is an edge view of the cam for actuating a lock operating bar.

Referring particularly to the drawings, the illustrated mechanism is shown as being applied to a master operating system for a series of sliding cell doors and locks such as are used in large prison installations wherein the doors and locks are actuated by a door propelling bar 10 and a lock operating bar 11. These bars are usually arranged in a casing 12 above the cells 13 which have a row of sliding doors 14, one such door being shown in Fig. 1. It will be understood by those skilled in the art that master operating mechanism for such cell doors is usually arranged in a control cabinet 15 at one end of the row of cells. In this case, the usual selector mechanism for effecting the operating connections between the master bars and the respective doors and locks is omitted because such mechanism is old and well known. It is sufficient to state that a keeper or attendant may select any number of doors to be opened or closed by manipulating suitable selectors in the control cabinet 15.

In accordance with this invention, lock and door operating movements are imparted in proper sequence to the locking bar 11 and door propelling bar 10 by a single hand wheel 16 mounted on a shaft 17 journaled in the bearing 18 on the back wall of the master control box. On this shaft is shown a sprocket 19 driving a chain 20 trained on a sprocket 21 which is keyed to a shaft 22 journaled in the casing 12 and carrying a worm 23. The worm 23 is shown as having a helical groove 24 of varying pitch from one end to the other and connected to the door propelling bar 10 by means of a roller 25 on a pin 26 projecting laterally from the bar. The pin is confined in the groove by means of a grooved guiding plate 27 suitably secured to bearing brackets 28 at the opposite ends of the worm. The arrangement is such that, as the hand wheel is turned, it imparts rotation to the worm, thereby moving the master propelling bar to its door opening or door closing position. In this instance, the two master bars are located on the same side of the worm to enable the casing to be made relatively narrow.

In the position shown in Figs. 1 and 3, the master propelling bar is in its door closing position and the worm is adapted to be turned through approximately four revolutions to move the bar to its door opening position. Referring to Figs. 1, 3 and 6, it will be noted that the helical groove 24 in the worm terminates at its opposite ends in short circumferential portions extending around about one-fourth of the periphery of the worm, without imparting movement to the propeller bar 10 and the pitch of the groove gradually increases from its termination at each end toward the central portion of the worm. The arrangement is such that the hand wheel has to be turned through a part of a revolution before any movement is imparted to the door propelling bar. It is given sufficient lost motion to enable the operating mechanism to actuate the lock operating mechanism as will later be explained. After the hand wheel turns through about one-eighth of a turn, depending upon the gear ratio of the driving sprockets 19 and 21, initial opening or closing movement of the doors is imparted gradually and their speed is accelerated until the roller

25 reaches the center of the worm. Thereafter, the opening or closing movement is decelerated or retarded until the door comes to rest and it is opened or closed gradually without any shock. Then, the final turning movement of the worm provides sufficient lost or idling motion at the end of the door opening or closing movement to permit the locking bar to be operated again. The lost motion and the varying pitch of the worm are therefore important features of the door operating mechanism. A further advantage of the circular portions of the slot or groove at the ends of the worm resides in the fact that the mechanism is self-locking and prevents any unauthorized actuation of the door propelling bar. In other words, the door propelling bar is positively locked against any longitudinal movement at both ends of its stroke when the hand wheel is turned through the limit of its movement in either direction.

The lock operating bar 11 is here shown as being positively driven by the hand wheel while the door propelling bar is idle or during the lost motion part of the movement of the hand wheel and worm. In this instance, a cam 29 in the form of a disk having a bent edge 30 is secured to the hand wheel shaft 17. This cam operates a lever 31 pivoted intermediate its ends to brackets 32 and connected at its upper end to the locking bar 11. The lower end of the lever is shown as having a pair of spaced pins 33 in the form of shouldered bolts carrying rollers or sleeves 34 which straddle contact and contact with opposite faces of the cam so as to impart oscillating or pivotal actuating movement to the lever. The lever is bent adjacent to the hand wheel to provide adequate clearance for the fingers. (Figs. 5 and 6.) When the parts are in the positions shown in Figs. 1 and 6, the lever has moved the locking bar to its door-locking position. When the cam dip or bent edge 30 passes in either direction between the rollers, the lever imparts full, unlocking movement to the locking bar. The bar is held in this position until the cam rotates through nearly a complete revolution (see the nomenclature applied to Figs. 7 and 8). The gear ratio is preferably such that one revolution of the hand wheel will operate all of the doors so that the cam actuates the locks after the doors are completely opened or closed. However, if more mechanical advantage is required the gear ratio may be changed by employing a smaller driving sprocket and the cam may be operated by a pair of gears.

In Fig. 1, it will be noted that the forward end of the locking bar 11 is near the inside wall of the door of the control cabinet. When it is moved to its unlocking position it projects through the door opening. Thus, the cabinet door cannot be closed and locked until the locking bar is in its locking position.

What is claimed is:

1. In an operating system for cell doors having a door propelling bar, a worm having a decreasing pitch from the central portion toward its opposite ends connected to actuate said bar; and a manually operable member connected to the worm.

2. In an operating system for cell doors having a door propelling bar, a worm having a helical groove of varying pitch decreasing sharply from the central portion toward its opposite ends connected to said bar to provide a maximum mechanical advantage during the initial door opening or door closing movement of the bar; and a hand wheel connected to operate said worm.

3. In an operating system for cell doors having a door propelling bar, an elongated worm having a helical groove journaled adjacent to and parallel with said bar; said groove having a much greater pitch at the middle than the pitch near the opposite ends; a roller on said bar confined in said groove; and an operating hand wheel connected to rotate said worm.

4. In a lock and door operating system for cell doors having a door propelling bar and a lock operating bar, a worm connected to impart movement to the door propelling bar; a hand wheel connected to rotate the worm; mechanism operable by the hand wheel connected to impart movement to the lock operating bar only when the worm has moved the door propelling bar to its door-opening or door-closing position; and said worm having end portions with zero pitch permitting it to rotate idly while the mechanism is actuating the lock operating bar.

5. In a master lock and door operating system for cell doors having a master door propelling bar and a lock operating bar, a worm having a helical groove connected to the door propelling bar, said groove having end portions extending circumferentially of the worm to permit the worm to rotate through a portion of a revolution without moving the door propelling bar; a hand wheel having a shaft connected to rotate the worm; a cam operatively connected to said hand wheel shaft; and operating means connecting the cam to the lock operating bar, said cam being timed to impart lock operating movement to the lock operating bar while the door operating bar is held against movement by said worm.

6. In a master lock and door operating system for cell doors having a master door propelling bar and a lock operating bar, a worm having a helical groove connected to the door propelling bar, said groove having end portions extending circumferentially of the worm to permit the worm to rotate through a portion of a revolution without moving the door propelling bar; a hand wheel having a shaft connected to rotate the worm; a cam on the hand wheel shaft and timed to make one revolution as the worm is rotated through the limit of its movement in either direction; and a pivoted lever connecting said cam to impart movement to said lock operating bar.

7. In a master lock and door operating system for cell doors having a door propelling bar and a lock operating bar, a worm mounted adjacent to the door propelling bar having a helical groove of varying pitch with a short circumferential portion at each end; a roller on the master propelling bar confined in said groove; a guide plate for the propelling bar adjacent to the worm; a hand wheel geared to operate the worm; a cam connected to be operated by the hand wheel; a pivoted lever connected at one end to the lock operating bar; and means connecting the other end of the lever to the cam, said cam being so timed as to impart lock operating movements to the lock operating bar while the propelling bar is held against movement by the circular end portions of the helical groove in said worm.

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