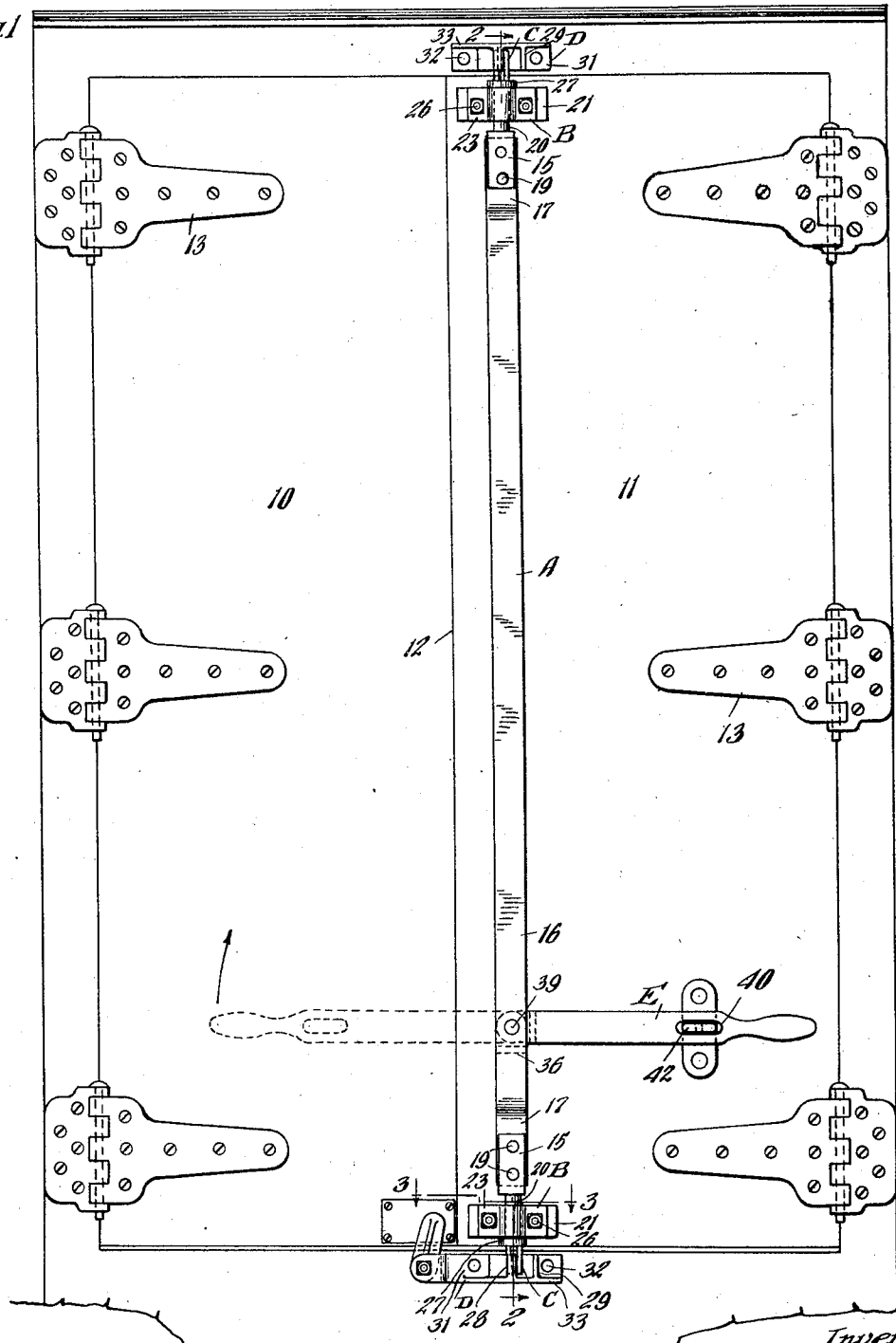
Nov. 10, 1931. J. F. O'CONNOR 1,830,956

DOOR OPERATING MECHANISM

Filed Nov. 16, 1925 2 Sheets-Sheet 1

Fig. 1




Witness

Wm. Geiger

Inventor

John F. O'Connor

By George L. Knight

his Atty.

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DOOR OPERATING MECHANISM

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Fig. 2

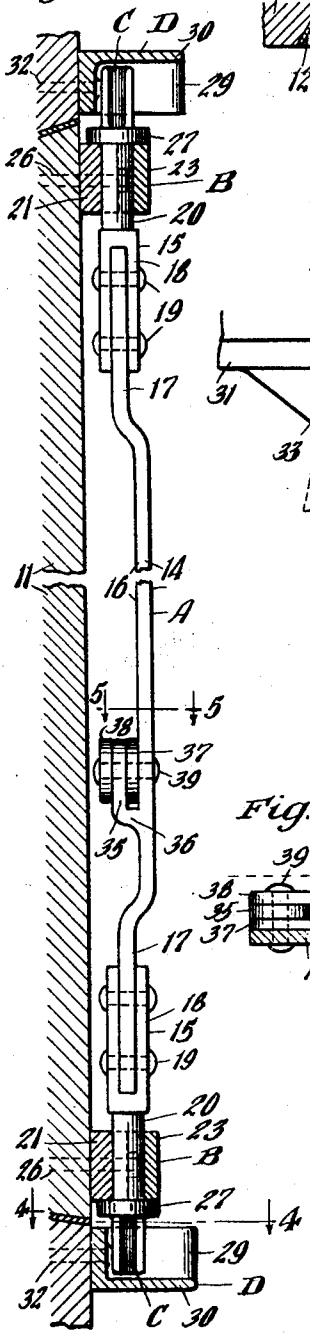



Fig. 3

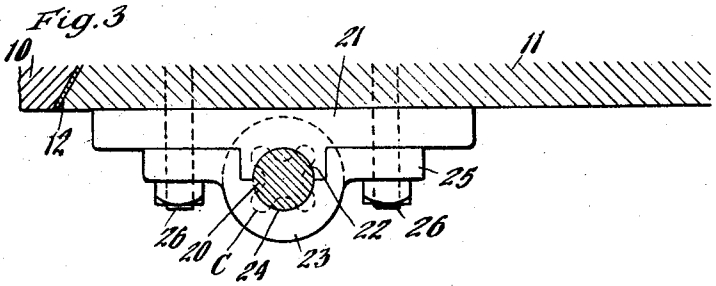



Fig. 4

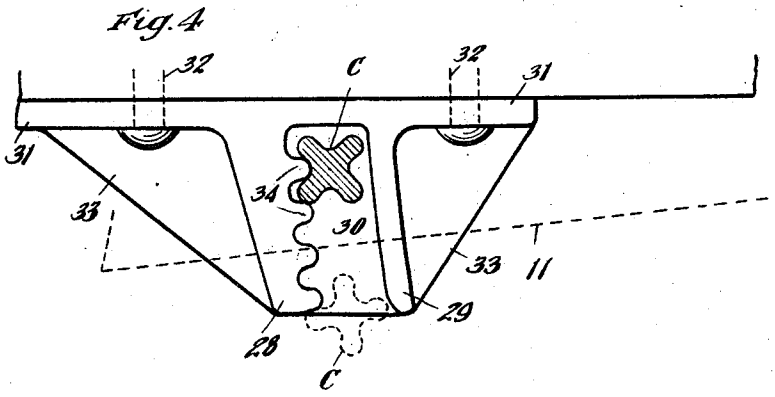



Fig. 5

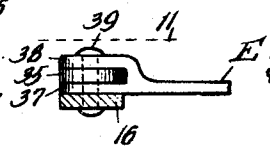



Fig. 6

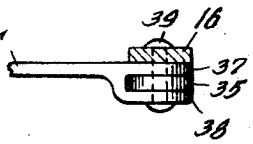
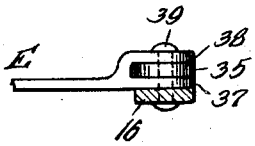



Fig. 7




Witness
Wm. Geiger

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Patented Nov. 10, 1931 1,830,956

# UNITED STATES PATENT OFFICE

JOHN F. O'CONNOR, OF CHICAGO, ILLINOIS, ASSIGNOR TO W. H. MINER, INC., OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE

## DOOR OPERATING MECHANISM

Application filed November 18, 1925. Serial No. 69,295.

This invention relates to door operating mechanisms.

One object of the invention is to provide a door operating mechanism, including a shaft rotatably mounted upon the door, said shaft being provided with operating portions projecting beyond the edges of the door, and adapted to cooperate with keepers fixed upon the door frame for effecting opening and closing movement of the door through a predetermined distance sufficient to clear the insulation upon the abutting edges of the door, in conjunction with means for rotating said shaft for approximately a full revolution to cause movement of the door through the required predetermined distance, resulting in a reduction of the applied force necessary to move the door operating mechanism at a given instant in its operation.

Other objects and advantages of the invention will more clearly appear from the description and claims hereinafter following.

In the drawings forming a part of this specification, Figure 1 is a side elevation of a portion of a refrigerator car, showing the doors thereof, and my improvements in connection therewith. Figure 2 is a broken, vertical, sectional view of the invention, taken substantially on the line 2—2 of Figure 1, and showing parts of the mechanism in elevation. Figure 3 is a horizontal partial sectional view of the invention on the line 3—3 of Figure 1. Figure 4 is a horizontal sectional view of the invention taken substantially upon the line 4—4 of Figure 2 showing the bottom keepers in top plan. Figure 5 is a fragmentary sectional view of the operating shaft and lever, substantially upon the line 5—5 of Figure 2, showing the position of the shaft at the inception of the door opening operation. Figure 6 is a view similar to Figure 5 showing the position of the shaft and lever when the same have been rotated one-half revolution. And Figure 7 is a view similar to Figure 5 showing the position of shaft and lever when the same have been rotated substantially one complete revolution.

In the drawings, 10 and 11 designate hinged refrigerator car doors, the latter being the last one to be closed, said doors being provided with beveled meeting edges, as indicated at 12, in the usual manner, and suitable insulating packings are provided on said meeting edges and also upon the outer edges of the doors and door frame. As is customary, the operating shaft is mounted on the last door to be closed—that is, the door 11 in the structure as shown. The doors 10 and 11 are swingably supported upon the usual hinge members 13—13.

The improved door operating mechanism comprises, broadly, a rotatable shaft A; a pair of mounting brackets B; a pair of actuating gears C—C; a pair of keepers D—D; and lever mechanism E for rotating said shaft.

The operating shaft A, as shown, comprises an intermediate connecting bar 14 of rectangular formation, and end castings 15—15, the bar 14 having an offset intermediate portion 16, and end members 17—17. Each end casting 15 is forked, as indicated at 18, to receive the corresponding end portion 17 of the operating bar 14, and is secured to the bar by rivets 19 extending through the forked portions of the casting. Outwardly of the forked portion, the end member 15 is provided with a cylindrical bearing portion 20 adapted to co-operate with the adjacent mounting bracket B. Each mounting bracket is preferably of two-part construction and located adjacent the edge of the door, said bracket including an inner section 21 having a half journal bearing seat 22, and an outer section 23 having a half journal seat 24, the outer section being provided with flanges 25, and the two sections being secured to the car door by suitable bolts 26—26 passing through the flanges 25 of the outer section and through the body portion of the inner section 21, as best shown in Figure 3. Each end member 15 outwardly of the related bracket B is formed with a collar 27, which bears against the outer edge of the bracket, and outwardly of the collar is integrally formed the gear C. The gear C is preferably of a type which has four diametrically opposed teeth or ribs adapted to co-operate with the keepers D, as hereinafter more fully described, it being

noted that the gear is proportioned so that a full revolution of the gear is required to traverse the keeper.

Secured to the lintel and threshold of the door frame are the keepers D—D hereinbefore referred to, each of which is provided with spaced upstanding walls 28 and 29, and a bottom wall 30, the walls 28, 29 and 30 defining a recess in which the related gear C operates. The walls 28 and 29, at the outer sides thereof, are provided with flanges 31 through which are extended suitable securing bolts 32, the bottom wall forming web portions 33 connecting the walls 28 and 29 with the flange portions 31—31. The inner face of the wall 28 is provided with rack teeth or ribs 34 adapted to co-operate with the related gear C, the teeth 34 being four in number and spaced so that slightly more than a full revolution of the gear is necessary to traverse the keeper from the position of the gear indicated in full lines in Figure 4 to the position indicated in dotted lines in said figure, the movement of the gear and the length of the rack being so proportioned as to move the door a predetermined required distance to clear the insulation at the door edges when the mechanism is operated. The rack on the wall 28 is disposed upon an arc with the pivotal hinge axis of the door 11 as the center thereof, so as to accommodate the arcuate movement of the swinging edge of the door 11 and facilitate the meshing of the gears C with the racks upon the keepers.

As before stated, the gears and the keeper racks are so proportioned that a full revolution of the shaft is necessary to cause the gear to traverse the full extent of the rack, and so free the gear from the keeper to permit full opening of the door, or, in the closing operation, to insure complete closing movement of the door, this construction having the advantage that the power necessary to operate the shaft at a given instant is reduced and that the keepers and gears are of minimum size so as to project from the door and car frame a minimum distance. In conjunction with a door operating mechanism of the character specified, it is desirable to utilize radially movable lever means substantially similar to those now commonly in use for rotating the shaft in effecting accomplishment of this result. The shaft A has the intermediate portion thereof offset with respect to the end portions 17, as before referred to, and formed integrally with the intermediate portion 16 of the shaft, adjacent the lower end portion 17, is an offset angular branch 35, the outer portion extending substantially parallel with the offset portion 16 of the shaft, and the portion 36 connecting one end of the offset with the portion 16 of the shaft. The lever E has a forked end, one forked portion 37 of which extends between the angular portion 35 and the offset body portion 16 of the shaft and the other forked portion 38 of which extends upon the outer side of the angular portion 35, a rivet 39 being extended through the body portion 16 of the shaft, the two forked portions of the lever and the angular portion 35 formed on the shaft. This arrangement pivotally connects the lever to the shaft and limits the downward movement thereof, while permitting upward swinging movement of the lever to either side of the shaft in a plane substantially parallel to the plane of the offset portion 16, the radial swinging of the lever, of course, imparting rotation to the shaft and the gears C applied thereto. The lever E is provided with an aperture 40 adapted for the reception of the keeper 42 fixed on the door 11, by which the lever may be locked to the door 11 when the mechanism is in closed position, as is the usual practice.

In operation, assuming the parts to be in the position shown in full lines in Figure 1, the lever E is first disconnected from the locking means and swung outwardly away from the door, to the position shown in dotted lines in Figure 1, the shaft and gears being rotated, meshing of the teeth of the gears C and the teeth 34 of the racks, causing approximately one-half revolution of the gear during this movement, and a corresponding opening movement of the door 11. When the lever E has reached the position indicated in dotted lines in Figure 1, the same may be swung upwardly clockwise in the direction indicated by the arrow in Figure 1, past the shaft, and downwardly into the position which it occupied at the inception of the door opening movement, after which the lever may be again swung radially outwardly from the door to impart another half revolution to the shaft A, or slightly in excess of a half revolution, due to the greater movement of the lever which is permitted when the door is partly open, the final portion of movement of the shaft serving to move the door and gears C to the position indicated in dotted lines in Figure 4, where the parts are freed from the keepers and the door may be swung outwardly to fully open position. In closing the door, the gears are first alined with the keeper recesses, and a reversal of the above described movements takes place which effects full closing of the door.

By the above described arrangement, it will be appreciated that the gear ratio is such that a gain in power is effected for any given instant for the reason that the movement of the door is only half of that accomplished by a half revolution of the shaft in usual practice, the full predetermined movement for opening the door so as to free the insulation, being accomplished by a full, or slightly greater than a full, revolution of the shaft, the particular lever means associated with the mechanism being so mounted with re-

spect to the shaft as to permit radial movement of the lever to effect approximately a half revolution of the shaft and the lever then returned to be again radially swung to effect the final revolution of the shaft.

While I have herein shown and described what I now consider the preferred manner of carrying out my invention, the same is merely illustrative and I contemplate all changes and modifications that come within the scope of the claims appended hereto.

I claim:

1. In a refrigerator car having a pivoted side door, the combination with keepers mounted on said car and being provided with rack portions extending at an angle to the face of said car; of a rotatable shaft mounted on said door, said shaft being provided with gears on its ends projecting outwardly beyond the edges of the door and adapted to cooperate with the racks upon said keepers for effecting opening and closing movements of said door; lever means pivotally connected to said shaft, said lever means being swingable to either side of said shaft in a plane substantially parallel to the plane defined by the face of said door, said lever means being swingable in a direction substantially perpendicular to the plane defined by the the face of said door to effect rotation of said shaft to impart the required rotation to said gears.

2. In a refrigerator car door operating mechanism, the combination with a door member; of a hinged door; keeper means secured to said door member adjacent the door and having rack portions substantially corresponding in extent to the distance of movement of the door necessary to free the abutting edges thereof; a rotatable shaft mounted on the door and having gear members cooperating with said racks, said gear members and said keeper racks being operatively engaged throughout more than a one half revolution of said shaft, while effecting movement of the door to such an extent only as to free said edges; and means for rotating said shaft through more than a half revolution, said rotating means including a lever swingable about the axis of the shaft to effect rotation thereof, and means movably connecting the lever to the shaft for displacement transversely of the shaf to dispose the operating end of the lever to one side or the other of said shaft and uniting said lever and shaft for rotation when said lever is swung about the axis of the shaft.

3. In a refrigerator car door operating mechanism, the combination with a door frame member and a cooperating swinging door hinged along one edge; of an operating shaft rotatably supported on said door adjacent the opposite edge thereof and disposed lengthwise of said edge; keeper means on the door frame; cooperating means on said shaft and keeper means operatively engaged throughout more than a half revolution of said shaft for effecting movement of said door to such an extent only, in either opening or closing direction, as to either force the same open to thereby initiate the opening movement thereof or to force the same tightly closed; and a lever means operatively connected to said shaft for effecting rotation thereof, said lever means being swingable about the axis of rotation of said shaft to effect rotation thereof and being displaceable from one side to the other of said shaft independently of rotation of the latter to provide for intermittent successive rotation of said shaft in either direction to an extent greater than half a revolution thereof.

4. In a refrigerator car having a pivoted side door, the combination with keepers mounted on said car; of a rotatable shaft mounted on the door; means on the shaft operatively engaging with said keepers continuously throughout more than a rotation of 180° of said shaft for effecting movement of said door; and means for producing rotation of said shaft through an angle of more than 180°, including an operating lever shiftable transversely of the shaft to be projected to either side thereof, and held against swinging movement relative to the shaft about the axis of the same.

5. In a door operating mechanism for cars, the combination with a door frame; of a swinging door cooperating with said frame; a shaft rotatably mounted on the door; keeper means on the door frame; means on said shaft engaging said keeper means during rotation of the shaft through more than 180° to effect opening and closing movement of the door; means for rotating said shaft, including an operating lever pivoted on the shaft to swing about an axis transverse of the shaft, the pivoted end portion of said lever being disposed between the shaft and the door when said door is in closed position.

6. In a refrigerator car provided with a door opening in a wall thereof, the combination with a pivoted door for closing said opening, said door lying substantially in the plane of said wall when closed; of a rotatable shaft mounted on the door, said shaft having keeper engaging means thereon; keeper means on the wall cooperating with said keeper engaging means to effect opening and closing movements of the door upon rotation of said shaft; means for rotating the shaft, including an operating lever swingable about the axis of the shaft toward and away from said door through an arc of approximately 180°; and means movably connecting the lever to the shaft for displacement from one side of the axis of rotation of the shaft to the other and continuously locking said lever and shaft together against relative rotation about the axis of the shaft to effect movement of said shaft

in unison with the lever when the lever is swung about the axis of the shaft.

7. In a door operating mechanism, the combination with a door member and a pivoted door; of keeper means secured to said door member; of a shaft mounted for rotation upon said door, said shaft having means coacting with said keepers to effect movement of said door upon approximately a complete revolution of said shaft, said shaft being provided with an offset portion intermediate its ends, and having an angular extension formed on the inner side of said offset portion and spaced therefrom; and an operating lever having a forked end, one forked portion fitting between the angular member and the offset portion of said shaft, the other forked portion being disposed outside of said angular member; and a pivot pin extending through the offset portion of said shaft, the forked ends of said lever, and said angular portion.

In witness that I claim the foregoing I have hereunto subscribed my name this 13th day of November, 1925.

JOHN F. O'CONNOR.