

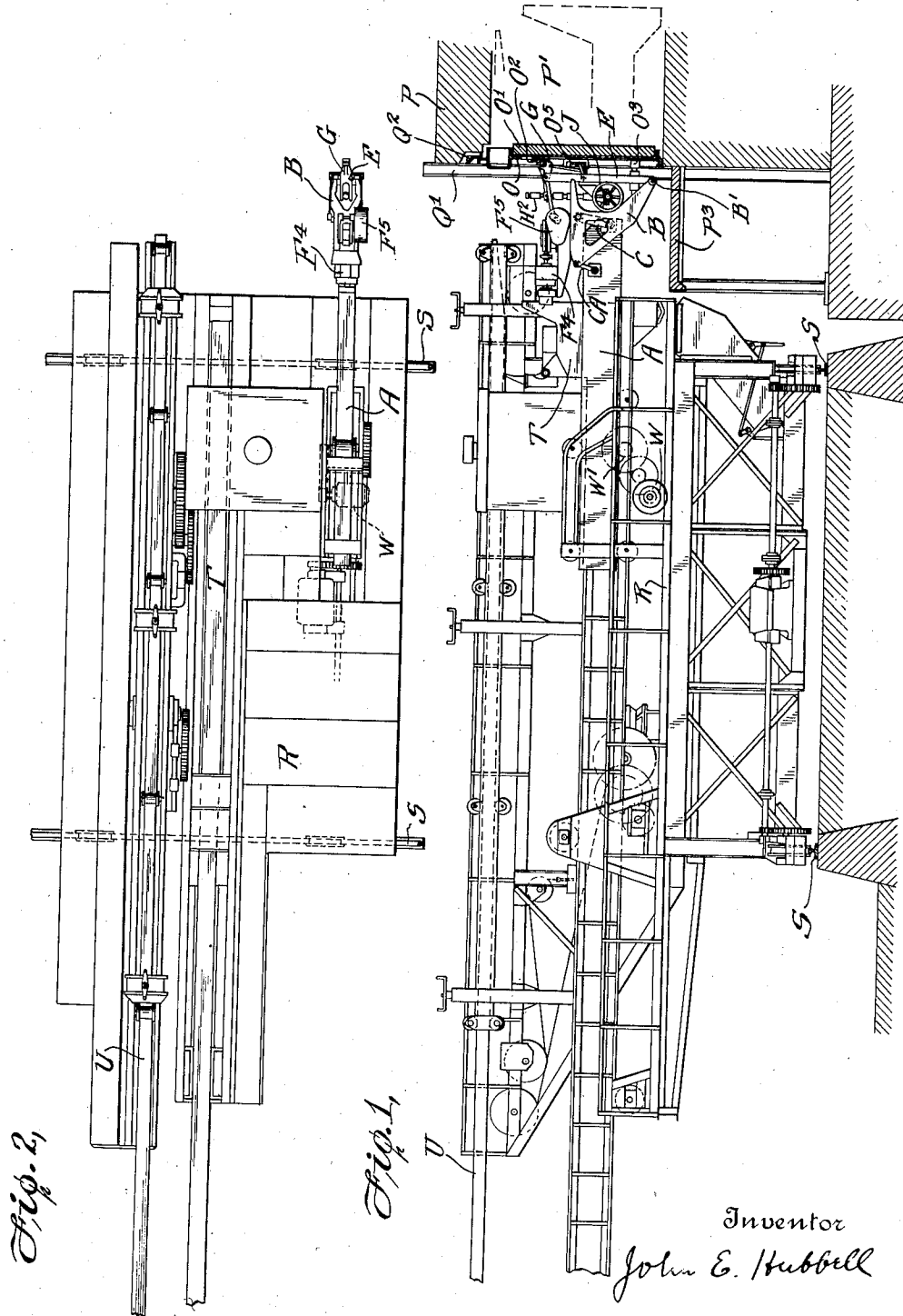
J. E. HUBBELL.
DOOR HANDLING MACHINE.

APPLICATION FILED OCT. 22, 1918. RENEWED SEPT. 7, 1920.

1,357,058.

Patented Oct. 26, 1920.

2 SHEETS—SHEET 1.



Inventor
John E. Hubbell

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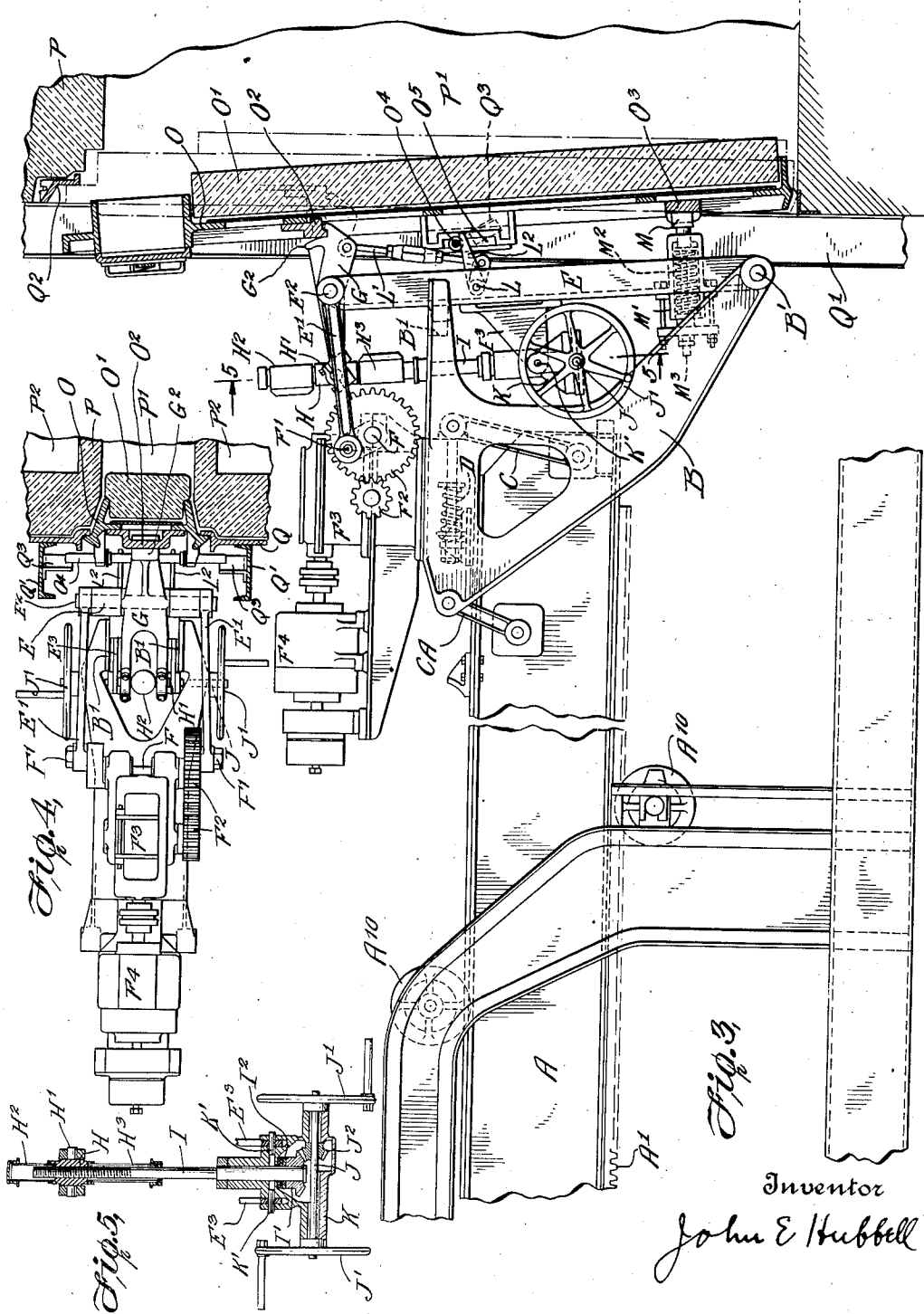


Fig. 3
Inventor
John E. Hubbell

UNITED STATES PATENT OFFICE,

JOHN E. HUBBELL, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-THIRD TO LOUIS WILPUTTE AND TWO-THIRDS TO ALICE A. WILPUTTE, BOTH OF NEW ROCHELLE, NEW YORK.

DOOR-HANDLING MACHINE.

1,357,058.

Specification of Letters Patent.

Patented Oct. 26, 1920.

Application filed October 22, 1918, Serial No. 259,185. Renewed September 7, 1920. Serial No. 409,043.

To all whom it may concern:

Be it known that I, JOHN E. HUBBELL, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Door-Handling Machines, of which the following is a specification.

The general object of my present invention is to provide an improved door handling mechanism especially devised for moving plug doors into and out of the ends of the horizontal coking chambers of a by-product coke oven. These doors are quite heavy, ordinarily weighing several tons each, and to remove such a door from its closed position it is necessary to lift the door slightly to take the weight of the door off the door sill, or bottom wall of the oven chamber, and then to move the door horizontally out of the coke chamber, after which it is usually necessary to move the door transversely of the length of the oven chamber to get it out of line with the latter.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming part of this specification. For a better understanding of the invention, however, and the advantages possessed by it, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated a preferred embodiment of my invention.

Of the drawings:

Figure 1 is an elevation of my improved door handling mechanism and shows in section a portion of the coke oven structure with which it is associated.

Fig. 2 is a plan view of a portion of the apparatus shown in Fig. 1.

Fig. 3 is an elevation taken similarly to Fig. 1 but on a larger scale, showing only a portion of the apparatus of Fig. 1.

Fig. 4 is a plan view of a portion of the apparatus shown in Fig. 3, and

Fig. 5 is a partial section on line 5-5 of Fig. 3.

In the drawings, I have illustrated the use of my improvement in an installation in which the door handling mechanism for the "pusher" side of a horizontal by-product coke oven plant is mounted on the pusher machine carriage R, on which is

also mounted the coke ejecting ram T, the charge leveling bar U, and the mechanisms for giving the ram T and the bar U their movements, and for giving the carriage R its movement transverse to the oven chambers along the pusher track rails S. The door handling mechanism proper comprises a bar or beam A, mounted as shown on guide rolls A¹⁰ for movement toward and away from the oven chambers in a direction parallel to the longitudinal axes of the latter. This longitudinal movement of the bar A is brought about through mechanism which as shown comprises a motor mounted on the carriage R, and operatively connected to bar A by speed reducing gearing including a spur gearing W' in mesh with a toothed rack secured to or formed on the bar A. The coke oven structure P shown, comprises horizontal coking chambers P' with flued heating walls at each side of the chamber, and a door O for the pusher end of each chamber which comprises a metallic rim or framework and a refractory body portion O'. In the closed position of the door shown in Fig. 1 the refractory inner body portion O' of the door projects into the oven chamber preferably to the outer edges of the first vertical flues P² in the heating walls. The side flanges of the door then abut against the sides of the doorway. In the particular construction shown, the sides of the doorway proper comprise metallic flash plates Q which cover the ends of the heating walls and are held in place by the usual vertical buckstays Q'. At the top of the doorway the flash plates Q are shown as connected by a metal lintel Q². The door is normally secured in its closed position by means of a horizontal locking bar O⁴ which is vertically movable in the guideways O⁵ carried by the door. The ends of this bar O⁴ engage the inner inclined sides of the lugs or brackets Q³ carried by the adjacent buckstays.

In so far as above specifically described, the oven structure and apparatus disclosed is of a known type and comprises nothing novel with me.

The improved door handling mechanism shown comprises a lever element E, which is pivotally connected to the sliding bar element A, to turn with respect to the latter about a horizontal axis parallel to and ad-

5 adjacent to the lower edge of the door. Associated with this lever are means for securing the door to the lever, and for turning the lever about the axis of its hinge connection to the bar A to thereby tilt the door from the normal closed position shown in Fig. 1 into the inclined position shown in Fig. 2, or vice versa. The lever E may be directly hinged to the sliding element A, but for safety and convenience in operation, I prefer to interpose a yielding or cushion connection between the lever E and the element A. Such a safety connection protects the apparatus in particular from injury in case of an undue advance movement of the beam A. This safety connection, in the form shown, comprises an element B which straddles the beam A and is connected to the latter by links C and CA. The cushion spring D, interposed between the elements A and B normally holds the latter in the advanced position shown in the drawing in which the yoke portion of the element B rests upon the top of the beam A. The legs of element B support at their lower ends a shaft B' by which the lever E is hinged to the element B. Advantageously the link C is made about twice as long as the link CA and the two links are so arranged that when the bar A is moved too close to the door and the cushion spring D yields to permit a backward movement of the member B relative to the member A, this relative movement will not create an appreciable change in the level of pintle B'.

35 The upper end of the lever E is bifurcated to receive the door engaging hook lever G which is pivotally connected to the lever E by a shaft E². The lever E is turned relatively to the member B on the axis of the pintle B' by an electric motor F⁴ on the member B, and a crank shaft F operated by the motor and carrying crank pins F' which are connected by links E' to the ends of the shaft E². The shaft of the motor F⁴ is connected to the crank shaft F by speed reducing gearing, including spur gears F² inclosed in a casing F⁵ (not shown in Fig. 3), and speed reducing gearing inclosed in a housing F³.

50 The door engaging lever G is provided at its inner end with a door engaging hook adapted to take under a bracket or hook plate O² secured to the metallic frame of the door, preferably at a level appreciably above the center of gravity of the door. The outer end of the hook lever G is connected to an operating mechanism which comprises, in the preferred construction illustrated, a nut H screwed on a threaded spindle I and provided with trunnions H', to which the two branches of the bifurcated outer end of the lever G are pivotally connected. The lower end of the shaft I is

70 turn is hinge connected to ear portions E³ of the lever E by co-axial pins or shafts K' which are parallel to the shafts E² and B'. Secured to the lower end of the shaft I is a bevel gear I' which meshes with a bevel gear J², secured to a shaft J. The latter is journaled in the yoke K and provided at its ends with hand-wheels J'. A suitable thrust bearing I², which may advantageously be a ball bearing, is interposed between the upper end of the gear I' and the tubular portion of the yoke K in which the lower end of the shaft I is journaled. H² and H³ represent tubular guards secured to the nut H and inclosing the threaded upper end of the shaft I. By rotating the hand-wheel J', the nut H is raised and lowered and the hook end of the lever G thus moved out of and into operative engagement with the hook plate O². Advantageously, I associate with the lever G, means for automatically moving the door locking bar O⁴ into and out of operative relation with the lugs Q³ as the lever G is moved out of and into operative relation with the hook plate. The means for this purpose comprises a rock shaft L journaled in the lever E and having an arm connected by a link L' to the lever G and having other arms G² for engaging and lifting the bar O⁴.

To avoid undesirable relative movement of the door O and lever E when the door is supported by the lever E through the hook G and to assist in properly closing the door, I provide the lever E with a door engaging part adjacent the lower end of the lever, and advantageously, though not necessarily, made of a yielding character. As shown, this part is in the form of a plunger M mounted in a casing M' secured to the lever E adjacent its lower end. The outer end of the plunger M engages the inner end of a cushion spring M² received in the casing M', and the outer end of the spring is engaged by an adjustable abutment member M³ projecting into, and adjustably secured in the outer end of the casing M'.

The operation of opening the door O is as follows: The carriage R is adjusted on the track rails S to bring the bar A in front of the door to be opened. The bar A which has been previously retracted with respect to the carriage R to provide the necessary clearance between the door handling mechanism and buckstays Q' as the carriage is being moved along the rails S, is then advanced into the door engaging position shown in the drawings. This brings the hook end of the lever G under the hook plate O² and the arms L² under the locking bar O⁴. The adjustment of the element A with reference to the carriage R need only secure approximate registration between the engaging surfaces of the lever

G and hook plate O² since accurate registration may be quickly and easily secured by a slight operation of the motor F and a corresponding angular adjustment of the lever E. To prevent an undue inward movement of the lever G, the latter is preferably formed with a curved shoulder G² which abuts against the outer face of the hook plate O². After the lever E is thus brought into the proper relative position with respect to the door, the shaft J is rotated to bring the locking lever into snug engagement with the underside of the locking plate O². The motor F⁴ is then operated to swing the lever E from the position occupied by it in Fig. 1 into position occupied by it in Fig. 2. This turns the door from the position shown by it in full lines in Fig. 1, and in dotted lines in Fig. 3, into the full line position of Fig. 3. The effect of this tilting of the door is to lift the bottom of the door off the door sill, and to transfer the weight of the door from the door sill to the lever E and the mechanism for supporting the latter. After the door is turned into the position shown in full lines in Fig. 3, it may be fully withdrawn from the oven chamber by the retraction of the beam A, and in practice provision may well be made for retracting the beam A far enough to carry the door to the outer edge of the oven bench P². Then in normal operation, the carriage R is shifted as required to bring the ram T and the leveling bar U successively into alinement with the oven chamber.

To put the door back into place, after the carriage R is returned to the position in which the beam A is in line with the oven chamber, the beam A is advanced until the lower end of the door snugly engages the doorway, and the beam A should be advanced for this purpose far enough to put the spring M², and spring D, if both are employed, under some tension. After this is done, the motor F⁴ is operated to swing the lever A toward the oven and thereby force the upper end of the door into the closed position. After the door is thus brought up against the doorway, the shaft J is rotated to lower the hook lever G and the arms L², thus disconnecting the lever G from the door, and permitting the locking bar O⁴ to lock the door in place.

The apparatus disclosed, in addition to possessing obvious advantages of simplicity in construction and operation, possesses a special advantage in that the warping of parts resulting from the unequal expansion of different portions of the oven structure and tending to set the different doors when in their closed positions out of plumb in varying degrees, do not interfere with the operation of the apparatus since such variations may be compensated for by a corre-

sponding change in the angular adjustment of the lever E about the axis of its hinged connection B' to the member A. When, as will be the ordinary practice, the axis of the shaft B' is slightly above the bottom edge of the door, the turning movement of the door from the dotted line to the full line position of Fig. 3 would tend to throw the lower end of the door inward a slight distance if the door engaging part M were then rigidly connected to the beam A, but the yielding connection actually employed makes this tendency of no importance. To prevent any possibility of the bar A being retracted while the hook lever G engages the door and before the lever E is tilted away from the position shown in Fig. 1, the operation of the motor W may be made dependent upon the position of the lever E in such fashion that the latter cannot be operated except when the lever E is tilted into or near the position shown in Fig. 3. This may be accomplished by the use of such known means as are commonly employed for making the operation of one part dependent on the position of another part.

It will be understood that the mechanism for turning the hook lever G about its fulcrum need not, and in practice should not, be of a character to permit the door to be lifted off the door sill in this manner. All that is required of this mechanism is to bring the hook lever G snugly against the plate O² and to lift the locking bar O⁴. If the door were lifted by the adjustment of the hook lever G any appreciable distance, the door might not clear the top Q² of the door frame when the lever E was subsequently turned to tilt the door. The door handling mechanism disclosed herein embodies certain broadly novel features not claimed herein but which are disclosed and claimed in my co-pending application. Serial No. 375,279.

While in accordance with provisions of the statutes, I have illustrated and described the best form of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the claims appended hereto, and that certain features of my invention may be used to advantage without the corresponding use of other features.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. The combination with a coke oven having horizontal coking chambers and doors for the latter, of a carriage horizontally movable transversely of the oven chambers, a part mounted on said carriage and means for adjusting it relatively of the carriage longitudinally of the oven chambers, a mem-

ber mounted on said part and adjustable with respect thereto longitudinally of the oven chambers away from the latter, resilient means opposing such adjustment, a lever pivoted to said member to turn with respect thereto about a horizontal axis transverse to the oven chambers and adjacent their bottom level, means for turning said lever about said axis, and door engaging means carried by said lever.

2. The combination with a coke oven having horizontal coking chambers and doors for the latter, of a carriage horizontally movable transversely of the oven chambers, a part mounted on said carriage and means for adjusting it relatively of the carriage longitudinally of the oven chambers, a member mounted on said part and adjustable with respect thereto longitudinally of the oven chambers away from the latter, resilient means opposing such adjustment, a lever pivoted to said member to turn with respect thereto about a horizontal axis transverse to the oven chambers and adjacent their bottom level, means for turning said lever about said axis, upper door engaging means and a lower yielding door engaging abutment carried by said lever.

3. The combination with a coke oven having horizontal coking chambers of a carriage horizontally movable transversely of the oven chambers, a part mounted on said carriage and means for adjusting it relatively of the carriage longitudinally of the oven chambers, a member, links connecting it to said part, a lever pivoted to said member to turn with respect thereto about a horizontal axis transverse to the oven chambers and adjacent the bottom level of the chambers, means for turning said lever about said axis, door engaging means carried by said lever, said links being pivotally connected to said part and member by shafts parallel to said axis, and being of such unequal length that when said member is adjusted relatively to said part toward and away from the oven chambers, the pivotal connection between said lever and member moves in a substantially horizontal plane, and resilient means opposing movement away from said chambers of said member relative to said part.

4. The combination with a coke oven having horizontal coking chambers of a carriage horizontally movable transversely of the oven chambers, a part mounted on said carriage and means for adjusting it relatively of the carriage longitudinally of the oven chambers, a member, links connect-

ing it to said part, door engaging means mounted on said member said links being pivotally connected to said part and member by shafts transverse to said chambers and being of such unequal length that when said member is adjusted relatively to said part toward and away from the oven chambers, the door engaging means moves in substantially horizontal lines and resilient means opposing movement away from said chambers of said member relative to said part.

5. The combination with a structure having a chamber and a vertical door for the chamber at one side of the structure, of a door operating mechanism comprising a member horizontally movable toward and away from said side of the structure, a lever pivoted to said member to turn with respect thereto about a horizontal axis parallel to said side of the structure and adjacent the bottom level of said chamber, door engaging means carried by said lever, and means mounted on said member for turning said lever about said axis.

6. The combination with a structure having a chamber and a vertical door for the chamber at one side of the structure, of a door operating mechanism comprising a member horizontally movable toward and away from said side of the structure, a lever pivoted to said member to turn with respect thereto about a horizontal axis parallel to said side of the structure and adjacent the bottom level of said chamber, door engaging means carried by said lever, and means comprising a motor mounted on said member and operating connections between said motor and said lever for turning the latter about said axis.

7. The combination with a structure having a chamber and a vertical door for the chamber at one side of the structure, of a door operating mechanism comprising a member horizontally movable toward and away from said side of the structure, a lever pivoted to said member to turn with respect thereto about a horizontal axis parallel to said side of the structure and adjacent the bottom level of said chamber, door engaging means carried by said lever and means comprising a crankshaft journaled on said member and a link connection between said crankshaft and lever for turning the latter about said axis.

Signed at New York city in the county of New York and State of New York this eighteenth day of October A. D. 1918.

JOHN E. HUBBELL,