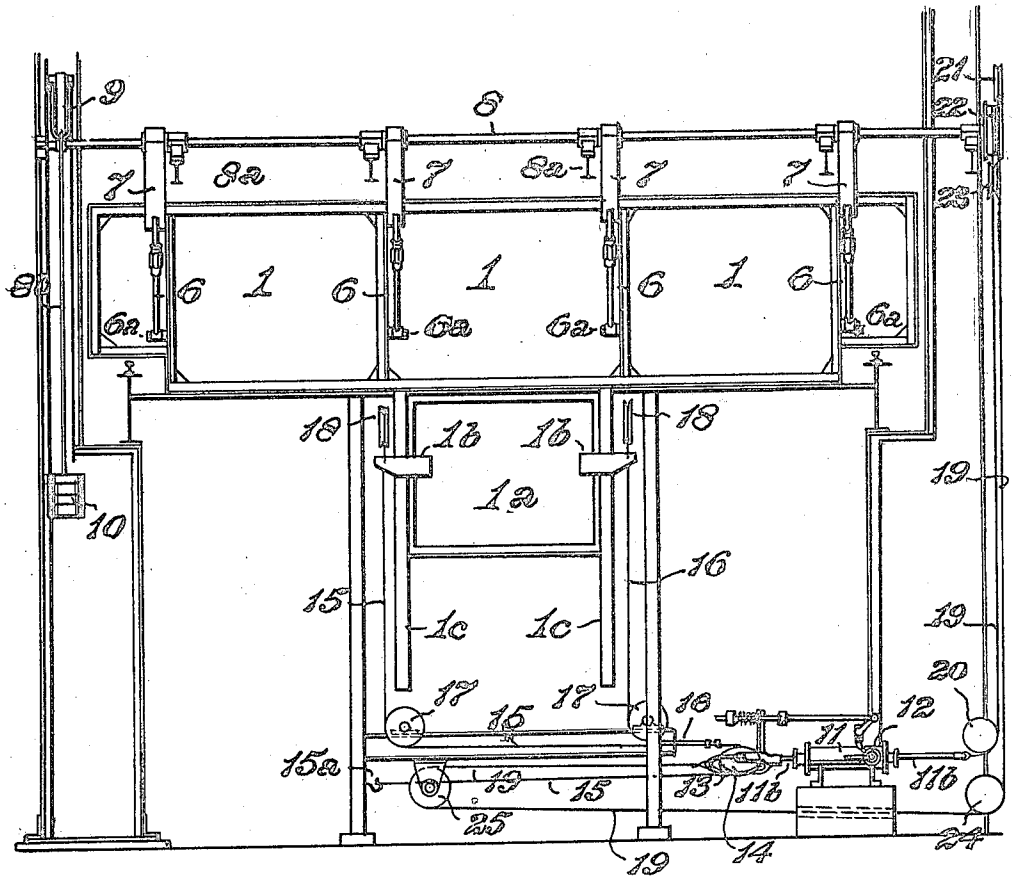
June 5, 1923. 1,457,907

F. W. HEISLER

CRANE DOOR OPERATING MECHANISM

Filed Oct. 8, 1919 4 Sheets-Sheet 1

FIG. 1.



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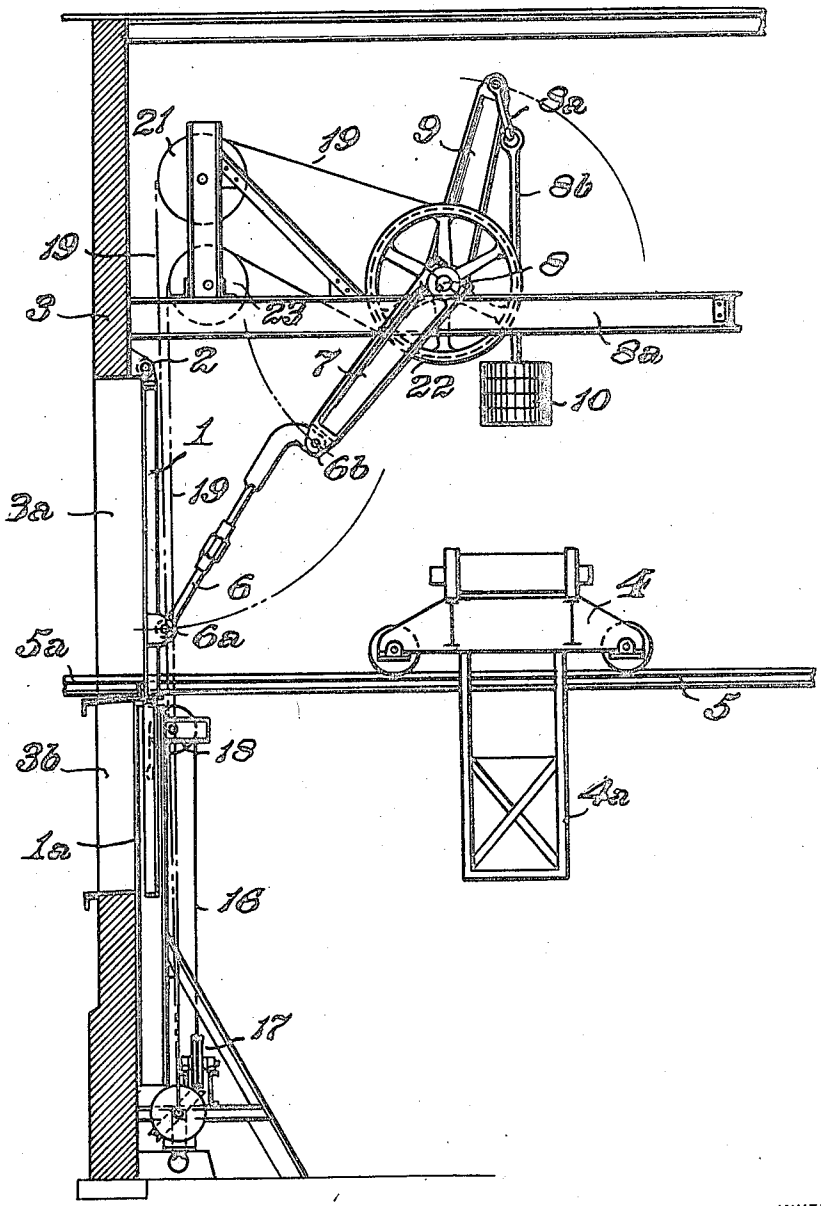
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CRANE DOOR OPERATING MECHANISM

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-FIG. 2.-



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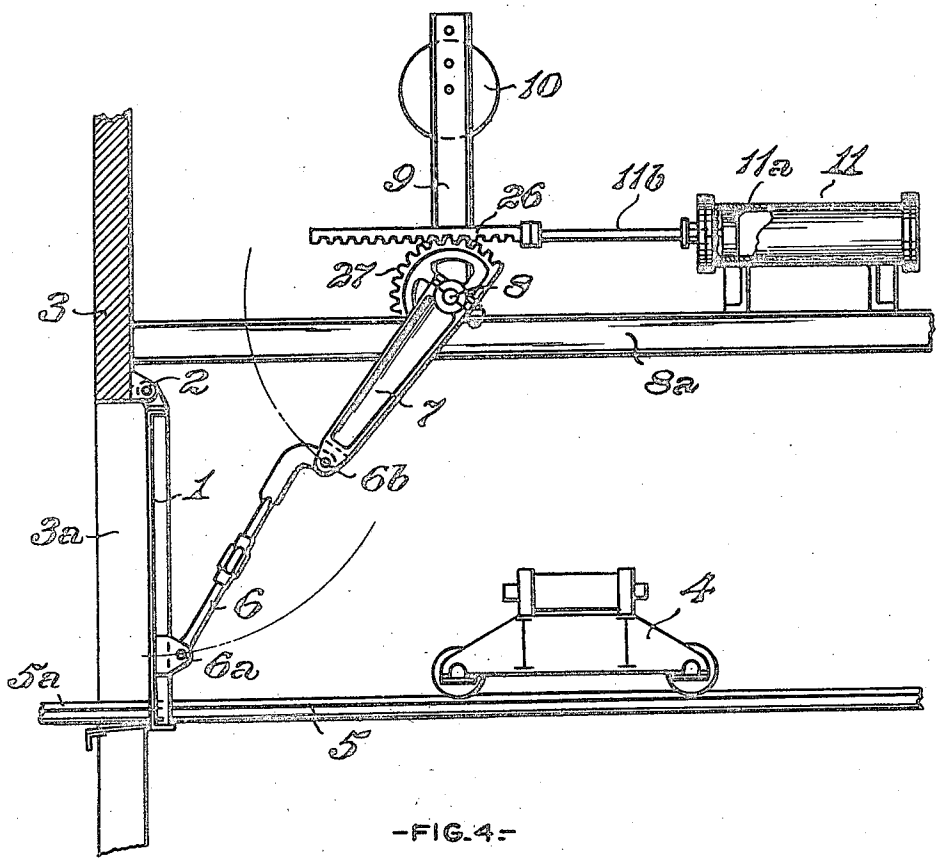
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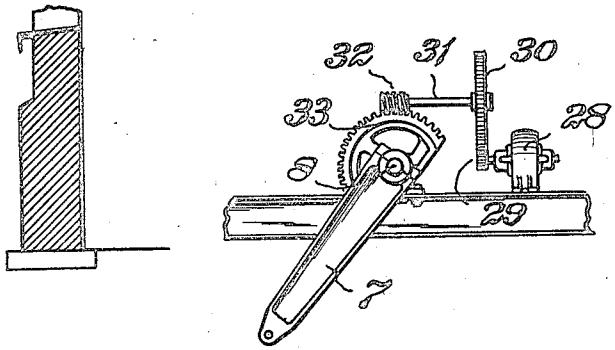
CRANE DOOR OPERATING MECHANISM

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-FIG. 3.-



-FIG. 4.-



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CRANE DOOR OPERATING MECHANISM

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FIG. 5.

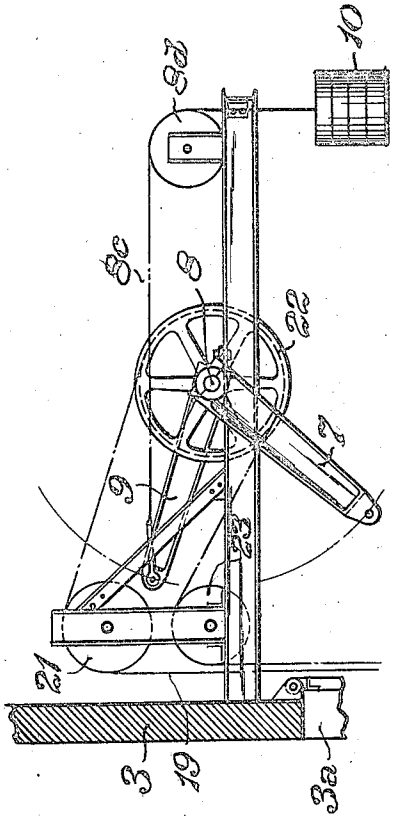
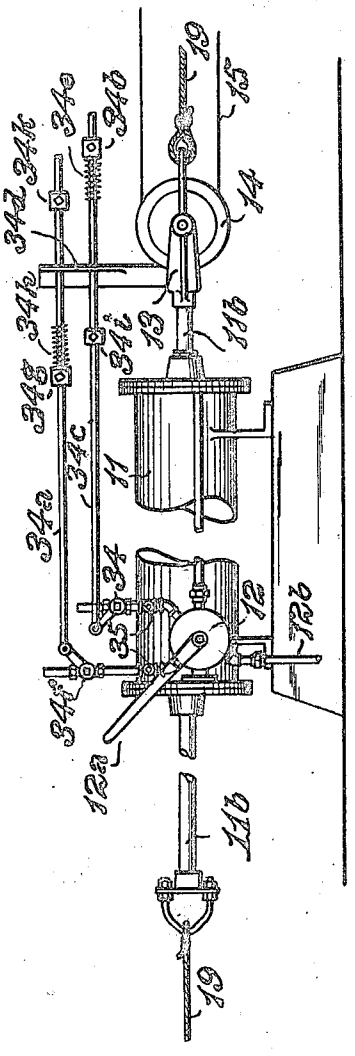


FIG. 6.



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Patented June 5, 1923. 1,457,907

UNITED STATES PATENT OFFICE.

FREDERICK WM. HEISLER, OF SCHENECTADY, NEW YORK.

CRANE-DOOR-OPERATING MECHANISM.

Application filed October 8, 1919. Serial No. 329,393.

To all whom it may concern:

Be it known that I, FREDERICK W. HEISLER, of Schenectady, in the county of Schenectady and State of New York, have invented a certain new and useful Improvement in Crane-Door-Operating Mechanism, of which improvement the following is a specification.

My invention relates to means for operating the doors controlling the openings in a building through which travelling cranes, operating normally on runways located within the building, are traversed, when required, between said runways and extended runways on the exterior of the building. The object of my invention is to provide a simple, effective, and readily applicable mechanism, whereby doors of the character above specified may, with their operating mechanism, be constructed with a reduction of weight and cost; be held securely locked, in either open or closed position; be effectively braced to resist high wind pressure; and be prevented from distortion and cramping, so as to be readily opened or closed during a storm, or under comparatively high wind pressure.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a view, in elevation, of a crane door, in connection with which my invention is applied, as seen from the interior of the building in which it is installed; Fig. 2, a vertical transverse section through the wall of the building in which the door operates, and a side view, in elevation, of the operating mechanism; Fig. 3, a similar view, illustrating a structural modification; Fig. 4, a view illustrating the application of an electric driving motor; Fig. 5, a view, similar to Fig. 2, but illustrating another structural modification; and, Fig. 6, a view, in elevation, of an operating cylinder and its connections.

Referring descriptively to the specific embodiment of my invention which is herein exemplified, it is illustrated as applied in connection with a crane door, 1, which is hinged, at its top, by pins or pivots, 2, to one of the walls, 3, of a building, so as to swing in a vertical plane, and controls an opening or doorway, 3^a, in said wall through which a travelling crane, 4, which, in operation, normally traverses on a runway, 5, in the building, may, as from time to time desired, be moved from said runway, to an extended runway, 5^a, on the exterior of the building, and returned, when required, to the interior runway, 5. An auxiliary wicket door, 1^a, controls a doorway, 3^b, in the wall, located below the main doorway, 3^a, and of sufficient size to permit the passage of the operator's cage, 4^a.

Door lifting links, 6, are coupled, at their lower ends, by pins, 6^a, to the crane door, 1, adjacent to its bottom, and the upper ends of said links are coupled, by pins, 6^b, to door lifting arms, 7, fixed upon an operating shaft, 8, journalled in bearings on girders, 8^a, above the doorway, 3^a. The lifting arms are, as shown in Figs. 1 and 3, set on the operating shaft at such an angle to a horizontal plane, that the axes of the lifting link pivots, 6^a, and 6^b, stand in line with the axis of the operating shaft, when the door is closed, thereby locking it in position, which, in the case of large runway doors, when subjected to high wind pressure, is often of much importance. A weight arm, 9, is fixed upon, and projects upwardly from, the operating shaft, 8, and a counterbalance weight, 10, of about the same weight as the combined weights of crane door and wicket door, is suspended from the weight arm, by links, 8^a, 8^b. As shown in Fig. 2, the weight arm, 9, is fixed on the operating shaft in such relation to the lifting arms, as to stand in nearly vertical position when the doors are closed, in which period the moment of the counterbalance weight is at the minimum, and, as the door is opened, it gradually increases until it reaches the maximum when the doors are fully opened for the passage of the travelling crane and operator's cab.

The modification of the normal position of the weight arm and its connection to the counterbalance weight which is illustrated in Fig. 5, is similarly operative to the disposition of these members which is above described, the structural difference being that, in this case, the weight arm, 9, stands in nearly a horizontal position when the doors are closed, and the counterbalance weight, 10, is connected to it by a cable, 8^c, passing around a guide sheave, 8^d, instead of by the links, 8^a, 8^b. The counterweight may be located in any position required to meet conditions of limitation of space near the doors, and the weight arm may be located in any desired plane in the length of the operating shaft. The angular position

of the counterweight arm, relatively to the lifting arm, is determined by the counterweight effect which it is desired to produce when the doors are in position requiring the maximum of counterbalance, and to produce the minimum counterbalance effect when the doors are closed.

Movement is imparted to the operating shaft, 8, to open and close the doors, by a fluid pressure motor cylinder, 11, in which is fitted a piston, 11^a, fixed on a piston rod, 11^b, motive fluid being admitted to, and exhausted from, the motor cylinder by a control valve, 12, of any preferred known form. As shown in Figs. 1 and 6, the piston rod extends through both heads of the motor cylinder, and carries, on one of its ends, a block or bearing 13, for a sheave or pulley, 14, around which passes a cable, 15, one end of which is secured to a fixed support, 15^a. After leaving the sheave, 14, the cable, 15, is connected to another cable 16, and the cables, 15 and 16, are reeved on sheaves, 17, 17, and, extending upwardly, pass around sheaves, 18, 18, and are secured to suspension arms, 1^b, on the auxiliary wicket door, 1^a. The traverse of the door, 1^a, will be twice that of the piston of the motor cylinder, by reason of the provision of the sheave, 14, and its relative traverse may, if desired, be further increased by the application of another sheave. The advantage of this feature of my improvement is that of providing any desired clearway for the crane cage, without unduly increasing the stroke of the motor cylinder piston.

The crane door actuating cable, 19, which is connected to the opposite end of the motor cylinder piston, reeves over sheaves, 20 and 21, and several times around the winding drum, 22, on the operating shaft, 8, to which drum it is clamped to prevent slipping. From the winding drum, 22, it passes over guides sheaves, 23, 24, and 25, and is connected to the block, 13, carried on the end of the piston rod further from that to which it is first connected. The movement of the piston of the motor cylinder is transmitted to the operating shaft by the cable, 19, in much the same manner as in the operation of a fiddle bow drill, except that the operating shaft swings through an arc of approximately 180 degrees to open both doors wide. By reversing the movement of the motor cylinder piston, the movements of the operating shaft and doors are coincidently reversed.

In the modification shown in Fig. 3, there is substituted for the intermediate cables and sheaves above described, a rack, 26, which is secured on the piston rod of the motor cylinder and engages a segment gear, 27, on the operating shaft, 8. As shown in Fig. 4, the operating shaft is actuated by an electric motor, 28, which, through gears, 29, 30, rotates a worm shaft, 31, carrying a worm, 32, which engages a worm wheel segment, 33, fixed on the operating shaft.

As indicated in Fig. 6, the control valve, 12, of the operating cylinder, 11, is manually operable by a hand lever, 12^a, and may be of any suitable known type adapted to admit motive fluid to one end of the motor cylinder, and coincidently exhaust it from the opposite end. The piston, 11^a, of the motor cylinder, is cushioned, a predetermined time before the end of its stroke in either direction, by exhaust closure valves, 34 and 34^f, controlling the exhaust from opposite ends of the cylinder, respectively, said valves being slidingly coupled by rods, 34^a and 34^e, respectively, to a guide bracket, 34^d, formed on the pulley block, 13. The rod, 34^a, carries a tappet, 34^k, and a spring, 34^h, and the rod, 34^e, carries a tappet, 34^l, and a spring, 34^e.

When the operating lever, 12^a, of the control valve, 12, is moved towards the right, motive fluid from the supply pipe, 12^b, is admitted into the left hand end of the cylinder, 11, by the control valve, causing the piston, 11^a, rod, 11^b, pulley, 14, and guide bracket, 34^d, to move to the right. When near the completion of the stroke to the right, the guide bracket, 34^d, compresses the spring, 34^e, and closes the exhaust from the right hand end of the cylinder, by actuating the closure valve, 34, for the purpose of trapping fluid and thereby cushioning the piston at the close of the stroke. Small bleeder exhaust valves, 35, are interposed between the corresponding exhaust valves, 34 and 34^f, and the control valve, for the purpose of slowly exhausting the trapped cushioning fluid, thereby permitting the piston to complete its stroke. When moving toward the right at the completion of a stroke, the guide bracket engages the tappet, 34^k, which actuates the valve, 34^f, to permit a return, or movement toward the left, of the piston, immediately after moving the lever, 12^a, in that direction, to the position shown in Fig. 6, the other half of the cycle of movements being similarly completed.

I claim as my invention and desire to secure by Letters Patent:

1. The combination of a building having a crane doorway formed in the upper portion of its vertical walls, craneways adapted to support a crane passing through the doorway, a crane door hinged at its upper section to the vertical wall and adapted to close said doorway, a horizontal operating shaft disposed parallel to said vertical wall and supported by the building, means for rotating the shaft about its axis, pivoted links coupling the shaft to the lower section of the crane door and adapted to raise and lower said door and lock it in its upper open

position to permit safe passage of the crane and to form an effective lock and wind bracing for the lower section of the crane door when in its closed position, a lower doorway adapted to permit the passage of a crane cage, an auxiliary door controlling the lower doorway, and means coupling said doors in a manner adapted to open or close them simultaneously.

2. The combination of a building having a crane doorway formed in the upper section of its vertical walls, craneways adapted to support a crane passing through the doorway, a lower doorway adapted to permit passage of a crane cage, a crane door adapted to control the crane doorway by swinging to, or from, a closed vertical position from, or to, its horizontal open position, where it is disposed at a sufficient distance above the craneway to permit free passage of the crane, means for coupling an auxiliary door to the crane door in a manner adapted to control said lower doorway, and means for transmitting power to actuate said doors.

3. The combination of a building wall having an upper doorway adapted to admit a traveling crane and a lower doorway adapted to admit a crane operating cage, a main door controlling the upper doorway, an auxiliary or wicket door controlling the lower doorway, crane runways extending oppositely from the upper doorway for the traverse of a traveling crane, an operating shaft, means for rotating the shaft about its axis, means coupling the operating shaft and main door, and means coupling the movement imparting means to the auxiliary or wicket door.

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