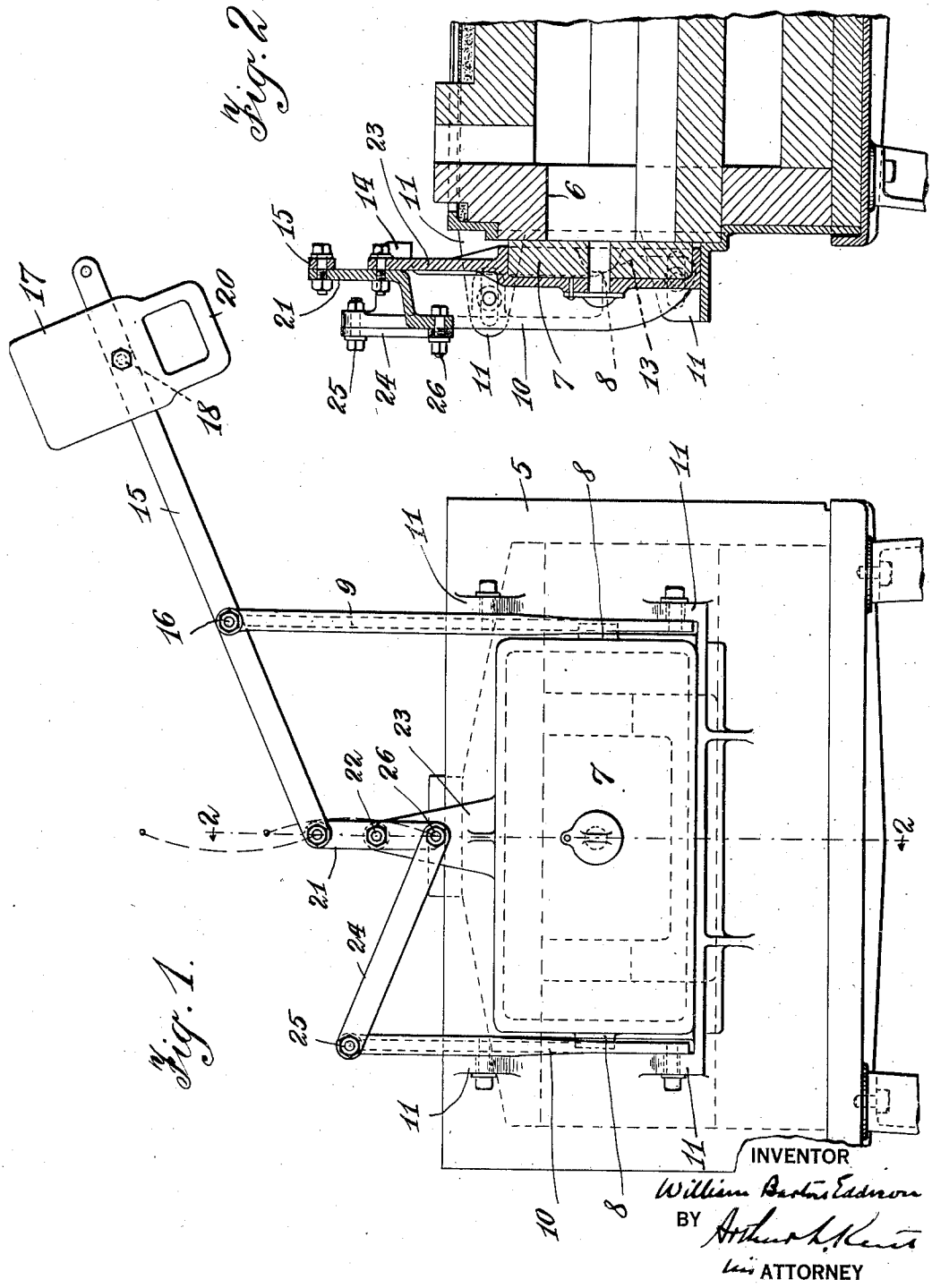
May 26, 1925. 1,539,170

W. B. EDDISON

DOOR OPERATING MECHANISM

Filed Sept. 24, 1919 2 Sheets-Sheet 1



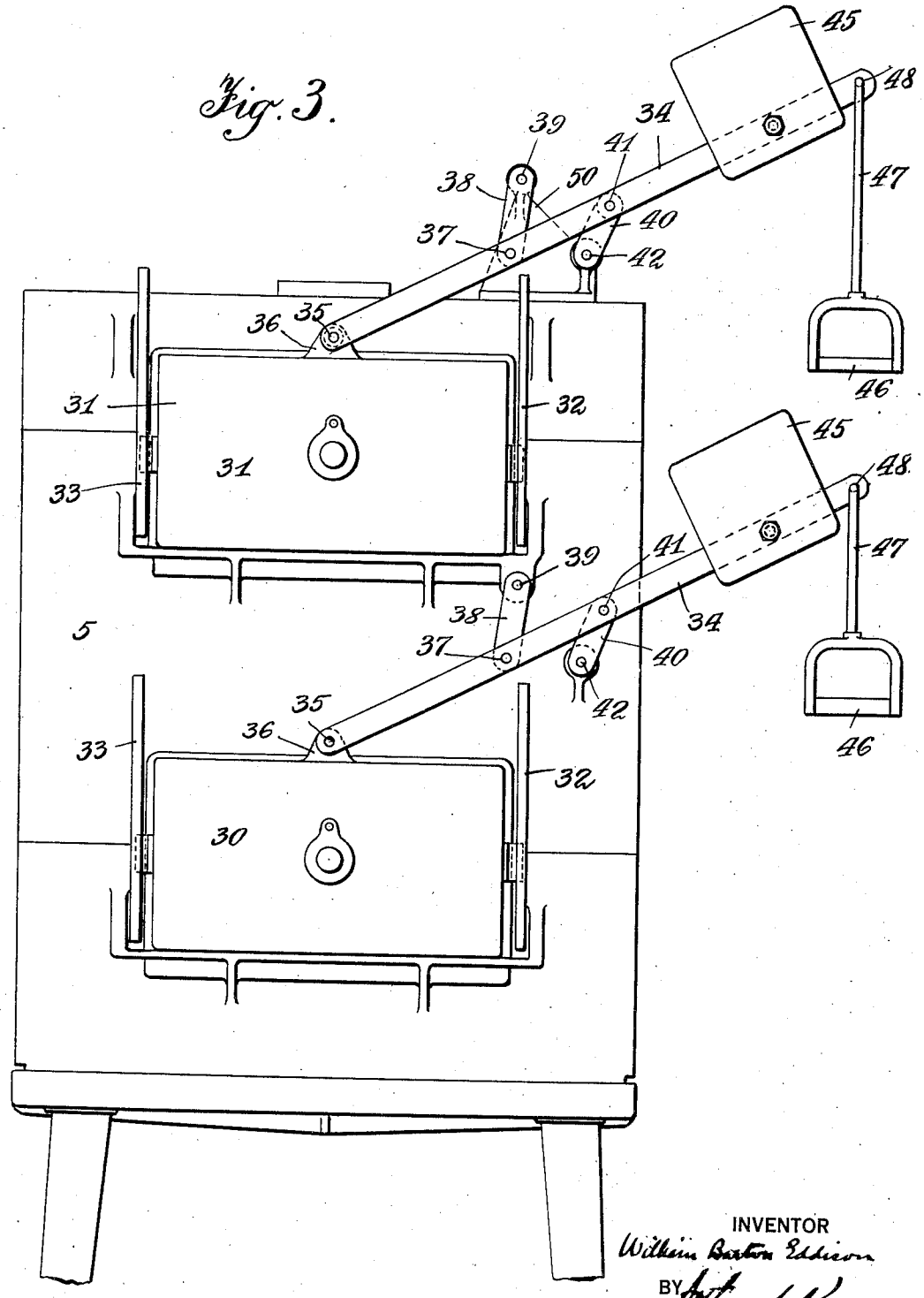
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Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM BARTON EDDISON, OF IRVINGTON, NEW YORK, ASSIGNOR TO THE SURFACE COMBUSTION CO., INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

DOOR-OPERATING MECHANISM.

Application filed September 24, 1919. Serial No. 325,925.

To all whom it may concern:

Be it known that I, WILLIAM BARTON EDDISON, a citizen of the United States, residing at Irvington, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Door-Operating Mechanism, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

My invention relates to operating mechanism, especially adapted for furnace doors, but also adaptable for operating other doors or similar elements where the requirements are similar.

An important object of the invention is to apply the operating force to the door in a substantially straight line, so that there is no tendency to cause the door to bind in its guides when guides are provided, and to accomplish this by simple and positive means, dispensing with chain or other connections which are non-positive, complicated, or objectionable for other reasons.

Certain doors of a class well exemplified by furnace doors are arranged to have a straight-line sliding movement to close or disclose the door opening. These doors are usually directed by guides at their two sides, and the door engages with these guides with some freedom to permit free movement and at the same time avoid the necessity for very accurate fitting of the parts. In some cases operating levers have been fulcrumed at a stationary point carried by the furnace casing, and these levers have been connected to the doors by chains so as to apply an opening pull to the door in a straight line parallel to the direction of the guides. Such chain mechanisms, however, are not positive in both directions of movement, and are objectionable for other reasons.

In accordance with preferred embodiments of the present invention, the operating lever has a fulcrum connection with the furnace casing and is connected to the door, and means are provided, usually in the form of a linkage, to cause the point of connection to the door to move, throughout the necessary range of door movement, in a straight line parallel to the guides. This mechanism enables the operating force to be applied to the door positively in both directions, so that any slight impediment to the closing movement of the door may be easily overcome.

Two exemplifying embodiments of the invention are shown in the accompanying drawings and described hereinafter. After considering these embodiments, it will be evident to persons skilled in the art that the invention may be embodied in other forms, and I do not limit myself to details except as claimed.

Fig. 1 is a front elevation of a furnace with its door, and operating mechanism embodying the invention in one form.

Fig. 2 is a vertical section at 2—2, Fig. 1.

Fig. 3 is a front elevation of a furnace provided with two doors and showing a modified embodiment of the operating mechanism.

Referring first to Figs. 1 and 2, the furnace casing or body 5 has a door opening 6. Slidably arranged in front of the opening is a door 7. At each end the door has a lug 8, and these lugs cooperate with vertical guides 9, 10, which direct the door in a straight-line, vertical movement in opening and closing.

The guides may be, as shown, in the form of flat plates bolted to lugs 11 on the casing. The rear edges 12 of these plates lie in front of the lugs 8, and at a point which the lugs approach as the door is nearly closed, these rear edges are provided with rearwardly inclined cam faces 13 which, when the door is fully closed, hold the back of the door firmly against the portion of the casing surrounding the door opening. The guides usually have near their upper ends shoulders 14 to limit upward movement of the door by engagement with lugs 8.

An operating lever 15 is fulcrumed at 16 at a fixed point and, conveniently, this may be located on an upward extension of guide 9. A counterweight 17 is placed near the outward end of the lever, and is desirably adjustable on the lever, as by being formed to slide thereon and being secured by a set screw 18. A handle 20 is preferably provided, and this may conveniently, as shown, be made a part of the counterweight 17. The inward end of the lever is pivotally connected to the upper end of a connecting or equalizing link 21 and the link is pivotally connected at 22 to a part of the door, in this case to a

bracket 23 extending upwardly from the door. Another link 24, which may be identified as a "controlling" or "directing" link, is pivotally connected at 25 to a fixed part, and conveniently, this may be an upward extension of the guide 10. The inward end of link 24 is pivotally connected at 26 to the lower end of equalizing link 21.

The door is shown closed in Figs. 1 and 2. The arrangement of the lever and linkage is such that when the handle is pulled to open the door, the arc of movement of the inward end of lever 15 and the arc of movement of the inward end of link 24 cause the upper and lower ends of the equalizing link to swing in opposite directions at the same rate, so that the point 22 of connection of the link to the door travels in a straight line in the direction of door movement, or parallel to the door guides. Dotted lines show the arcs of movement of the lever and link 24. Link 24 may be described as a "controlling" or "directing" link because in all positions of the door it positively locates the connection point 22 and prevents any lateral force being applied to the door by the operating mechanism. The door is thus moved by the operating linkage with great freedom and with equal positiveness in both directions.

The length of the link 24 between its pivots 25 and 26 should equal the length of the inner end of the lever 15 between its fulcrum pivot 16 and the axis of its pivotal connection to the equalizing link 21; and the pivots 16 and 25 should be spaced in the direction of door movement a distance equal to the length of the equalizing link between its end pivots, that is, for a vertically movable door as shown, one of these pivots should be higher than the other by a distance equal to the length of the equalizing link between its end pivots.

Fig. 3 shows a furnace structure having two doors 30, 31, and modified operating mechanism. Door guides 32, 33, similar to the guides 9 and 10 of Figs. 1 and 2 are shown but they do not carry any lever or link connections. An operating lever 34 is provided for each door, and each operating lever is pivotally connected at its inward end at 35 to a lug 36 on its door, and is fulcrumed at 37 to the end of a swinging link or arm 38, which is pivotally connected at 39 to a fixed point on the furnace casing. A controlling or directing link 40 connected to the lever 34 at point 41 and at 42 to a fixed point on the casing serves to cause such endwise movement of the lever as it is swung on its fulcrum to raise or lower the door that the inner end of the lever and the pivotal connection 35 are caused to move in a straight line in the direction of door movement, or parallel to the door guides, that is, vertically for operating the vertical sliding door in the construction shown. The purpose of the swinging fulcrum link is merely to permit of the necessary endwise movement of the lever under control of the link 40 for causing its inner end to have the desired straight-line movement. Near the outer end of the lever a counterweight 45 is provided, and this may be made adjustable as in Fig. 1 and 2. The operating handle 46 in this embodiment, however, is separate from the counterweight and is carried at the lower end of a link 47, pivotally connected at 48 to the outer end of the lever.

With this construction the operating lever is definitely located in all positions within the range of its intended movement without regard to its connection to the door, so that, as with the construction of Figs. 1 and 2, any lateral strain on the door is avoided. If the lever is disconnected from the door, its inner end will move in the same vertical line intersecting the point of connection with the door, just as when the lever is connected as shown in the drawing.

In the case of the upper door 31, the pivot points 39 and 42 for links 38 and 41, respectively, may be located on a suitably formed bracket 50 located on top of the furnace casing.

What is claimed is:

1. In a door operating mechanism, the combination of a door, vertical parallel guides for said door, said guides having their upper ends at different vertical levels, a pivot carried by said door, and levers connecting said pivots to the upper ends of said guides and forming a straight line motion whereby a straight line lifting movement may be applied to said door by applying force to one of said levers.

2. In a door operating mechanism, the combination of a door, vertical parallel guides for said door, said guides having their upper ends at different elevations, a pivot fixed to the upper portion of said door, and levers connecting said pivot to the upper ends of said guides and forming a straight line motion whereby a straight line vertical lifting force may be applied to said door by applying force to one of said levers, one of said levers being extended outside of said guides and having an adjustable counterweight and handle thereon.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM BARTON EDDISON.

Witnesses:
ARTHUR W. PETERS,
W. H. GRENZIG.