

R. R. HILLMAN.
MECHANISM FOR OPERATING FURNACE DOORS.
APPLICATION FILED MAR. 7, 1911.

1,032,004.

Patented July 9, 1912.

2 SHEETS-SHEET 1.

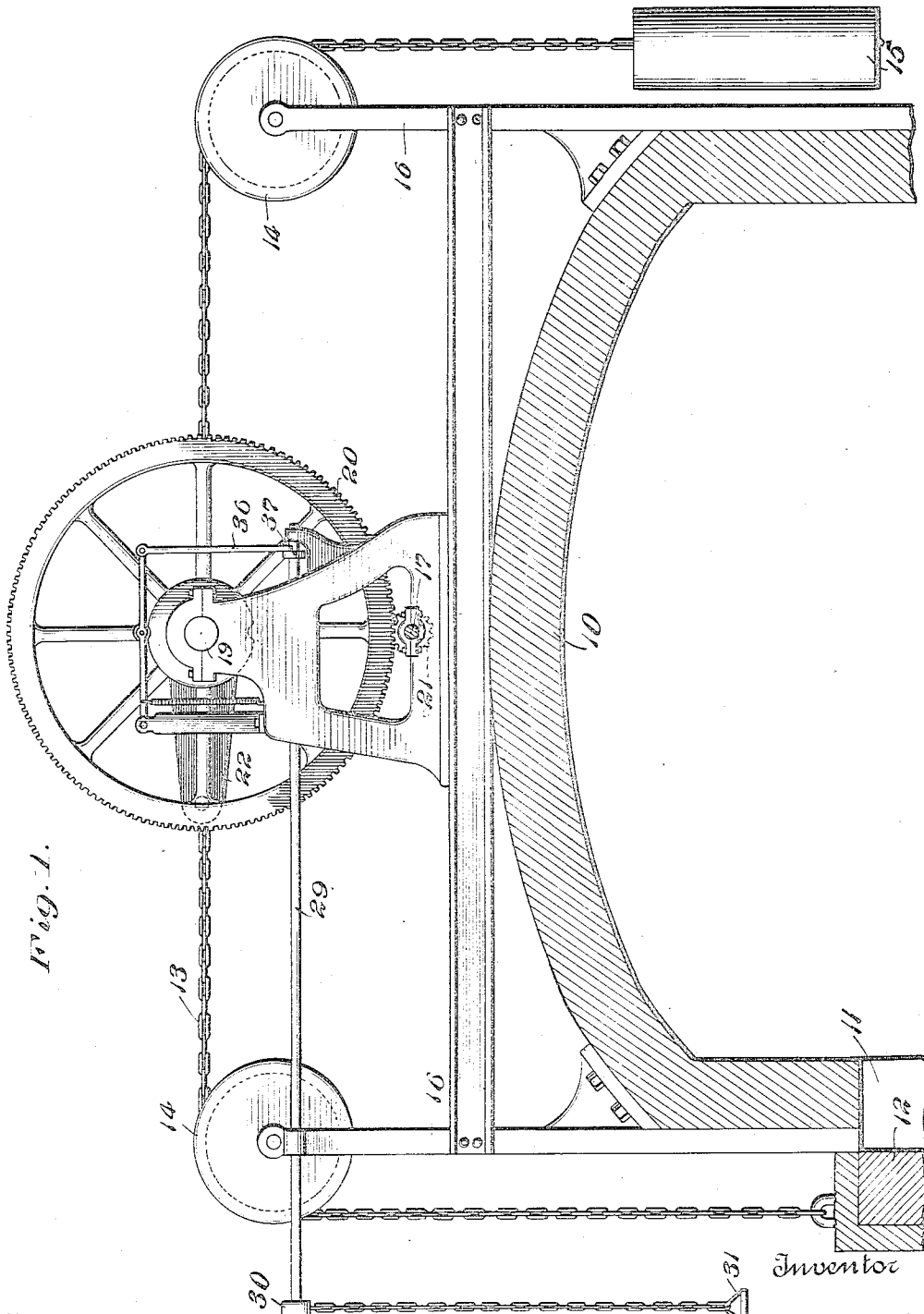


Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 3.

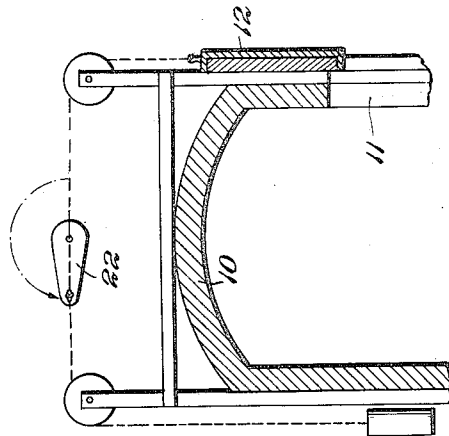
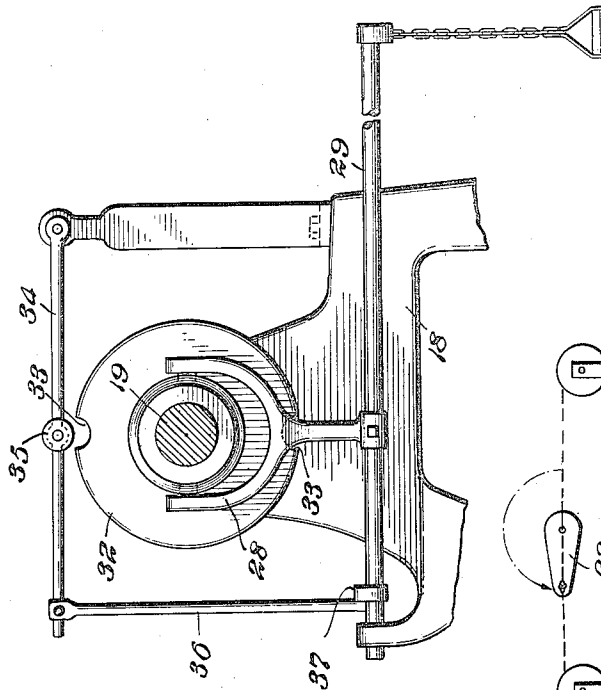


Fig. 2.

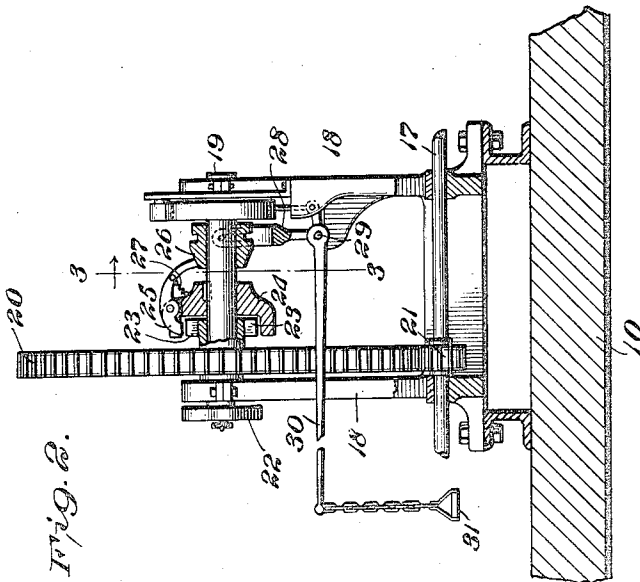


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UNITED STATES PATENT OFFICE.

RALF R. HILLMAN, OF BUFFALO, NEW YORK.

MECHANISM FOR OPERATING FURNACE-DOORS.

1,032,004.

Specification of Letters Patent.

Patented July 9, 1912.

Application filed March 7, 1911. Serial No. 612,776.

To all whom it may concern:

Be it known that I, RALF R. HILLMAN, a citizen of the United States, and resident of Buffalo, Erie county, State of New York, have invented certain new and useful Improvements in Mechanism for Operating Furnace-Doors, of which the following is a specification.

The object of the present invention is to provide power operated means for opening and closing furnace doors, and more particularly to provide a mechanism of this character which will operate promptly and with a minimum of power and which can be conveniently started and stopped by a person standing close to the door to be operated.

The invention is particularly applicable to plants in which a number of furnaces are located side by side or in which a single furnace is provided with a number of doors.

The invention will be described in connection with the accompanying drawings, in which—

Figure 1 is a cross section of a furnace through one of the doors and door openings and with an operating apparatus located above the furnace; Fig. 2 is a left side view, partly in section, of the operating mechanism shown in Fig. 1; Fig. 3 is a section on the line 3—3, of Fig. 2, on an enlarged scale; and Fig. 4 is a diagrammatic cross section of the furnace viewed from the opposite side as compared with Fig. 1 and omitting the operating mechanism, with the exception of the crank.

It will be understood that in the several views of the drawings my invention is illustrated more or less diagrammatically and that changes in details of construction and in proportions of the parts may be made without departing from the spirit of the invention.

The furnace 10 may be of any style or type, provided with the usual door opening 11. The door 12 is adapted to slide vertically and is sustained by a chain or other flexible suspending means 13 passing around pulleys 14 and connected to a counterbalancing weight 15, which is preferably located in the rear of the furnace. The pulleys 14 are mounted on suitable standards 16 which may be supported on the furnace.

It will be understood that my invention is especially adapted for use in connection with

a furnace or furnaces provided with a series of doors which must be opened and closed individually at intervals.

Along the top of the furnace I arrange a power shaft 17, which is continuously operated by suitable means such as a small steam engine or electric motor. This shaft is mounted in suitable bearings in frames 18 which may be bolted to the furnace framework. Mounted in each frame 18 is a countershaft 19 provided with a large gear 20 which meshes with a pinion 21 on the power shaft 17. The gear is preferably made large in proportion to the pinion so that it will require but little power to turn it. The shaft 19 is preferably located on a line between the upper edges of the sheaves or pulleys 14, and on one end of the shaft is a crank 22 to the outer end of which the chain or flexible member 13 is connected. It will be evident that when the crank extends horizontally in one direction, the door will be closed as indicated in Fig. 1, and that when it extends horizontally in the opposite direction the door will be opened as indicated in Fig. 4, the change being effected by a semi-revolution of the gear 20. The gear 20 is free to revolve on the shaft 19 and is constantly rotated by the pinion 21. I provide suitable clutching means for connecting the gear 20 to the shaft 19 to rotate therewith, when desired, and automatic means for freeing the shaft from the gear after the shaft has made a half revolution. Any suitable clutch may be used for this purpose. As shown in the drawing, the hub of the gear 20 is provided with two oppositely extending teeth 23 and adjacent to these teeth is a hub or collar 24 which is fastened on the shaft, and on which is pivotally mounted a pawl 25, one end of which is adapted to engage the teeth 23, and the other end or tail of which is arranged to engage a cone 26, which is slidably mounted on the shaft 19. The pawl 25 is normally held in engagement with the cone and out of engagement with the teeth 23 by a suitable spring 27. When the cone 26 is moved toward the hub 24, the tail of the pawl is raised and its opposite end is thrown into the path of the constantly revolving teeth 23. The engagement of either of these teeth with the pawl will rotate the hub 24 and shaft 19, and the crank 22 will thus be turned, raising or low-

ering the door of the furnace as the case may be. The clutch is operated by means of a yoke 28 carrying pins which lie in an annular groove in the cone. The yoke 28 is carried by a rock shaft 29, one end of which
 5 may be mounted on the frame 18, as shown in Fig. 3, and the other end of which may be mounted in one of the standards 16, as shown in Fig. 1. The rock shaft 29 extends
 10 outward to the front of the furnace and is provided at its outer end with an arm 30 which may be operated either directly or by a suitably connected handle 31.

Fixed on the shaft 19 is a disk 32 provided with oppositely disposed notches 33, and above the disk is an arm 34 carrying a pin or roller 35 adapted to fit either of the notches 33 to lock the disk and shaft from turning. The notches are so located with
 15 respect to the part 35 and the crank 22, that the shaft will be locked when the crank is in one or other of the positions shown in Figs. 1 and 4, that is, when the furnace door is either fully closed or fully raised.
 20 The arm 34 is connected by a link 36 to an arm 37 on the rock shaft 29 for a purpose to be presently explained.

The operation of the invention is as follows. It will be understood that the counterweight 15 is of substantially the same weight as the door to be operated and that the door can therefore be raised and lowered with very little power. The shaft 17 and the large gear 20 are constantly rotated.
 25 The shaft 19 and its attached crank 22 are normally at rest in one or other of the positions shown in Figs. 1 and 4. When it is desired to either open or close the furnace door, the operator pulls down the arm 30, which simultaneously raises the arm 34, thereby unlocking the disk 32 and operating the clutch so as to lock the gear 20 to the shaft 19. The crank is then revolved through a half revolution. The operating
 30 arm 30 must be released before the crank has completed a half revolution. The pin or roller 35 resting on the periphery of the disk prevents the clutch cone from being withdrawn and holds the pawl 25 in contact with one of the teeth 23. Upon completion of a half revolution the pin or roller 25 drops into the succeeding notch 33 and again locks the shaft 19, simultaneously withdrawing the cone 26 and releasing the shaft
 35 from the rotating gear 20. It will be evident that fractional movements of the door can be effected by providing the disk 32 with additional notches 33. For instance, if two additional notches were placed half way between the notches shown, the door would automatically stop when half opened and when half closed, and might be fully opened and fully closed by two movements of the arm 30 instead of by a single movement, as
 40 65 illustrated.

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

1. In a furnace door operating device, the combination with a plurality of furnace doors; of a constantly rotating power shaft and separate means driven by said shaft for operating each door comprising a countershaft, a crank on the countershaft, a connection between the crank and the door, and means for imparting to the countershaft, at will, intermittent partial rotations, in the same direction, to alternately open and close the door.

2. In a furnace door operating device, the combination with a plurality of furnace doors; of a constantly rotating power shaft and separate means driven by said shaft for operating each door comprising a countershaft, a crank on the countershaft, a connection between the crank and the furnace door, means for imparting to the countershaft successive partial rotations in the same direction, and means for automatically stopping and locking the shaft at the termination of each partial rotation.

3. In a furnace door operating device, the combination with a plurality of vertically movable furnace doors; of a constantly rotating power shaft and separate means driven by said shaft for operating each door comprising a countershaft mounted in suitable bearings, a crank on the countershaft, a connection between the crank and the furnace door, and means for imparting to the countershaft an intermittent movement in the same direction to open and close the door.

4. In a furnace door operating device, the combination with a plurality of vertically movable furnace doors; of a constantly rotating power shaft and separate means driven by said shaft for operating each door comprising a countershaft mounted in suitable bearings, a crank on the countershaft, a connection between the crank and the furnace door, means for imparting to the countershaft an intermittent movement in the same direction to open and close the door, and a hand-operated device for controlling said intermittent movement.

5. In a furnace door operating device, the combination with a plurality of vertically movable furnace doors; of a constantly rotating power shaft and separate means driven by said shaft for operating each door comprising a counterweight connected with the door to balance the same, a countershaft mounted in suitable bearings, a crank on the countershaft, the connection between the door and counterweight being also connected to the crank, and means for rotating the crank through partial revolutions comprising, a gear mounted on said countershaft, means for clutching the shaft to the gear,

means for preventing the unclutching of the shaft and gear until the partial revolution is completed, and means for automatically unclutching the shaft and gear upon completion of the partial revolution.

6. In a furnace door operating device, the combination with a plurality of vertically movable furnace doors; of a constantly rotating power shaft and separate means driven by said shaft for operating each door comprising a countershaft mounted in suitable bearings, a crank on the countershaft,

a connection between the crank and the furnace door, means for intermittently rotating the countershaft in one direction, and means for automatically locking the countershaft against rotation upon completion of each partial rotation.

In testimony whereof I affix my signature in presence of two witnesses.

RALF R. HILLMAN.

Witnesses:

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GEO. G. DAVIDSON, Jr.