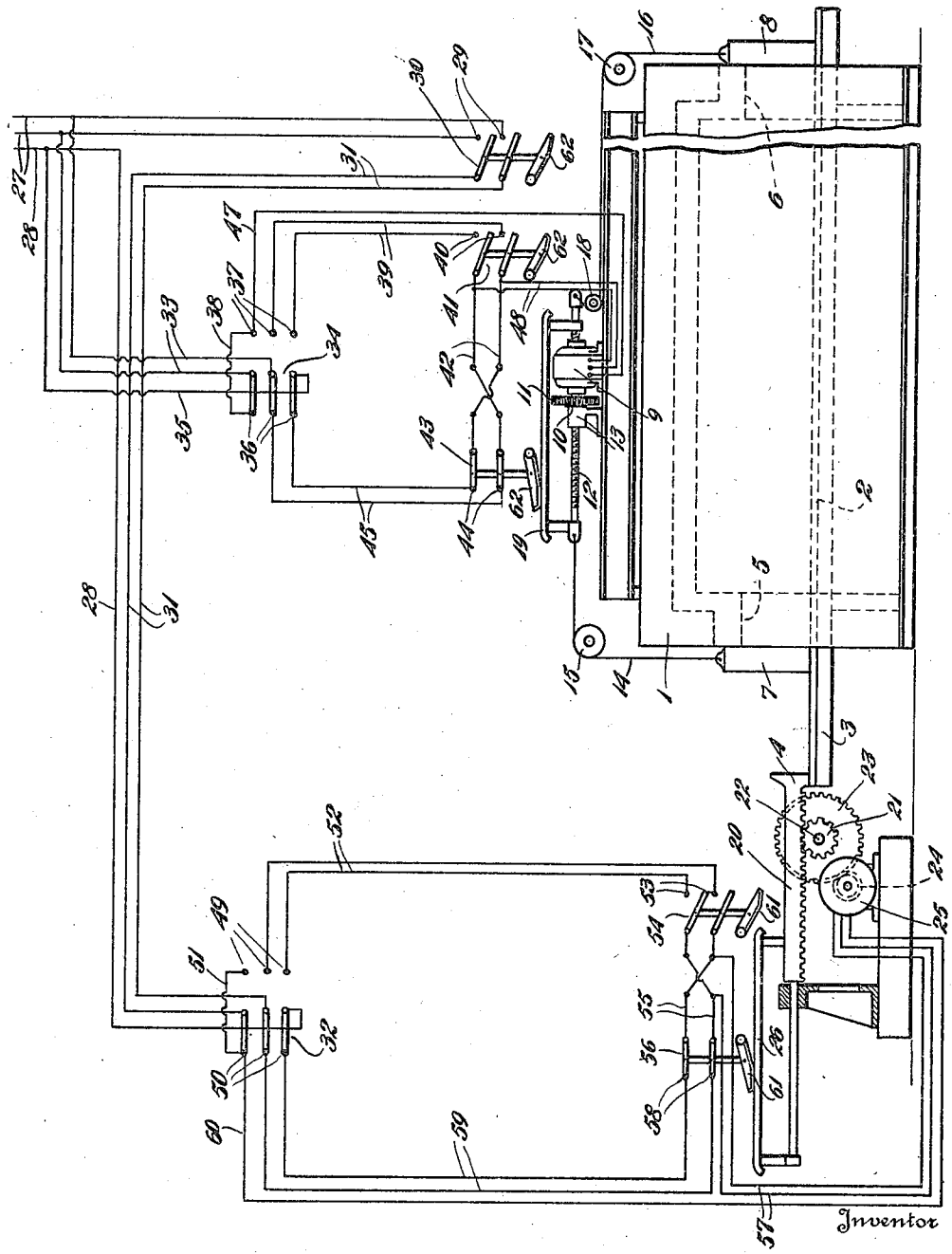
Nov. 6, 1928. 1,690,272

F. T. COPE

FURNACE DOOR AND PUSHER INTERLOCK

Filed March 5, 1925



Inventor

Frank T. Cope

By Frease and Bond

Attorneys

Patented Nov. 6, 1928. 1,690,272

UNITED STATES PATENT OFFICE.

FRANK T. COPE, OF SALEM, OHIO, ASSIGNOR TO THE ELECTRIC FURNACE COMPANY, OF SALEM, OHIO, A CORPORATION OF OHIO.

FURNACE DOOR AND PUSHER INTERLOCK.

Application filed March 5, 1925 Serial No. 13,133.

This invention relates to electric furnaces and more particularly to the type in which a charge is introduced through a door by a power operated pusher mechanism for opening the furnace doors and operating a pusher to move the material through the furnace; and the objects of the invention are to provide an interlock mechanism by means of which the pusher cannot be operated until the doors are opened, thus preventing the pusher mechanism or the furnace from being damaged in the event that the operator negligently attempts to place the pusher mechanism in operation before the doors have been opened.

An embodiment of the invention is illustrated in the accompanying drawing, in which, the figure is a diagrammatic view of a continuous furnace provided with door opening mechanism and pusher operating mechanism, showing the improved interlock applied thereto.

Similar numerals of reference indicate corresponding parts throughout the drawing.

A continuous furnace is indicated at 1, provided throughout its length with a hearth 2, upon which the material is adapted to be moved through the furnace, the hearth extending beyond the charging end of the furnace as shown at 3, in order that the material to be treated may be charged upon said extension of the hearth, and then pushed into the furnace by the pusher 4 as will be hereinafter described.

The charging and discharge door openings 5 and 6 are arranged to be normally closed by the doors 7 and 8 respectively. For the purpose of raising and lowering the doors 7 and 8 in unison, a motor 9 is mounted in a suitable location, preferably above the furnace as shown. The pinion 10 upon the motor shaft meshes with a gear 11, which is provided with a threaded bore to receive the screw 12 slidably located in a bearing indicated at 13.

A cable 14 is connected to the top of the door 7 and extends over a pulley 15, the opposite end of the cable being connected to the adjacent end of the screw 12.

A similar cable 16 is connected to the top of the door 8 and extends over the pulleys 17 and 18, and is attached to the other end of the screw 12. When the motor 9 is operated to raise the doors, the screw 12 will travel toward the right pulling the cables 14 and 16 over the pulleys and raising both of the doors in unison.

A bar 19 is carried by the screw 12, and is arranged to automatically operate a series of switches which control the limit of travel of the doors and the interlock between the doors and pusher.

The pusher 4 is provided with a rack bar 20, meshing with a pinion 21 upon the shaft 22 which carries a gear 23 meshing with a pinion 24 upon the shaft of the pusher operating motor 25.

A bar 26, similar to the bar 19, is carried by the rack bar 20 and arranged to operate switches which control the limit of travel of the pusher.

Each of the motors 9 and 25 is illustrated as a three-phase reversing motor. The current supply is brought in from the wires 27 and 28, the two wires 27 leading to the contact points 29 of the interlock switch 30, the blades of which are connected by wires 31 with two of the blades of the pusher operating switch 32, while the wire 28 is connected to the third blade of said switch.

The wires 27 are also connected, as by wires 33, with two of the blades of the double throw reversing switch 34 which controls the operation of the doors and which is of the same construction as the switch 32, the wire 28 being connected as by a wire 35 with a third blade of the switch 34.

Two sets of contacts 36 and 37 are provided for alternate engagement with the blades of the switch. One of the contacts 36 is connected by a wire 38 with the corresponding contact 37, the other two contacts 37 are connected by wires 39 with the contacts 40 of the limit switch 41, the blades of which are connected by the wires 42, in reverse position, with the blades of the limit switch 43. The contacts 44 of the limit switch 43 are connected by the wires 45 with the two lower contacts 36 of the double throw, reversing switch 34. A wire 47 connects the upper contacts 36 and 37 of the switch 34 with the door operating motor 9 and the wires 48 connect said motor with the wires 42.

The double throw reversing switch 32 is provided with two sets of contacts 49 and 50, one of the contacts 49 being connected by a wire 51 with the corresponding contact 50. The other two contacts 49 are connected by wires 52 with the contacts 53 of a limit switch 54 which controls the travel of the pusher 4.

The blades of the switch 54 are connected by wires 55 with the blades of another limit switch 56 which controls the travel of the pusher in the opposite direction and wires 57 connect the wires 55 with the pusher motor 25. The contacts 58 of the switch 56 are connected as by the wires 59 with the two lower contacts of the reversing switch 32, a wire 60 leading from the other contact of the reversing switch to the pusher motor.

Each of the limit switches 54 and 56 is provided with a shoe 61 arranged to be engaged by the bar 26 to operate the switches, and each of the limit switches 41 and 43 as well as the interlocking switch 30 is provided with a similar shoe 62 arranged to be engaged with the sliding bar 19.

In operating the furnace the double throw reversing switch 34 is thrown into the position shown in the drawing, closing the circuit through the wires 45, 42 and 48 to the motor 9 to operate the motor in the direction to move the screw 12 to the right, raising the doors 7 and 8. The parts are so located that the bar 19 will engage the shoe 62 of the limit switch 41, closing said switch just before said bar has permitted the shoe of the switch 43 to drop, opening the switch. At this time the doors are in the opened position and the motor is thus stopped. Although the drawing shows the mechanism diagrammatically it should be understood that the shoe of the interlocking switch 30 is engaged by the bar 19 as the doors reach the open position, closing the locking switch and completing the circuit through the double throw reversing switch 32 to the pusher motor 25.

Assuming that the switch 32 is in the position shown in the drawing, the motor 25 will be operated to move the pusher to the right, pushing any material which has been placed upon the extension 3 into the furnace in the usual manner. As the bar 26 engages the shoe of the switch 54 to close the same and moves out of engagement with the shoe of the switch 56, permitting the same to open, pusher motor will be stopped. The switch 32 is then thrown into the opposite position engaging the blades with the contacts 49 to move the pusher back to the position shown in the drawing, after which the switch 34 is thrown to reverse position, operating the motor 9 to close the doors, returning the parts to the normal position.

From the above it will be obvious that unless the doors are open and the switch 30 closed, current will not flow to the switch 32, and the pusher motor is thereby prevented from operating regardless of the fact that the operator may carelessly throw the switch 32. Damage to the furnace and pusher mechanism is thus eliminated, as the pusher can not be operated in either direction while the doors are open.

I claim:—

1. In combination with a furnace, a door and a pusher for moving material into the furnace when the door is in the opened position, a motor for operating the door, a switch controlling the door motor, a motor for operating the pusher, a switch controlling the pusher motor, an interlock switch in parallel with the pusher motor switch, a sliding bar operated by the door motor, switches engaged by the sliding bar to stop the door motor when the door is in the fully opened or fully closed position, said sliding bar engaging the interlock switch to close it only when the door is in the fully opened position.

2. In combination with a furnace, a door and a pusher for moving material into the furnace when the door is in the opened position, a motor for operating the door, a switch controlling the door motor, a motor for operating the pusher, a switch controlling the pusher motor, an interlock switch in parallel with the pusher motor switch, a sliding bar operated by the door motor, switches engaged by the sliding bar to stop the door motor when the door is in the fully opened or fully closed position, said sliding bar engaging the interlock switch to close it only when the door is in the fully opened position, a sliding bar operated by the pusher motor, switches engaged by the last named sliding bar to stop the pusher motor when the pusher is at either extreme position of travel.

In testimony that I claim the above I have hereunto subscribed my name.

FRANK T. COPE.