C. T. KEIGLEY.

INTERLOCK AND SIGNAL DEVICE FOR COKE OVEN DOOR OPERATING AND PUSHER MACHINES.

APPLICATION FILED DEC. 3, 1919.

1,368,163.

Patented Feb. 8, 1921.

2 SHEETS—SHEET 1.

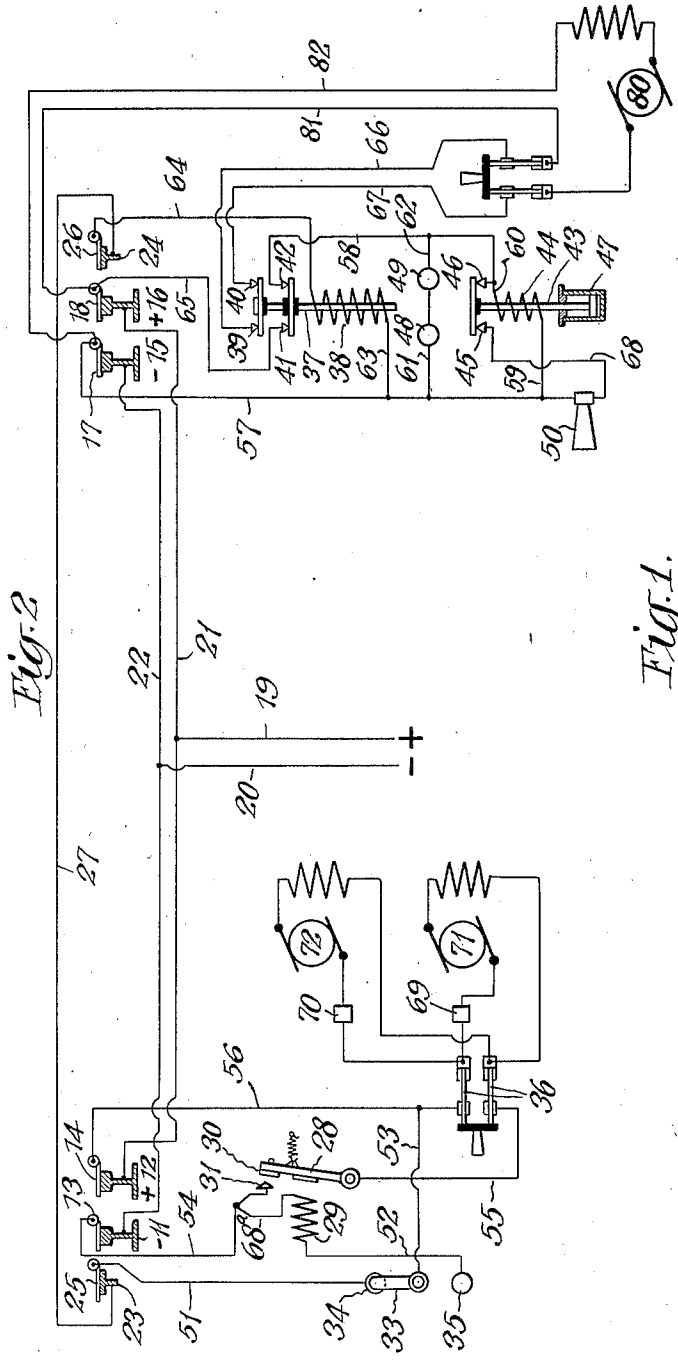


Fig. 2.

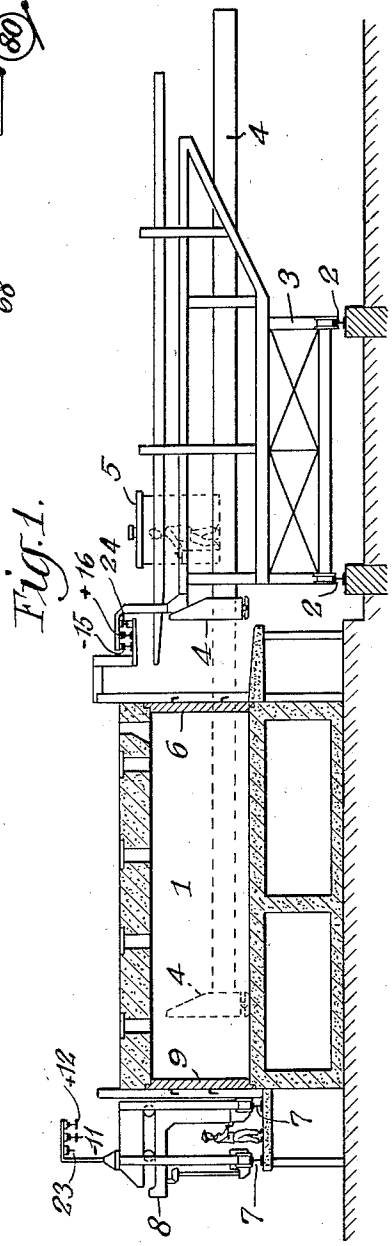


Fig. 1.

INVENTOR

Claire T. Keigley

BY

D. Anthony Usina

ATTORNEY

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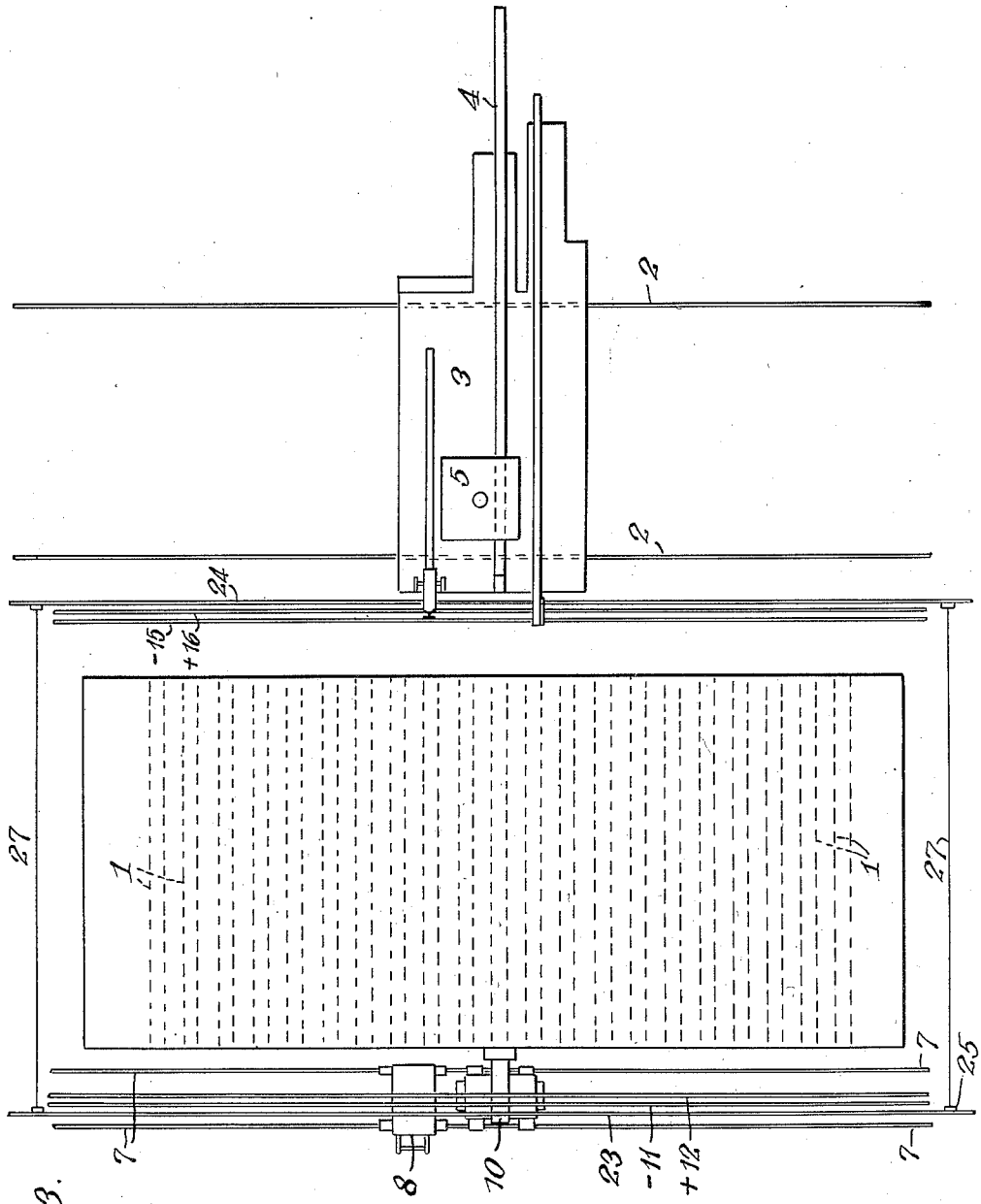



Fig. 3.

INVENTOR

Claire T. Keigley

BY

D. Anthony Usina

ATTORNEY

# UNITED STATES PATENT OFFICE.

CLAIRE T. KEIGLEY, OF LORAIN, OHIO.

## INTERLOCK AND SIGNAL DEVICE FOR COKE-OVEN-DOOR OPERATING AND PUSHER MACHINES.

1,368,163. Specification of Letters Patent. Patented Feb. 8, 1921.

Application filed December 3, 1919. Serial No. 342,300.

*To all whom it may concern:*

Be it known that I, CLAIRE T. KEIGLEY, a citizen of the United States, residing at Lorain, county of Lorain, and State of Ohio, have invented certain new and useful Improvements in Interlock and Signal Devices for Coke-Oven-Door Operating and Pusher Machines, of which the following is a specification.

This invention relates particularly to horizontal coke ovens built in batteries with the ovens or coking chambers arranged side by side. The ends of such ovens are usually closed with removable doors to permit the discharge of the coke, the doors being operated by machines traveling on tracks extending along both sides of the battery of the ovens. To discharge the coke from the oven chambers there is a pusher machine arranged to travel on tracks running along one side of the battery, called the pusher side. This machine carries a ram for pushing the finished cake of coke out at the opposite end of the oven chamber, called the coke side. The pusher machine also carries mechanism for operating the doors on the pusher side. On the coke side of the battery there travels a door operating machine and a coke guide, the latter serving to direct the coke from the oven into a coke quenching car which operates on a track arranged on a lower level.

The ejection of coke from the oven chambers is conducted according to a certain sequence with which the operators on both the coke pusher and the door machine are familiar. Thus, as soon as an oven has been pushed and the oven doors properly replaced the machines on both sides of the battery of ovens automatically move to the next oven to be pushed. The operators on the pusher machine and door machine being entirely out of sight of each other, the pusher machine operator has to depend on a signal of some kind from the coke side telling him when to push. This signal is given as soon as the coke side door has been removed, the coke guide spotted and the coke quenching car positioned to receive the hot coke.

Signaling systems have been used where the engineer on the quenching car locomotive blows a whistle when everything is ready on the coke side, which is the signal for the pushing machine operator to push the oven when he is ready. It will be apparent that with railroad locomotives frequently passing near the coke plant and blowing whistles at intervals, or where there is more than one battery with several quenching car locomotives operating independently of each other, the coke pusher operator frequently acts on a wrong signal, the consequences often resulting in bodily injury to the workmen on the coke side and causing delays in the operation of the plant.

With the apparatus herein disclosed the coke pusher operator cannot possibly move the pusher ram forward until the door machine operator throws a switch to give the signal. This action completes a master circuit for the motor, which effects the forward motion of the pusher ram and allows the operator to push the oven. As the door machine operator closes the control to give the signal switch, he automatically cuts the main power circuit for his door machine motors so that he is unable to move the door machine or the coke guide after the latter has been properly spotted, thus providing an additional safety feature.

The invention is illustrated in the accompanying drawings in which—

Figure 1 is a cross sectional elevation through a battery of coke ovens showing the coking chambers with the coke pusher on the right and door machine on the left;

Fig. 2 is a diagrammatic illustration of the essential electrical mechanism and wiring on the door machine and coke pushing machine respectively;

Fig. 3 is a plan view of a battery of coke ovens showing the operating machinery on both sides.

The oven or coking chambers 1 are as usual arranged side by side, any desired number being combined to a battery. Charging the ovens is accomplished in the usual manner through closable holes in the roof of the coking chambers. On rails 2 at one side of the battery travels the electrically driven coke pushing machine 3 carrying pusher ram 4. The operator for this machine is in the cab 5 where also the different controllers for the bridge travel, pusher ram, etc., are located. This pusher machine is also equipped with suitable mechanism for handling the pusher side oven doors 6. On the opposite side of the battery (the coke side) the electrically driven door machine 8 travels along rails 7. This machine operates the oven doors 9 on the coke side of the battery and is

also used for moving the coke guide 10 which serves for guiding the coke across the bench into a quenching car, not shown, operating on a lower level. Main feed rails —11 and +12 supply electric power to the door machine 8 and run the entire length of the door machine track 7. 13 and 14 denote collector shoes attached to the door machine which slide on the feed rails when the door machine is in motion, and transmit the electric current from the rails —11 and +12 to the door machine motors. —15 and +16 indicate a similar set of feed rails and 17 and 18 a set of collector shoes for the pusher machine. The rails —11 and +12 and —15 and +16 are supplied with electric power through feed wires 19, 20, 21 and 22. Collector bars 23 and 24 with collector shoes 25 and 26 are mounted similarly to the feed rails and are connected with wire 27 which forms a part of the circuits for the interlocking and signal devices carried by the door machine 8 and pusher machine 3.

The door machine is equipped with a magnetically operated switch 28 which controls the supply of current to the motors 71 and 72 which are used to actuate the mechanism for moving the doors and spotting the coke guide. A hand operated switch 33 located on the door machine controls the circuit for the magnetic switch 28 and also another circuit hereinafter described for apparatus carried by the pusher machine.

The pusher machine is equipped with a magnetic relay 37, signal lamps 48 and 49, an electrically operated audible signal 50 and a time limit relay 43 all of which are in circuits controllable by the door machine operator in the manner now to be described.

When the door machine operator wishes to move his machine 8 the single pole knife switch 33 is closed to contact with jaw 35; this closes an electric circuit from feed wire 19, rail +12, wires 56 and 53, switch 33, jaw 35, wire 52, magnet 29, wires 68[a] and 54 to rail —11. This energizes coil 29 of magnetic switch 28, thus closing contacts 30 and 31 which gives a main power circuit to the motors on the door machine as follows: feed wire 19, +12 rail, wire 56, switch 36 through controllers 69 and 70 in parallel and motors 71 and 72 in parallel, switch 36, wire 55, switch 28, contacts 30 and 31, and wire 54 to rail —11. Thus the door machine operator can perform any operations actuated by his motor 71 and 72 such as removing the oven door 9 and spotting the coke guide 10.

In the meantime it is impossible for the pusher ram to operate on the forward or pushing stroke for the reason that the master circuit for this motion through wires 66 and 67 is open at contacts 39 and 40 of the relay 37, said relay being deënergized at this time. All other operations of the coke pusher such as removing the oven door, bridge travel, backward motion of pusher ram, etc., are not affected since only the circuit for the motor 80 for effecting the forward or pushing stroke of the ram 4 is interlocked.

When the coke side oven door 9 has been removed and the coke guide 10 and coke quenching car spotted to receive the hot coke the door machine operator reverses the single pole double throw knife switch on the door machine, so that blade 33 leaves jaw 35 and makes contact with jaw 34. This signals the coke pusher operator in cab 5 and at the same time closes the master circuit for the forward or pushing stroke of the pusher ram 4 as follows: When knife switch 33 contacts with jaw 34 the following circuit is established, feed wire 19, +12 rail, wires 56 and 53, switch 33, contact 34, wire 51, collector shoe 25, bar 23, wire 27, bar 24, shoe 26, wire 64, coil 38, wires 63 and 57 to —15 rail. This energizes coil 38 of relay 37, thus closing contacts 39, 40, 41 and 42. The closing of contacts 39 and 40 completes the master circuit for motor 80 through wires 66 and 67, 81 and 82 and permits the forward operation of the pusher ram. When contacts 41 and 42 close, three parallel circuits are simultaneously established as follows: first, one circuit from +16 rail, shoe 18, wire 65, contacts 41 and 42, wires 58 and 62, lamps 49 and 48, wires 61 and 57, shoe 17 to —15 rail. This lights the lamps 48 and 49, located in the coke pusher operator's cab and thereby gives the pusher operator a visible signal that he may push the oven. The second, parallel circuit is established from +16 rail, shoe 18, wire 65, contacts 41 and 42, wire 58, contacts 46 and 45, wire 68, horn 50, wire 57, shoe 17 to —15 rail. This operates horn 50 located just outside the pusher cab, giving an additional signal. The third parallel circuit is from +16 rail, shoe 18, wire 65, contacts 41 and 42, wires 58 and 60, coil 44, wires 59 and 57, shoe 17 to —15 rail. This energizes coil 44 of time limit relay 43 and opens contacts 45 and 46, thus opening the circuit of the horn. This limits the operation of the horn to a time determined by the setting of the time relay 43, hence preventing a continuous sounding of the horn.

After the signal has been sent to the pusher operator to push the oven, it is impossible to move the door machine for the reason that the power circuit to the door machine motors 71 and 72 has been opened at contacts 30 and 31 of magnetic switch 28. This switch having been opened by deënergizing the coil 29 when contact was broken between blade 33 and jaw 35 of the double throw knife switch.

This mechanism for opening the doors on the coke side as well as that for spotting the coke guide, is of known design and therefore is not shown and described in detail herein as it is considered sufficient to

say that said mechanisms are driven by the motors 71 and 72 which are under control of the operator on the coke side as above described. Similarly the detailed description and illustration of the mechanism for actuating the coke-pusher 4 is considered unnecessary, suffice it to say that the forward motion of the ram is affected by the motor 80 which is in circuit with wires 66, 67, 81 and 82 which circuit is open across the contacts 39 and 40 except when closed by the operation of the relay 38 as above described.

It will be seen that with the apparatus herein described the discharging operation of the ovens has been made practically foolproof, since the door machine operator who is in a position to oversee the travel of the coke from the oven into the quenching car, has at all times perfect control over the pushing operation, and can stop the pusher ram in any position of its forward travel by disengaging switch-blade 33 from its contact 34 thereby deënergizing the relay 38 and breaking the circuit of the motor 80.

As it is clear that changes of arrangement and substitution of equivalents may be made by those skilled in the electrical arts it is intended that all the matter herein described and shown on the accompanying drawings shall be interpreted in an illustrative and not in a limiting sense.

What I claim is:—

1. In an apparatus of the class described, a coke oven, a door operating machine movable along one side thereof, and a pusher machine movable along the other side thereof, motors carried by each of said machines, devices carried by the door operating machine operatively connected with devices carried by the pusher machine whereby the motor on said pusher machine cannot be operated until after the current has been disconnected from the motors on the door operating machine, a signal carried by said pusher machine operatively connected with the aforesaid devices and arranged to be actuated after the motors on the door-operating machine have been disconnected.

2. In an apparatus of the class described, a coke oven, a door operating machine movable along one side thereof, a pusher machine movable along the other side thereof, motors carried by each of said machines, a ram which derives its forward motion from the motor on the pusher machine, a magnetic relay controlling the circuit of the motor which moves the ram, a magnetic switch having contacts in circuit with the motors on the door operating machine, a control switch on said door operating machine, and circuits including said motors, said switches and said relay whereby in one position of said control switch the coil of the magnetic switch will be energized to close the circuit through the motors on the door operating machine and in the other position thereof said coil will be deënergized to open the said motor circuit, and said magnetic relay will be energized to close the master circuit of the ram operating motor.

3. In an apparatus of the class described, a door machine movable along one side of the oven, a pusher machine movable along the other side thereof, a ram carried by said pusher machine, feed rails and a collector bar extending longitudinally along both sides of the oven, a conductor joining the collector bars; a control switch on the door machine and a relay on the pusher machine in circuit with said feed rails and said collector bars, and a motor on the pusher machine for effecting the forward stroke of said ram, said motor being in a circuit controlled by the above mentioned relay.

4. In an apparatus of the class described, a door machine movable along one side of the oven, a pusher machine movable along the other side thereof, a ram carried by said pusher machine, feed rails and a collector bar extending longitudinally along both sides of the oven, a conductor joining the collector bars, a control switch on the door machine and a relay on the pusher machine in circuit with said feed rails and said collector bars, and a signal device on the pusher machine in a circuit controlled by said relay.

5. In an apparatus of the class described, a door machine movable along one side of the oven, a pusher machine movable along the other side thereof, a ram carried by said pusher machine, feed rails and a collector bar extending longitudinally along both sides of the oven, a conductor joining the collector bars, a control switch on the door machine and a relay on the pusher machine in circuit with said feed rails and said collector bars, a motor on the pusher machine for effecting the forward stroke of said ram, and a signal device on the pusher machine, said motor and said signal device being in circuits controlled by the above mentioned relay.

6. In an apparatus of the class described, a door machine movable along one side of the oven, a pusher machine movable along the other side thereof, a ram carried by said pusher machine, a circuit including a control switch on the door operating machine and a magnetic relay on the pusher machine, a motor on the pusher machine for effecting the forward motion of said ram, in a circuit controlled by said relay, and signal lights in a separate circuit on said pusher machine also controlled by said relay.

7. In an apparatus of the class described, a door machine movable along one side of the oven, a pusher machine movable along the other side thereof, a ram carried by said pusher machine, a circuit including a con-

trol switch on the door operating machine and a magnetic relay on the pusher machine, a motor on the pusher machine for effecting the forward motion of said ram, the power circuit for said motor being in a circuit controlled by said relay, and an electric horn in a circuit controlled by said relay.

8. In an apparatus of the class described, a door machine movable along one side of the oven, a pusher machine movable along the other side thereof, a ram carried by said pusher machine, a circuit including a control switch on the door operating machine and a magnetic relay on the pusher machine, a motor on the pusher machine for effecting the forward motion of said ram, the power circuit for said motor being controlled by said magnetic relay and a circuit controlled by said relay including an electric horn and a time limit relay arranged to break the circuit through the horn after the lapse of a determined interval.

9. In a battery of coke ovens having a pusher machine carrying a motor and a ram driven thereby operating on one side and a door machine on the other side carrying door operating motors, a pair of feed rails on both sides of the battery for supplying current to the pusher and door machines, an interconnected collector bar on each side of the battery, collector shoes carried by the pusher machine and on the door machine engaging said rails and said collector bars, a magnetically operated relay controlling the master circuit for the motor for effecting the forward movement of the ram, a magnetically operated switch on the door machine interposed in the power circuit of the door machine motors, a hand operated double throw switch on the door machine, the circuits being so arranged and connected that in one closed position of the hand switch it energizes the magnetic switch on the door machine thereby completing the circuit for the door machine motors, while in its other closed position it breaks this circuit and makes a circuit through the aforesaid relay switch on the pusher machine and thereby closes the master circuit for the motor which effects the forward motion of the ram.

10. In a battery of coke ovens having a pusher machine operating on one side carrying a motor and a ram driven thereby and a door machine on the other side of the battery carrying a door operating motor, a pair of feed rails on both sides of the battery for supplying electric current to the devices on the pusher and door machines, interconnected collector bars on each side of the battery, collector shoes carried on the pusher and door machines engaging said collector and feed rails, a visible and audible signal carried on the pusher machine, and being arranged in circuits controlled by a magnetically operated relay, a magnetically operated relay having contacts interposed in the circuits for the pusher ram motor and the aforesaid signals, a magnetically operated switch on the door machine interposed in the power circuit of the door machine motors, a hand operated double throw switch on said door machine in circuit with said magnetic switch and said relay, so arranged and connected that in one closed position it energizes the magnetic switch on the door machine and thereby completes the circuit for the door machine motors, while in its other closed position it deënergizes said magnetic switch and closes the circuit through said relay thereby closing the circuits for said ram motor and said signal devices.

In witness whereof, I have hereunto signed my name.

CLAIRE T. KEIGLEY.