

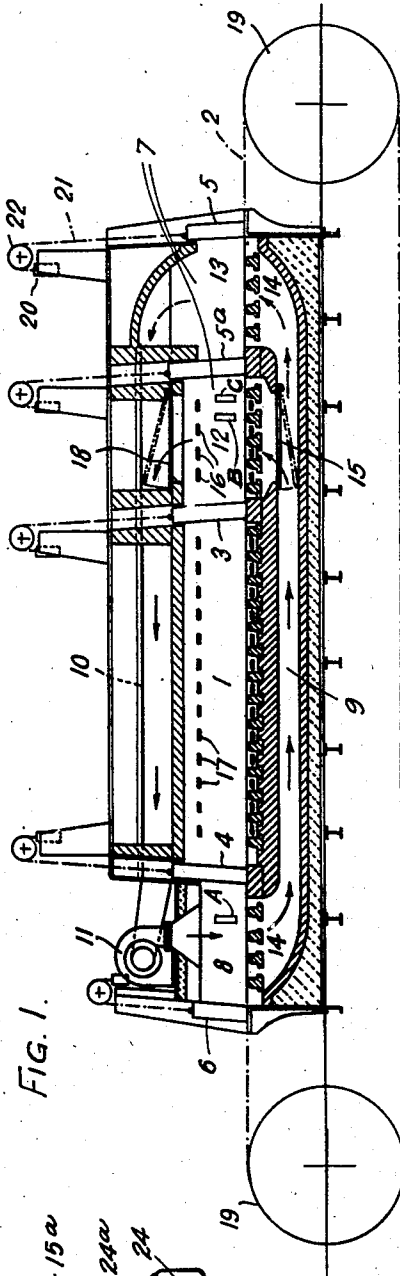
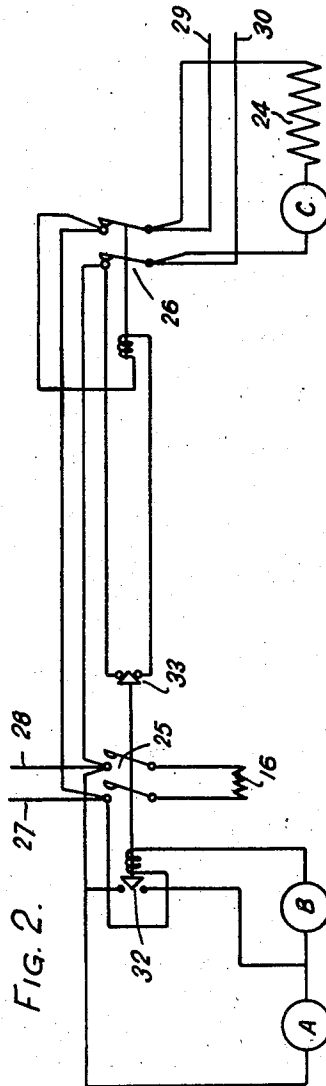
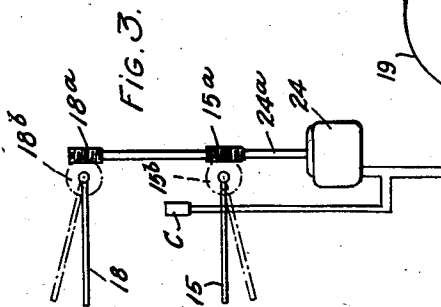
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HEATING FURNACE

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HEATING FURNACE

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8 Claims. (Cl. 263-8)

This invention relates to heating furnaces and especially to annealing furnaces.

An object of the invention is to provide a device for usefully employing the heat contained in a charge which has passed out of the furnace.

This object is effected according to the invention by providing means for circulating a stream of gas over the charge which has emerged from the furnace proper and passing this gas to the charge awaiting entry to the furnace over a path exterior to the furnace interior.

By a further feature of the invention damper means are provided to regulate the relative proportions of heated gas reaching the part of an entry chamber through which the charge passes before entering the furnace which is nearest the furnace door and the part which is nearest the outer door of the entry chamber. Thermally responsive devices of known kind may be provided to operate the damper means in accordance with the temperature of the circulating gas and to reduce the quantity of gas entering the part of the entry chamber nearest the furnace door, or stop such admission, when the temperature of the gas falls below a predetermined value. Preferably, this feature of the invention is employed in conjunction with means for heating the part of the entry chamber adjacent the furnace door. The charge nearest the furnace door will attain a higher temperature than that nearest the outer door of the entry chamber and by passing all or a greater part of the circulating gas over the charge nearest the outer door when the temperature of the circulating gas falls, the temperature of the charge actually entering the furnace can be maintained more nearly at a constant desired value, while the amount of heat imparted to the cold charge is as great as possible. In the case of an annealing furnace maintained at a constant temperature and where the operation of the conveyor to discharge and load the furnace occurs at fixed times, the maintenance of the entering charge at a fixed temperature is important.

The heating is preferably electrical and the furnace may be divided into as many zones or chambers as is desired.

The invention is illustrated by way of example in the accompanying drawing, in which—
Fig. 1 is a section of the furnace, and

Fig. 2 is a diagram of the electrical circuit for controlling the dampers.

The charge which may be, for example, cartridge cases, is adapted to be moved into and through the furnace 1 by a conveyor 2 driven by drums 19. The furnace is provided with doors 3, 4 at each end of the furnace space proper and further doors 5, 6 which afford access to an entry chamber 7 and an exit chamber 8 in which the charge rests before entering the furnace proper and after emerging therefrom respectively. The

doors are counterbalanced by weights 20 suspended by chains 21 passing over pulleys 22, and are arranged to be opened and closed together to permit the charge to be carried into and through the furnace. A lagged duct 9 is formed in the masonry of the furnace below the upper run of the conveyer 2, which communicates with the entry and exit chambers through openings 14 in the floors thereof. A further lagged duct 10 arranged above the furnace opens to the upper spaces of the entry and exit chambers, and a fan 11 is arranged in this duct to cause air to pass from the upper part of the entry chamber to the upper part of the exit chamber, over a heated charge in this chamber and through the openings in the floor to the openings in the floor of the entry chamber, returning over the cold charge to the fan. The flow of air is indicated by the arrows.

The entry chamber 7 is divided by a door 5A into an inner compartment 12 and an outer compartment 13. Access to the compartment 12 by the hot air from the exit chamber 8 is controlled by pivoted dampers 15 and 18 which are operated thermostatically in such a manner that they open or close simultaneously to isolate or connect the compartment 12 from or with the compartment 8 in dependence on the temperature of the hot air and the compartment 12. The compartment 12 of the entry chamber is provided with electrical heating elements 16 similar to the heating elements 17 of the furnace proper.

The dampers 15 and 18 also serve to control the circulation of gas in the ducts 9 and 10. A gas other than air may, of course, be circulated when desired.

Referring to Fig. 2, the dampers 15 and 18 (not shown in Fig. 2) are actuated by a solenoid or motor indicated diagrammatically as a motor at 24. The current for the solenoid or motor is supplied from mains 27 and 28 through contacts 26 and a thermostat C. The arrangement is such that the dampers 15 and 18 are closed when contacts 26 are in the off position. Suitable means for simultaneously moving the dampers is shown in Fig. 3 showing somewhat diagrammatically the means for opening and closing the dampers 15 and 18. In Fig. 3 the spindle 24a of the motor 24 has fixed upon it two worms 15a and 18a which mesh with pinions 15b and 18b respectively. The pinions are fixed respectively to the hinged ends of the dampers 15 and 18. The thermostat C is placed in the compartment 12 and completes a circuit for opening the dampers 15 and 18, when the temperature in compartment 12 is sufficiently high, provided the contacts 26 are closed. Current for the heaters 16 is supplied through contacts 25 which are operated by a circuit including thermostats A and B situated respectively in the chamber 8 and the compartment 12. The

contacts 25 are held in by a circuit including contacts 32 and thermostat B, so that once closed, the contacts 25 remain closed independently of the temperature in the chamber 8 until the temperature of the compartment 12 rises above a predetermined value. When once opened, however, contacts 25 will not be again closed until the temperature in both chamber 8 and compartment 12 falls. Opening of the contacts 32 causes interlocked contacts 33 to close, thus completing a circuit for closing contacts 26. Closure of contacts 26 completes a circuit for supplying the fan 11 with current by way of the leads 29 and 30.

I claim:

1. A heating furnace having an entry and an exit, an entry chamber, closure means between the entry chamber and the furnace, further closure means dividing the entry chamber into a part adjacent to the furnace and a part remote from the furnace, an exit chamber adjacent to the furnace exit, a duct closed to the interior of the furnace and connecting the two said parts of the entry chamber with the exit chamber, means for passing a gas through the duct from the exit chamber to the entry chamber, damper means for controlling the relative proportions of the gas reaching the part of the entry chamber adjacent to the furnace and the part remote from the furnace respectively, and means for controlling the damper in dependence on the temperature of the part of the entry chamber adjacent to the furnace to reduce the proportion of gas entering the part of the entry chamber adjacent to the furnace when the temperature thereof falls.

2. A heating furnace having an entry and an exit, an entry chamber, closure means between the entry chamber and the furnace, further closure means dividing the entry chamber into a part adjacent to the furnace and a part remote from the furnace, an exit chamber adjacent to the furnace exit, a duct closed to the interior of the furnace and connecting the two said parts of the entry chamber with the exit chamber, means for passing a gas through the duct from the exit chamber to the entry chamber, damper means for shutting off from the said duct the part of the entry chamber adjacent to the furnace, and means for actuating said damper means to shut off the part of the entry chamber adjacent to the furnace when the temperature of the last-named part of the entry chamber falls below a predetermined value.

3. A heating furnace having an entry and an exit, an entry chamber, closure means between the entry chamber and the furnace, further closure means dividing the entry chamber into a part adjacent to the furnace and a part remote from the furnace, an exit chamber adjacent to the furnace exit, a duct closed to the interior of the furnace and connecting the two said parts of the entry chamber with the exit chamber, means for passing a gas through the duct from the exit chamber to the entry chamber, damper means for shutting off from the said duct the part of the entry chamber adjacent to the furnace, means for closing the damper means when the temperature of the last-named part of the entry chamber falls below a predetermined value, and means for opening said damper means when the temperature of the part of the entry chamber

adjacent to the furnace and the temperature of the exit chamber rise above respective predetermined values.

4. A heating furnace having an entry and an exit, an entry chamber, closure means between the entry chamber and the furnace, further closure means dividing the entry chamber into a part adjacent to the furnace and a part remote from the furnace, an exit chamber adjacent to the furnace exit, a duct closed to the interior of the furnace and connecting the two said parts of the entry chamber with the exit chamber, means for passing a gas through the duct from the exit chamber to the entry chamber, damper means for shutting off from the said duct the part of the entry chamber adjacent to the furnace, means for actuating said damper means to shut off the part of the entry chamber adjacent to the furnace when the temperature of the last-named part of the entry chamber falls below a predetermined value, heating means in the part of the entry chamber adjacent to the furnace, and means for switching said heating means on when the temperature of the exit chamber and that of the part of the entry chamber adjacent to the furnace fall below respective predetermined values and for maintaining said heating means on so long as the temperature of the last-named part of the entry chamber remains below said last-mentioned predetermined value thereof.

5. A heating furnace as claimed in claim 3 comprising heating means in the part of the entry chamber adjacent to the furnace, and means for switching said heating means on when the temperature of the exit chamber and that of the part of the entry chamber adjacent to the furnace fall below said last-mentioned respective predetermined values and for maintaining said heating means on so long as the temperature of the last-named part of the entry chamber remains below said last-mentioned predetermined value thereof.

6. A heating furnace as claimed in claim 2 comprising heating means in the part of the entry chamber adjacent to the furnace, and means for switching said heating means on when the temperature of the part of the entry chamber adjacent to the furnace falls below a predetermined value.

7. A heating furnace having an entry chamber, an exit chamber, closure means between the entry chamber and the furnace, further closure means dividing the entry chamber into a part adjacent to the furnace and a part remote from the furnace, an exit chamber adjacent to the furnace exit, a duct closed to the interior of the furnace and connecting the two said parts of the entry chamber with the exit chamber, means for passing a gas through the duct from the exit chamber to the entry chamber and damper means for controlling the relative proportions of gas reaching the part of the entry chamber adjacent to the furnace and the part remote from the furnace respectively.

8. A heating furnace as claimed in claim 7 comprising heating means in the part of the entry chamber adjacent to the furnace, and means for switching said heating means on when the temperature of the part of the entry chamber adjacent to the furnace falls below a predetermined value.

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