Oct. 6, 1936. J. FALLON 2,056,510

CONVEYER FURNACE FOR HEATING METAL SHEETS OR PLATES

Filed March 6, 1934 3 Sheets-Sheet 1

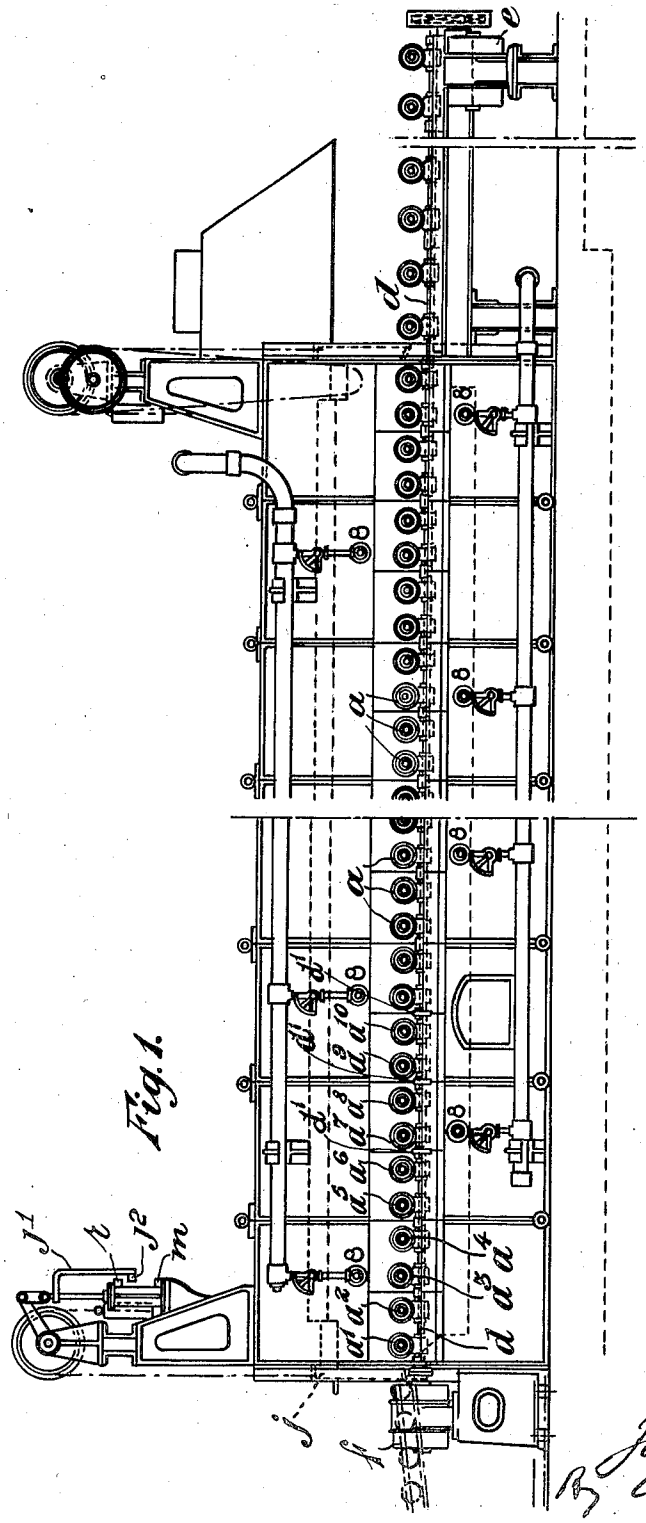


Fig. 1.

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CONVEYER FURNACE FOR HEATING METAL SHEETS OR PLATES

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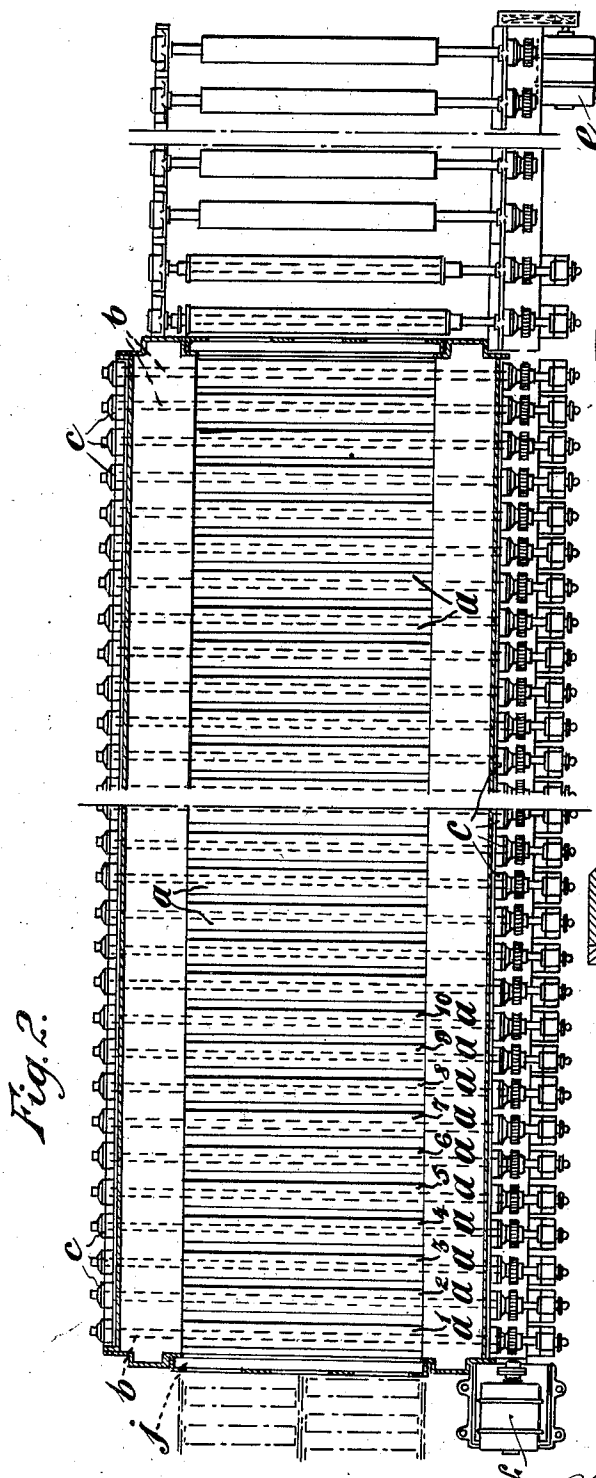


Fig. 2.

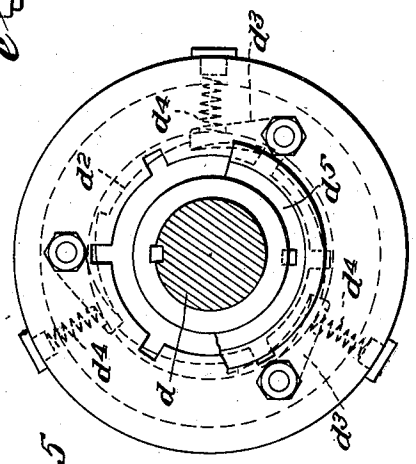


Fig. 5

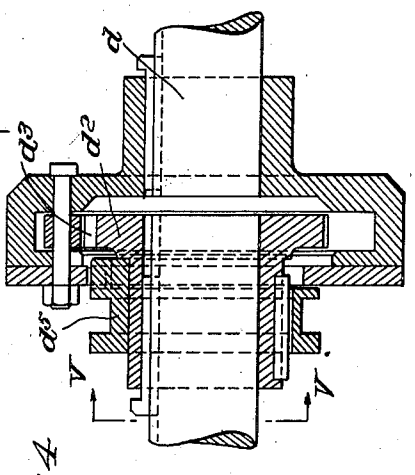


Fig. 4

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CONVEYER FURNACE FOR HEATING METAL SHEETS OR PLATES

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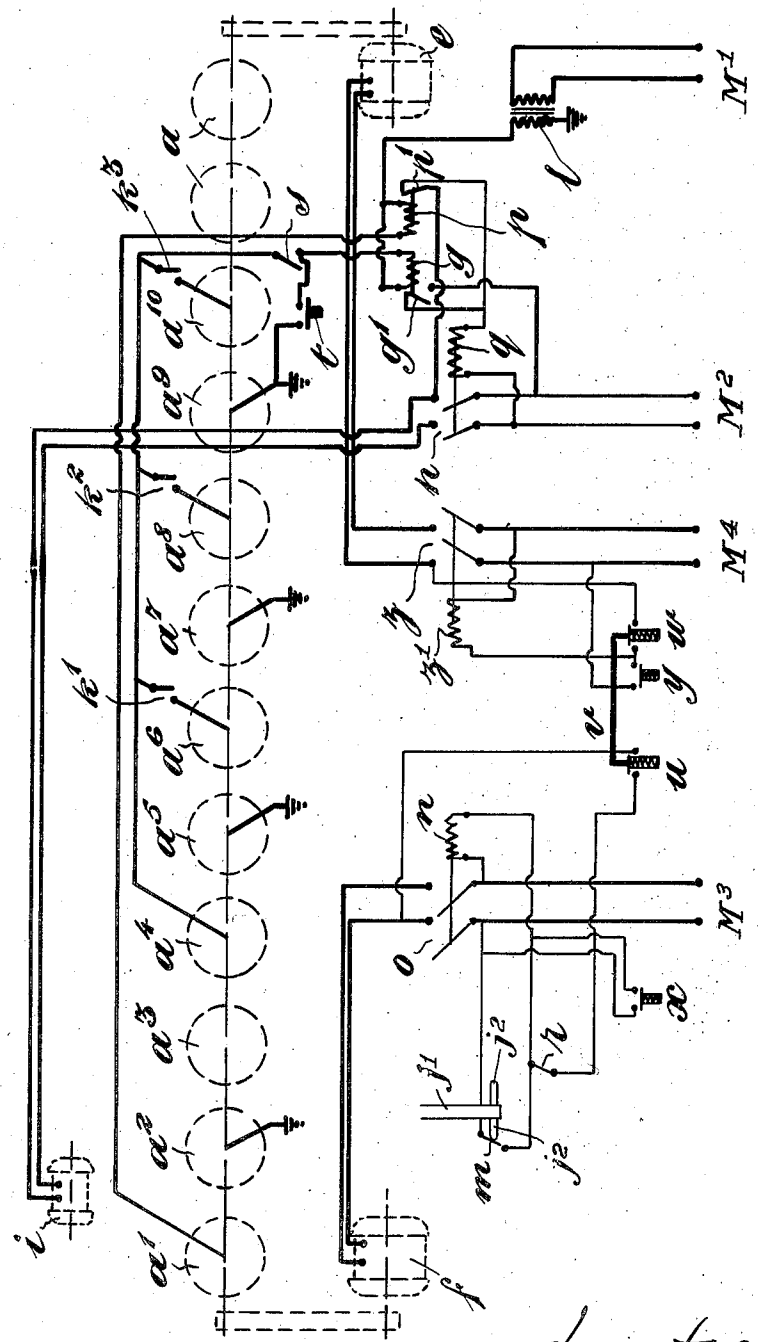


Fig. 3.

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Patented Oct. 6, 1936 2,056,510

UNITED STATES PATENT OFFICE

2,056,510

CONVEYER FURNACE FOR HEATING METAL SHEETS OR PLATES

John Fallon, Birmingham, England

Application March 6, 1934, Serial No. 714,258
In Great Britain January 24, 1934

4 Claims. (Cl. 263—6)

My invention relates to conveyer furnaces for heating metal sheets, plates, packs, and like laminated metal goods, more particularly the continous or continuous-intermittent live roller type of conveyer furnace for this purpose.

In furnaces of this type, difficulties and inconveniences have been experienced in connection with the extraction of the goods when ready for discharge and delivery to the rolling mill, and it is the object of the present invention to avoid these defects and to provide a roller conveyer mechanism which shall be highly convenient and efficient under varying conditions of operation, both for the traverse of the goods through the furnace and for their extraction therefrom at the discharge end of the furnace.

The invention consists in a roller hearth conveyer furnace wherein the entire series of rollers are geared together for rotation at a uniform normal conveying speed, and wherein a variable plurality of the rollers at the discharge end of the furnace are electrically adapted for an intermittent ejecting rotation at high speed, this high-speed discharge being effected by an ejection motor adapted either for automatic or push-button control, and being preferably arranged for operation in synchronized relation to the opening and closing movements of the discharge door of the furnace.

In order that the invention may be clearly understood and readily carried into practice, reference is had to the appended explanatory drawings, in which:—

Figure 1 is a side elevation of a pack-heating furnace of the roller hearth type having the present improvements embodied.

Figure 2 is a sectional plan of the furnace.

Figure 3 is a diagrammatic side elevation illustrating the electrical arrangements.

Fig. 4 is a sectional side elevation of one of the free-wheel clutches referred to below, while Fig. 5 is an elevation of said clutch, the last-mentioned view being taken in section on a plane indicated by the line V—V in Figure 4, with a part of the slidable locking dog d^5 referred to below broken away for facility of illustration.

In a convenient method of carrying the invention into effect, as applied to a pack-heating conveyer furnace of the roller hearth type having live rollers disposed transversely in parallelly spaced relation from end to end of the furnace and having over and under firing, the rollers a are built up on shafts b mounted in external bearings c, the entire set of rollers being externally geared for rotation at uniform normal conveying speeds by means of a longitudinal worm shaft d driven by a variable-speed primary motor e at the inlet end of the furnace, this motor e being operated by current passing from the mains at M^4 and through a contactor z normally closed by a coil z^1. A variable plurality of rollers a^1 to a^{10} at the discharge end of the furnace is electrically adapted for an intermittent ejecting rotation at high speed by means of an ejection motor f. For this purpose alternate rollers a^4 a^6 a^8 a^{10} adjacent the discharge end have insulated bearings and are coupled to the starting coil g of a switch h arranged in circuit with the motor i of the discharge door j, with intervening control switches k^1 k^2 k^3 which serve to switch in or out the number of rollers required in accordance with the length of the pack being traversed at normal furnace speed. The worm shaft d is fitted, in positions adjacent the rearward rollers a^6 to a^{10} of the group of rollers to be speeded up, with a series of say three free-wheel clutches d' of the ratchet-type each having a ratchet wheel d^2, pawls d^3, adjustable pressure devices d^4 and a slidable locking dog d^5, which clutches permit of the ejection group of the determined number of rollers a^1 to a^{10} being forwardly over-run at high speed, in the same direction as the remainder of the rollers a, when the ejection motor f is switched into circuit.

The several overrunning clutches d' are used to permit the number of rollers in the high-speed ejection group being varied according to the length of the material carried by the rollers. Material of short length will not require many rollers to be run at high speed, while material of greater length will require more rollers to be run at high speed. When one clutch has been set for the overrunning free-wheel action, the other clutches are locked by a sliding adjustment of the dogs d^5.

The high speed ejection motor f is actuated automatically by the forwardly moving pack short circuiting certain of the rollers. As the pack traverses forward, it successively makes bridging contact with adjacent pairs of the group of rollers a^{10} to a^4 coupled to the starting coil g, and, according to the setting of the control switches k^1 k^2 k^3, current from a small transformer l connected to the mains at M^1 passes through the starting coil g, through the pack bridging the selected pair of rollers, and is earthed through one or other of the intermediate rollers a^5 a^7 a^9 of this group, this causing a switch g^1 associated with the starting coil g to close, and thereby op-

erating the door motor contactor h by passage of a current from the mains at M^2 through said switch g^1 and through a coil q. This in turn operates the door motor i by current passing through said contactor h from the mains at M^2, and opens the vertically sliding discharge door j of the furnace. The overhead control gear of this door j incorporates an arm j' carrying a double-ended knock-off contact j^2 associated with a pair of switches m and r. On the door j reaching its uppermost position, said contact j^2 closes the switch m, which in turn operates the coil n of a contactor o by current passing through said switch m from the mains at M^3. This closes the contactor o and starts the ejection motor f by current passing through said contactor o from the mains at M^3, causing the pack to be traversed forward at high speed, until on the pack making bridging contact with the terminal pair of rollers a^1 and a^2, current from the transformer l is passed through a coil p, through the pack bridging said terminal pair of rollers and is earthed through the roller a^2. This causes the coil p to open-circuit a stop switch p^1 which open-circuits the maintaining coil q of the door motor contactor h. The door motor i is thereby switched off, the door j closes, and the contact j^2 opens the stop switch r whereby the ejection motor f is thrown out of action.

For non-automatic ejection, a stop switch s in the starting coil circuit is opened, and a hand-control push-button t is utilized for controlling the ejection of the pack. Depression of this button t causes the current from the transformer l to go through the starting coil g and button t to earth, closing the starting coil switch g^1 and operating the door motor contactor h, the subsequent sequence of operations being the same as already described.

Emergency stoppage of the entire plant is provided for by joint operation of an ejection motor emergency stop switch u and a primary motor emergency stop switch w having a coupling-bar connection v, these stop switches u and w being normally closed. On the switch w being open-circuited by the bar v, the circut through the contacts z from the mains at M^4 is open-circuited and the primary motor e is stopped. Simultaneously the switch u is open-circuited, this causing the circuit through the contactor o from the mains M^3 to be open-circuited for stoppage of the ejector motor f. Restarting is effected by depression of an ejection motor emergency starter x, causing the coil n to close the contactor o by passage of a current from the mains at M^3, and by depression of a primary motor emergency starter y associated with the coil z' and contactor z. The ejection motor contactor h is synchronized and interlocked with the discharge door motor i so that it is impossible to eject the pack unless the door j is fully opened.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a conveyer furnace for heating metal sheets and the like, in combination a roller hearth, means for rotating the entire series of rollers at a uniform normal conveying speed, means for intermittently rotating a determined group of rollers at the discharge end of the furnace at a high ejection speed, and electrical means for initiating said high ejection speed by contact of the forwardly moving sheets with selected rollers at variable distances from the discharge end of the furnace.

2. In a conveyer furnace for heating metal sheets and the like, in combination a roller hearth, a drive shaft gearing the entire series of rollers together for rotation at a uniform normal conveying speed, means for intermittently rotating a determined group of rollers at the discharge end of the furnace at a high ejection speed, free-wheel clutch mechanism interposed in said drive shaft for determining the number of rollers in said high-speed ejection group, and electrical means for initiating said high ejection speed by contact of the forwardly moving sheets with selected rollers at variable distances from the discharge end of the furnace.

3. In a conveyer furnace for heating metal sheets and the like in combination a roller hearth, an outlet door at the discharge end of the furnace, means for rotating the entire series of rollers at a uniform normal conveying speed, means for intermittently rotating a determined group of rollers at the discharge end of the furnace at a high ejection speed, electrical means for initiating said high ejection speed by contact of the forwardly moving sheets with selected rollers at variable distances from the discharge end of the furnace, and means whereby said high-speed discharge is operated in synchronized relation to the opening and closing movements of the outlet door.

4. In a conveyer furnace for heating metal sheets and the like, in combination a roller hearth, a drive shaft gearing the entire series of rollers together for rotation at a uniform normal conveying speed, means for intermittently rotating a determined group of rollers at the discharge end of the furnace at a high ejection speed, free-wheel clutch mechanism interposed in said drive shaft for determining the number of rollers in said high-speed ejection group, electrical means for initiating said high ejection speed by contact of the forwardly moving sheets with selected rollers at variable distances from the discharge end of the furnace, an outlet door at the discharge end of the furnace, and means whereby said high-speed discharge is operated in synchronized relation to the opening and closing movements of said outlet door.

JOHN FALLON.