Billet heating furnace.

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DE-A-2 244 532
DE-A-2 802 721


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Description

This invention relates to gas fired furnaces for heating metal billets in preparation for a hot forming operation to be carried out on the billets, and has been developed primarily for the purpose of heating brass billets prior to stamping in a press.

Automatic presses in the brass stamping industry require a regular supply of billets at a substantially uniform stamping temperature, and for this purpose it is usual for the billets to be fed to the press from a train which is pushed step by step through a furnace by a feeding mechanism which adds billets to the rear of the train in synchronism with the stamping rate of the press. The furnace is intended to heat each billet to the required stamping temperature during its passage through the furnace, but the furnaces which have been used so far have not proved entirely satisfactory.

In one type of furnace which has been used, the train of billets is pushed along a cast heat resistant skid at the base of a V-shaped refractory setting down one side of which a row of air blast gas burner nozzles fire onto the billets on the skid. This open hearth type of furnace has a very low thermal efficiency, and if the train of billets through the furnace is stopped for any reason, for example because of a press stoppage, there can be a problem with billets melting due to the high heat capacity of the skid and the refractory setting. Furthermore, control of the furnace is mainly manual and therefore requires frequent attention, and the working environment is poor due to flame splash from the skid.

In another type of gas fired furnace which has been used, known as the enclosed skid type, the train of billets is moved along a skid extending through an enclosed furnace chamber lined with a heat resistant material. In existing furnaces of this type the lining is of refractory material, and because of its high thermal mass there is still a problem with a tendency for the billets to melt during stoppages in the flow of billets through the furnace if the operating temperature of the furnace is too high. To avoid this problem, such furnaces are controlled so that the operating temperature is maintained below the billet melting temperature and only just above the stamping temperature. However, such a method of operation is inefficient since the temperature differential between the furnace and the billets at the outlet end of the furnace is small and the heat transfer rate is therefore very low. Consequently the furnace needs to be relatively large.

The aim of the present invention is to provide a billet heating furnace of the enclosed skid type which can be made very much smaller and can be operated safely, reliably, and very much more efficiently than existing enclosed skid billet heating furnaces.

To this end, according to the invention, a furnace of the enclosed skid type for heating billets to a predetermined temperature which is below their melting temperature as the billets are moved at a predetermined rate along the skid through the furnace chamber comprises a billet feed mechanism adjacent the inlet end of the furnace chamber for regularly feeding billets onto and along the skid, a gas burner for raising the temperature in the furnace chamber to an operating temperature which is higher than the melting temperature of the billets, burner control means for maintaining the operating temperature substantially constant, a delivery path adjacent the outlet end of the furnace chamber for receiving billets as they leave the chamber, a billet detector arranged to detect an interruption of the regular flow of billets from the furnace chamber and to shut down the burner when such an interruption is detected, and a reject mechanism for diverting billets from the delivery path and operative if the burner is shut down, the thermal mass of the skid and the heat resistant lining of the furnace chamber being such that after the burner is shut down, the temperature in the furnace chamber falls to below the melting temperature of the billets before the temperature of any billet stationary in the chamber can rise to the melting temperature.

By using a light weight heat resistant skid and a low thermal mass lining in the furnace chamber, and arranging for the burner to shut down immediately on detection of any interruption in the regular flow of billets leaving the furnace chamber, the furnace may be operated at a considerably higher temperature than conventional enclosed skin furnaces. This gives a greater temperature differential between the furnace chamber and the billets, which increases the heat transfer rate and therefore increases the furnace efficiency. For example, in one form of furnace in accordance with the invention which has been designed for heating brass billets and in which the skid is made from Inconel 600 sheet and the furnace lining comprises layers of ceramic fibre board, the furnace can be operated at a temperature of about 1200°C, which is substantially above the melting temperature of brass (860°C), to produce a billet temperature or about 750°C at the outlet of the furnace chamber. Provided the time taken for the billet detector to detect an interruption in the flow of billets from the furnace and to shut down the burner is not too long, the temperature in the furnace chamber will drop from 1200°C to below 860°C before the temperature of the billets in the chamber rises to melting point.

The billet detector may comprise a pneumatic sensor which produces a pulse in response to the passage of a billet down a delivery chute which forms at least part of the delivery path, and a timer which is reset by each pulse from the sensor and which is operative to shut down the burner if not reset by a pulse within a predetermined time after the previous pulse. The sensitivity of the detector is therefore determined by the setting of the timer. The timer may be a pneumatic device comprising a reservoir having an orifice bleed and a pressure switch arranged to produce an electrical output signal if the pressure in the reservoir falls to a predetermined low value, the reser-
voir pressure being restored to a predetermined high value in response to each pulse from the sensor.

An interruption of the regular flow of billets down the delivery chute may be caused by one or more billets coming off the skid in the furnace chamber, by a fault in the feed mechanism, or by stoppage of the press when the billets are being fed to an automatic press and the press stroke is used to index the operation of the feed mechanism. Whatever the reason for the interruption, however, it is detected almost immediately and the burner is automatically shut down. In addition, the reject mechanism is automatically actuated, not so much for the purpose of preventing the supply to the press of any billets immediately following the interruption since it is preferable that burner shut down will also be accompanied automatically by stoppage of the feed mechanism, but primarily for ensuring that when the furnace is started up again the billets are automatically rejected until the furnace reaches its operating temperature and the billets leaving the furnace chamber are at the required temperature. For this purpose, once the reject mechanism has been actuated, it is arranged to remain operative until deactivated by an operator who determines when the billets are ready to be supplied through the delivery chute to the press.

The reject mechanism may be located up-stream or down-stream of the billet detector in the delivery path, but preferably it is located up-stream, comprising a reject chute and a gate which is movable, for example by means of a pneumatic cylinder, between an open position (reject mechanism actuated) in which the billets leaving the furnace chamber are arranged to drop down the reject chute instead of the delivery chute, and a closed position in which the billets leaving the furnace chamber are arranged to pass the reject chute and to drop down the delivery chute.

The burner is preferably of a high velocity premix type which is fitted in the top of the furnace chamber and which is supplied with an air/gas mixture by a standard air blast control train. The gas/air mixture is ignited within the burner by means of an electrical ignition probe and combustion takes place inside a burner quartz, the hot combustion products being ejected through the quartz into the furnace chamber through a converging slot directly above and in line with the skid. The furnace may of course be provided with more than one such burner depending on the length of the furnace chamber required, having regard to the size of billets which are to be heated.

The burner control means is preferably low fire biased so that the burner always lights at low fire and then drives to high fire, and when the furnace operating temperature is reached this is maintained substantially constant, preferably by modulating an air valve in the air blast train feeding the burner, in response to a temperature sensor in the furnace chamber. This may be a thermocouple mounted under the skid.

Preferably the air and gas supplies to the burner are provided with sensors and the burner is arranged to be rendered inoperative if either the air or gas pressure is below a predetermined minimum. Consequently, not only can the burner not be started without sufficient gas and air pressure, but the burner will automatically shut down, for example by closure of a valve controlling the gas supply, if there is an appreciable fall in gas or air pressure during operation of the furnace.

Preferably the furnace chamber comprises two sections, a lower section in which the skid is mounted, and an upper section in which the burner is mounted and which is hinged to the lower section so that it can be raised and lowered, for example by means of a pneumatic cylinder, to open and close the furnace chamber. With this arrangement the furnace in accordance with the invention combines the ease of access of an open hearth type furnace with the higher efficiency of an enclosed skid furnace. As a safety precaution, the furnace is preferably provided with a switch which is operated to render the burner inoperative if the furnace chamber is not closed.

A particular example of a furnace in accordance with the invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a side elevation of the furnace;
Figure 2 is a plan view of the furnace;
Figure 3 is an end elevation of the furnace; and,
Figure 4 is a cross section through the furnace casing taken on the line IV—IV in Figure 1.

The furnace shown in the drawings has been designed for heating small brass billets to a temperature of approximately 750°C for supply to an automatic stamping press (not shown).

The furnace comprises a steel casing which is split into two parts, a lower or base part 1 comprising a folded channel section 3 and end plates 4 and 5 welded to the section 3, and an upper or lid part 2 comprising a folded inverted channel section 6 having end plates 7 and 8 welded to it. The lower casing part 1 is fixed on a suitable support, indicated generally at 9, and the upper part 2 is hinged to the lower part 1 by means of a hinge pin 10 which extends along one side of the casing and is journaled in laterally extending flanges of the end plates 4, 5, 7 and 8. The casing is arranged to be opened and closed by raising and lowering the lid 2 about the hinge pin 10 by means of a pneumatic cylinder 11 which has its lower end pivotally mounted on a post 12 fixed to the lower casing part 1 and which has its piston rod 13 pivotally attached to a lever 14 fixed to the lid 2 approximately midway along its length. A hook shaped catch 15 provided with manipulating handle 16 is pivotally attached to the lever 14 so that when the lid 2 is opened it can be locked in the open position by engaging the hooked end of the catch 15 below a retaining pin 18 fixed between a pair of anchor plates 19 which in turn are fixed to the side of the base part 1. One of the anchor plates 19 also mounts a microswitch.
20 which detects when the lid 2 is opened and which is closed only when the casing is fully closed. It is to be noted that both the anchor plates 19 and the lever 14 are provided with bearing holes through which the hinge pin 10 passes and which provide additional support for the hinge pin.

As shown in Figure 4, the lower and upper parts 1 and 2 of the furnace casing are lined with heat resistant ceramic fibre material 21 so that when the lid 2 is closed a relatively small rectangularly sectioned, longitudinally extending furnace chamber 22 is formed substantially centrally within the casing by means of a channel in the lining of the lower casing part 1. The ceramic fibre lining 21 of the lower part 1 comprises layers 23 or 1260°C grade ceramic fibre board covering the end walls 4 and 5 and the sides and bottom of the chamber which are as shown in Figure 4, and a layer 24 of 1600°C grade ceramic fibre moist felt lining the inner and upper surfaces of the layers 23 to form a strong high temperature resistant lining to the furnace chamber 22. The ceramic fibre lining 21 in the upper part 2 is formed by a layer 25 of 1260°C grade ceramic fibre blanket, layers 26 of 1260°C grade ceramic fibre board, and an outermost layer 27 (i.e., facing the furnace chamber 22) of 1600°C grade ceramic fibre moist felt, the layers being cut to fit around a pair of gas burner units 28 which are mounted in the lid part 2 towards one end of the casing, and also around a flue opening 25 at the opposite end of the casing. The ceramic fibre moist felt layers 24 and 27 are fitted wet and are dried in position prior to operation of the furnace. When the casing is closed the furnace chamber 22 is sealed by means of a ceramic fibre blanket 30 fitted in the lower part 2.

Set centrally into the base of the furnace chamber 22 is a V-shaped skid 31 which extends longitudinally through the furnace chamber, extending through an inlet opening 32 at one end of the lower casing part 1 and through an outlet opening 33 at the other end of the lower part 1. The skid 31 is formed to a 90 degree angle from a strip of Inconel 600, which is a light-weight heat resistant material, and is fixed at the outlet end of the casing part 1 so that it is free to expand at the inlet end where an overlapping inlet section 34 is provided to accommodate such movement of the skid 31.

The burners 28 mounted in the lid section 2 of the furnace casing are of a high velocity premix type which is fed with a gas mixture by a standard air blast control train comprising a common air supply duct 35 which branches to supply a pair of injectors 36 which entrain gas supplied to each from a gas supply duct 37. The air supply duct 35 contains a low pressure sensor (not shown) and a modulating valve (also not shown) for controlling the air supply as described later. The gas supply duct 37 also contains a low pressure sensor (not shown), and is provided with a control valve (also not shown) for shutting off the gas supply to shut down the burners.

The gas/air mixture is conducted from the injectors 36 to the burners 28 by pipes 38. Each of the burners 28 comprises a refractory lined top section 39 which is mounted on the top of the casing part 2 and which carries a row of gas/air mixing tubes 40 and a spark ignition probe 41, and a lower section 42 which is fitted within the lined lid part 2 of the furnace casing and which comprises a quartz cast from fused alumina refractory material. The gas and air which is supplied to each burner 28 is directed downwards through the mixing tubes 40 for combustion in the quartz of the lower section 42, the hot combustion products entering the furnace chamber 22 through a converging slot outlet 43 from the quartz which is directly above and in line with the skid 31. As mentioned earlier, the burners 28 are located towards the outlet end of the furnace chamber 22, and the hot combustion products entering the chamber 22 therefore move along the channel towards the inlet end where they are arranged to exit from the channel through the flue opening 29.

In operation of the present example, the burners 28 will bring the furnace chamber 22 to its operating temperature of approximately 1200°C within two minutes, the temperature being measured by a thermo-couple (not shown) which is located under the skid 31. When the operating temperature is reached, it is maintained substantially constant by means of a controller (not shown) which is responsive to the thermocouple and which operates the modulating valve in the air supply duct 35, thereby controlling the air/gas supply to the burners.

It is to be noted that the part of the air/gas supply train to the burners 28 shown in the drawings is fixed to the lid section 2 of the furnace casing by means of brackets 44, 45 and clamps 46, movement of the train when the lid section 2 is opening and closed being accommodated by flexible sections in the air and gas supply ducts 33 and 37.

Adjacent the inlet end of the furnace casing is a billet feed mechanism 47 for orienting and feeding a regular supply of billets onto the inlet section 34 of the skid 31. In the present example the billet feed mechanism 47 is of a known type comprising a pair of vibrating bowls (not shown) from which oriented billets are supplied via lateral feed paths 48 to a pair of feed positions on opposite sides of a stop 49 which is aligned with the axis of the skid 31. Associated with the two feed positions are a pair of pushers 50 arranged to be advanced and retracted by pneumatic cylinders 51, and by operating the cylinders out of phase billets are pushed alternately from the two feed positions through a tapering guide 52 to an outlet path 53 leading onto the inlet section 34 of the skid. In operation the cylinders 51 of the feed mechanism 47 are actuated in response to a signal from the press which is being fed by the furnace, so that each time a billet is stamped by the press one of the pushers 50 is advanced to push a fresh billet towards the skid, thereby
advancing all of the billets already on the skid and causing the leading billet to be fed to the press for the next stamping stroke.

Mounted on the support 9 adjacent the outlet end of the furnace casing is a billet discharge mechanism 54 having a guide channel 55 arranged to receive billets from the outlet end of the skid 31 and leading to a vertical passage 56 through which the billets are arranged to drop and which forms the lead-in part of a delivery chute 57 leading to the press. For the purpose of detecting any interruption in the regular supply of billets to the press during normal operation, the discharge mechanism 54 is provided with a billet sensor 58 in the form of a lever which is pivotally mounted about an axis 59 and which has a rest position, determined by a stop 60 engaging the lever, in which one arm 61 of the lever projects laterally into the passage 56 and the other arm 62 of the lever blocks a pneumatic passage 63. When a billet drops down the passage 56 to the delivery chute 57 it engages the arm 61 of the sensor 58, causing the sensor to pivot about the axis 59 so that the arm 62 unblocks the passage 63 to allow a pulse of air to flow to a timer (not shown) until the passage 63 is again closed when the sensor 58 returns to its rest position. The pulse sets the timer in operation, the timer being arranged to time out and issue a shut down signal if a predetermined time elapses without another billet dropping down the passage 56. The predetermined time is set to be greater than the normal interval between successive billets in the regular supply to the press. Consequently, during normal operation, the timer will not have timed out when the next billet drops down the passage 56 and pivots the sensor 58 to cause a fresh pulse to be sent to the timer, which is thereupon restarted. However, if for any reason there is an interruption in the regular flow of billets down the passage 56 the timer will time out and initiate a stop signal in response to which a control valve (not shown) in the gas supply duct 37 is closed to shut down the burners.

Also incorporated in the billet discharge mechanism 54 is a reject facility. This comprises a slide 64 which forms part of the floor of the channel 55 and which can be moved laterally to uncover a second vertical passage 65 in the path between the discharge end of the skid 31 and the passage 56 leading to the delivery chute 57. The second vertical passage 65 leads to a reject chute 66 and, when open, prevents any billets from reaching the delivery passage and chute 56, 57. The slide 64 is moved between its open and closed positions by means of a pneumatic cylinder 67 which is mounted on the side of the lower casing part 1 and which has its piston rod 68 connected to the slide 64 through a series of pivotally connected links 69, 70 and 71. The cylinder 67 is arranged to be operated to open the slide 64 automatically at the same time as the burners are shut down, and there is also means (not shown) for manually actuating the reject cylinder 67. In either case, however, the slide can be closed only by manual actuation of a switch (not shown) so that, on start-up or after any stoppage, the burners will not be supplied with the press from the furnace until the operator decides to close the slide 64, that is when he is satisfied that the billets are being heated to the required temperature.

The controls of the furnace are arranged so that, during operation, the gas control valve will close to shut down the burners in response to any one of the following happenings, detection of billet flow failure by the sensor 58, low pressure in either of the air and gas supply ducts 35 and 37 as detected by the appropriate low pressure sensor, opening of the furnace chamber lid 2 as detected by a switch 20 and actuation of a stop push button by the operator. In addition to closing the gas control valve, occurrence of any one of the above will also cause the controller to drive the modulating air valve to the minimum setting, deactivate the billet feed mechanism 47 to stop the supply of billets, and operate the reject mechanism to open the gate 64 to the reject chute 66. It is to be noted that the burners cannot be ignited if the furnace lid switch 20 is open or if either of the low pressure sensors in the air and gas supply ducts signal that the pressure in the duct is too low.

Claims

1. A furnace of the enclosed skid type for heating billets to a predetermined temperature which is below their melting temperature as the billets are moved at a predetermined rate along the skid through the furnace chamber, the furnace comprising a billet feed mechanism adjacent the inlet end of the furnace chamber for regularly feeding billets on to and along the skid, a gas burner for raising the temperature in the furnace chamber to an operating temperature which is higher than the melting temperature of the billets, burner control means for maintaining the operating temperature substantially constant, a delivery path adjacent the outlet end of the furnace chamber for receiving billets as they leave the chamber, a billet detector arranged to detect an interruption of the regular flow of billets from the furnace chamber and to shut down the burner when such an interruption is detected, and a reject mechanism for diverting billets from the delivery path and operative if the burner is shut down, the thermal mass of the skid and the heat resistant lining of the furnace chamber being such that, after the burner is shut down, the temperature in the furnace chamber falls to below the melting temperature of the billets before the temperature of any billet stationary in the chamber can rise to the melting temperature.

2. A furnace according to Claim 1, in which the heat resistant lining of the furnace chamber comprises ceramic fibre material.

3. A furnace according to Claim 1 or Claim 2, in which the skid has a V-shaped cross section and is made of Inconel 600.

4. A furnace according to any one of Claims 1 to 3, in which the skid is fixed at the outlet end of the
furnace chamber and is free to expand at the inlet end of the chamber.

5. A furnace according to any one of the preceding claims, in which the delivery path comprises a chute, and the billet detector comprises a pneumatic sensor which produces a pulse in response to the passage of a billet down the delivery chute, and a timer which is reset by each pulse from the sensor and which is operative to shut down the burner if not reset by a pulse within a predetermined time after the previous pulse.

6. A furnace according to Claim 5, in which the sensor comprises a pivoted member having a rest position in which one arm of the member projects into the delivery chute and another arm of the member blocks a pulse producing air jet, the arrangement being such that the passage of a billet down the delivery chute engages the arm which projects into the chute so that the member is rotated to allow the billet to pass, this movement of the member unblocking the air jet to produce a pulse.

7. A furnace according to Claim 5 or Claim 6, in which the timer is a pneumatic device comprising a reservoir having an orifice bleed and a pressure switch arranged to produce an electrical output signal if the pressure in the reservoir falls to a predetermined low value, the reservoir pressure being restored to a predetermined high value in response to each pulse from the sensor.

8. A furnace according to any one of the preceding claims, in which the reject mechanism is located upstream from the billet detector in the delivery path.

9. A furnace according to Claim 8 when dependent on any one of Claims 5 to 7, in which the reject mechanism comprises a reject chute and a gate which is movable between an open position in which billets leaving the furnace chamber are arranged to drop down the reject chute instead of the delivery chute, and a closed position in which the billets leaving the furnace chamber are arranged to pass the reject chute and to drop down the delivery chute.

10. A furnace according to any one of the preceding claims, in which the reject mechanism, when actuated, is arranged to remain operative until deactivated by an operator.

11. A furnace according to any one of the preceding claims, in which the burner is of a high velocity premix type which is fitted in the top of the furnace chamber so that the hot combustion products from the burner are ejected into the furnace chamber through a converging slot directly above and in line with the skid.

12. A furnace according to Claim 11, in which the air and gas mixture is fed to the burner by an air blast control train, and the burner control means comprises means for modulating an air valve in the air blast train in response to a temperature sensor in the furnace chamber.

13. A furnace according to Claim 11 or Claim 12 in which the air and gas supplies to the burner are provided with pressure sensors, and the burner is arranged to be rendered inoperative if either the air or gas pressure is below predetermined minimum.

14. A furnace according to any one of the preceding claims, in which the furnace chamber comprises a lower section in which the skid is mounted, and an upper section in which the burner is mounted and which is hinged to the lower section so that it can be raised and lowered to open and close the furnace chamber.

15. A furnace according to Claim 14, in which the furnace is provided with a switch which is open to render the burner inoperative if the furnace chamber is not closed.

16. A furnace according to any one of the preceding claims, in which the billet feed mechanism is arranged to stop if the burner is shut down.

17. A furnace according to any one of the preceding claims, in which the delivery path is arranged to deliver billets to a press for stamping and the billet feed mechanism is arranged to feed billets onto the skid in synchronism with the stroke of the press.

Patentansprüche


2. Offen nach Anspruch 1, dadurch gekennzeichnet, daß die wärmebeständige Auskleidung der Ofenkammer aus keramischem Fasermaterial besteht.

3. Offen nach Anspruch 1 oder 2, dadurch
gekennzeichnet, daß die Gletschiene einen V-förmigen Querschnitt aufweist und aus Inconel 600 hergestellt ist.

4. Ofen nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die Gletschiene am Auslaßende der Ofenkammer befestigt und am Einlaßende der Kammern frei ausdehnbar gehalten ist.


6. Ofen nach Anspruch 5, dadurch gekennzeichnet, daß der Sensor einen Schwenkbauteil mit einer Ruhestellung aufweist, in der ein Arm des Bauteils in die Abgaberutsche hineinragt und ein anderer Arm des Bauteils einen Impuls erzeugenden Luftstrom blockiert, wobei die Anordnung so getroffen ist, daß die Ausgaberutsche hinabgleitender Barren oder Knüppel mit dem in die Rutsche hineinragenden Arm in Wirkverbindung kommt, so daß der Bauteil verschwenkt wird, um den Barren oder Knüppel vorbeizulassen, wobei durch diese Bewegung des Bauteils der Luftstrom zur Erzeugung eines Impulses freigegeben wird.

7. Ofen nach Anspruch 5 oder 6, dadurch gekennzeichnet, daß der Zeitgeber eine pneumatische Vorrichtung ist, die einen Vorratshäuser mit einer Ableitung einschließt, der die elektrische Ausgangssignale erzeugt, wobei der Druck im Vorratsbehälter unter einen vorbestimmten niedrigen Wert abfällt, wobei der Vorratshäuserdruck bei jedem Impuls vom Sensor her wieder auf einen vorbestimmten hohen Wert gebracht wird.

8. Ofen nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß der Aussortiermechanismus in Förderrichtung vor dem Barren- oder Knüppeldetektor, das heißt stromaufwärts von diesem angeordnet ist.

9. Ofen nach Anspruch 9 in Abhängigkeit von einem der Ansprüche 5 bis 7, dadurch gekennzeichnet, daß der Aussortiermechanismus ein Ausstoßrohr und ein Tor aufweist, das zwischen einer Ofenstellung, in der die die Ofen kammer verlassenden Barren oder Knüppel die Ausstoßrutsche hinunterfallen, und einer Geschlossenstellung bewegbar ist, in der die die Ofenkammer verlassenden Barren oder Knüppel sich an der Ausstoßrutsche vorbeiwegen und die Abgaberutsche hinunterfallen, bewegbar ist.

10. Ofen nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß der Aus sortiermechanismus, wenn er betätigt wird, betäti gte bleibt, bis er durch eine Bedienungsperson entaktiviert wird.


15. Ofen nach Anspruch 14, dadurch gekennzeichnet, daß er mit einem Schalter versehen ist, der den Brenner bei nicht-geschlossener Ofen kammer abschaltet hält.

16. Ofen nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß der Barrenzuführmechanismus so eingerichtet ist, daß er stillsteht, wenn der Brenner abschal tet ist.

17. Ofen nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß der Abgabeweg Barren oder Knüppel einer Presse zum Prüfen zuführt und daß der Barrenzuführmechanismus Barren oder Knüppel synchron mit dem Hub der Presse auf die Gletschiene ließt.

Revendications

1. Four du type à glissière recouverte pour le chauffage de billettes, à une température prédéterminée qui est au-dessous de leur température de fusion pendant que les billettes sont déplacées à une vitesse prédéterminée le long de la glissière à travers la chambre du four, le four comprenant un mécanisme d'avarce des billettes adjacent à l'extrémité d'entrée de la chambre du four, destiné à faire avancer régulièrement les billettes sur et le long de la glissière, un brûleur à gaz destiné à élever la température dans la chambre du four jusqu'à une température de travail qui est plus élevée que la température de fusion des billettes, des moyens de commande du brûleur destinés à maintenir la température de travail sensiblement constante, une voie de distribution
adjacente à l’extrémité de sortie de la chambre du four et destinée à recevoir les billettes lorsqu’elles sortent de la chambre, un détecteur de billettes agencé de façon à détecter une interruption de l’écoulement régulier des billettes sortant de la chambre du four et à arrêter le brûleur lorsqu’une telle interruption est détectée, et un mécanisme de rejet destiné à dévier les billettes de la voie de distribution et intervenant si le brûleur est arrêté, la masse thermique de la glissière et le garnissage résistant à la chaleur de la chambre du four étant tels que, après l’arrêt du brûleur, la température régnant dans la chambre du four tombe au-dessous de la température de fusion des billettes avant que la température de toute billette immobilisée dans la chambre puisse s’élever à la température de fusion.

2. Four selon la revendication 1, dans lequel le gainage résistant à la chaleur de la chambre du four comprend une matière à fibres céramiques.

3. Four selon la revendication 1 ou la revendication 2, dans lequel la glissière présente une section transversale de forme en V et est réalisée en Inconel 600.

4. Four selon l’une quelconque des revendications 1 à 3, dans lequel la glissière est fixée à l’extrémité de sortie de la chambre du four et peut se dilater librement à l’extrémité d’entrée de la chambre.

5. Four selon l’une quelconque des revendications précédentes, dans lequel le voie de distribution comprend une goulotte, et le détecteur de billettes comprend un capteur pneumatique qui produit une impulsion en réponse au passage d’une billette descendant dans la goulotte de distribution, et une minuterie qui est remise à zéro par chaque impulsion provenant du capteur et qui intervient de façon à arrêter le brûleur si elle n’est par remise à zéro par une impulsion au bout d’un temps prédéterminé suivant l’impulsion précédente.

6. Four selon la revendication 5, dans lequel le capteur comprend un élément pivotant ayant une position de repos dans laquelle un premier bras de l’élément dépasse dans la goulotte de distribution et un autre bras de l’élément arrête un jet d’air produisant une impulsion, l’agencement étant tel que le passage d’une billette descendant dans la goulotte de distribution fait porter la billette sur le bras qui dépasse dans la goulotte afin que l’élément soit basculé pour permettre à la billette de passer, ce mouvement de l’élément déblocant le jet d’air pour produire une impulsion.

7. Four selon la revendication 6 ou la revendication 6, dans lequel la minuterie est un dispositif pneumatique comprenant un réservoir présentant un orifice d’échappement et un commutateur à pression agencé de façon à produire un signal électrique de sortie si la pression dans le réservoir tombe à une basse valeur prédéterminée, la pression du réservoir étant rétablie à une haute valeur prédéterminée en réponse à chaque impulsion provenant du capteur.

8. Four selon l’une quelconque des revendications précédentes, dans lequel le mécanisme de rejet est placé en amont du détecteur de billettes dans la voie de distribution.

9. Four selon la revendication 8 lorsqu’elle dépend de l’une quelconque des revendications 5 à 7, dans lequel le mécanisme de rejet comprend une goulotte de rejet et une porte qui est mobile entre une position d’ouverture dans laquelle des billettes sortant de la chambre du four sont agencées de façon à tomber dans la goulotte de rejet au lieu de la goulotte de distribution, et une position de fermeture dans laquelle les billettes sortant de la chambre du four sont agencées de façon à franchir la goulotte de rejet et à tomber dans la goulotte de distribution.

10. Four selon l’une quelconque des revendications précédentes, dans lequel le mécanisme de rejet, lorsqu’il est actionné, est agencé pour rester en fonction jusqu’à ce qu’il soit mis hors d’action par un opérateur.

11. Four selon l’une quelconque des revendications précédentes, dans lequel le brûleur est d’un type à prémélangé à grande vitesse, qui est monté à la partie supérieure de la chambre du four afin que les produits de combustion du brûleur soient éjectés dans la chambre du four en passant par une fente convergente directement au-dessus et en alignement avec la glissière.

12. Four selon la revendication 11, dans lequel le mélange d’air et de gaz est fourni au brûleur par un système de commande de soufflage d’air, et les moyens de commande du brûleur comprennent des moyens destinés à moduler une valve à air située dans le système de soufflage d’air en réponse à un capteur de température situé dans la chambre du four.

13. Four selon la revendication 11 ou la revendication 12, dans lequel les alimentations en air et en gaz du brûleur sont équipées de capteurs de pression, et le brûleur est agencé de façon à être mis hors d’action si la pression de l’air ou du gaz est au-dessous d’un minimum prédéterminé.

14. Four selon l’une quelconque des revendications précédentes, dans lequel la chambre du four comprend une partie inférieure dans laquelle la glissière est montée, et une partie supérieure dans laquelle le brûleur est monté et qui est articulée sur la partie inférieure de façon à pouvoir être élevée et abaissée pour ouvrir et fermer la chambre du four.

15. Four selon la revendication 14, dans lequel le four est équipé d’un commutateur qui est ouvert pour mettre le brûleur hors d’action si la chambre du four n’est pas fermée.

16. Four selon l’une quelconque des revendications précédentes, dans lequel le mécanisme d’avance des billettes est agencé de façon à s’arrêter sur le brûleur est arrêté.

17. Four selon l’une quelconque des revendications précédentes, dans lequel la voie de distribution est agencée pour distribuer des billettes vers une presse à emboutir et le mécanisme d’avance des billettes est agencé pour faire avancer les billettes sur la glissière en synchronisme avec la course de la presse.