The present invention relates to improvements in hot blast stoves such as those used to preheat the combustion air supplied to a conventional form of blast furnace.

A primary object of the invention is to provide a hot blast stove having a combustion chamber and a checker chamber with an upright division wall between them including a stratum of heat-insulating material effective to retard the transfer of heat through the division wall so as to substantially equalize the temperature throughout the entire cross-sectional area of the checker chamber at any desired horizontal plane or zone of the stove.

A further object of the invention is to provide such a division wall having incorporated therein a layer of material of lower heat conductivity than that of the remainder of the wall.

A more detailed object of the invention is to provide a division wall between the combustion chamber and the checker chamber of a hot blast stove with a heat-insulating material of graduated heat conductivity incorporated therein, which is effective to variably retard the transfer of heat through the division wall at different elevations or zones, so as to substantially equalize the temperature in the checker chamber at such various zones of the stove.

For a more complete disclosure of the invention, reference should be made to the following detailed description, the accompanying drawings, and the appended claims.

In the drawings:

Figure 1 is a vertical longitudinal section through a hot blast stove embodying the invention.

Figure 2 is a horizontal section on line II—II of Figure 1.

Figure 3 is a fragmentary detail of a portion of the division wall between the combustion and checker chambers of the stove, including a stratum of heat-insulating material of varying heat conductivity at different horizontal zones of the stove.

Referring in detail to the drawings, reference numeral 10 represents the outer annular refractory brick wall of the stove which is usually enclosed by a substantially cylindrical steel shell 12. At the top there is a substantially semispherical brick roof 14 covered by a dome-shaped steel cap 16.

In the embodiment of the invention illustrated, there is an upright division wall 18 curved in plan, dividing the interior of the stove into a combustion chamber 20 and a checker chamber 22, the latter being substantially filled with a conventional form of checker brick 24 resting on the usual supporting structure indicated generally at 26. The stove is equipped with an inlet port 28 through which gas and air for combustion are supplied during the heating cycle. During such cycle the air and gas are intermingled and burned in the combustion chamber 20, and the products of combustion pass to a suitable stack (not shown) by way of an exhaust port 30. When the stove is on blast, cold air enters through port 32, passes upwardly through the multiplicity of flues formed by the checkerbrick, thence downwardly through the chamber 20 and out by way of port 34 to a suitable hot blast main leading to the blast furnace.

The parts thus far described in detail are of somewhat conventional construction well known to those skilled in the art. A particular feature of the present invention relates to the novel construction of the division wall 18 separating the combustion chamber from the checker chamber. The claimed improvement involves incorporating in the division wall a stratum of heat-insulating material. For example, as shown in Figures 1 and 2, there is incorporated in the division wall an interior layer of material 18 characterized by a lower rate of heat conductivity than the portions 19 and 19 of the wall. The portions 19 and 19 may be formed of the conventional type of refractory brick normally used in hot blast stove construction and the material forming the stratum 18 will be of a character to retard the transfer of heat through the division wall for the express purpose of substantially equalizing the temperature in the checker chamber throughout substantially the entire cross-sectional area thereof at any desired horizontal zone or region of the stove. As illustrated in Figure 3, the thickness of the stratum of heat-insulating material 18 may vary at different elevations of the furnace, so as to provide a predetermined heat conductivity gradient. Instead of varying the thickness of the stratum 18, it may be of uniform thickness throughout but of differing densities or compositions at different elevations to provide any desired gradient of heat conductivity. The thickness of the heat-insulating material may be gradually increased from bottom to top, or vice versa, and may be entirely omitted at a predetermined point in the height of the wall, to suit the design or requirements of any given size of stove.

The herein claimed invention overcomes a troublesome problem which is inherent in hot blast stoves of conventional form. In such conventional stoves, during both the checker heating and air heating periods, the average temperature in the lower portion of the combustion chamber is considerably higher than the average temperature in the lower region of the checker chamber. This temperature differential
may vary from approximately 600°F to 1400°F during the air heating cycle, and from approximately 1500°F to 2250°F during the checker heating period. Due to the higher average temperature in the lower portion of the checker chamber, during both the checker heating and air heating periods, the refractory checkerwork immediately adjacent to an uninsulated division wall will be higher in temperature than the checkerwork more remote from the division wall. This difference in temperature in prior art construction is of sufficient magnitude to induce a differential expansion and contraction of the checkerwork in a given horizontal plane of the checker chamber, with resultant damage or destruction of the checkerwork or supports therefore in the base of the stove. The claimed invention overcomes this shortcoming inherent in prior art constructions by substantially equalizing the temperature of the checkerwork throughout the entire cross-sectional area at any given horizontal plane or region of the stove.

While I have illustrated the invention as embodied in a type of hot blast stove having a combustor chamber of approximately elliptical form, it will be understood that the invention is also applicable to hot blast stoves in which the combustor chamber is formed by an inner substantially circular wall either concentric to or tangent to the outer wall, it being obvious that the principles of the invention will apply by incorporating a body of heat-insulating material in a wall separating the combustor chamber from the checker chamber.

I claim:

1. A hot blast stove for heating blast furnace combustion air, comprising a hollow structure having an upright substantially hollow structure having an upright division wall dividing the interior of the stove into a combustor chamber and a checker chamber, said division wall including outer strata of fire-brick separated by a dissimilar stratum of heat-insulating material effective to retard the transfer of heat through said fire-brick strata, and a combustion chamber in said one face of said division wall and said annular wall, and a combustion chamber bounded by the other face of said division wall and said annular wall, said division wall consisting of two layers of refractory brick spaced apart by a layer of material of lower heat conductivity than that of the brick layers, the composite division wall being effective to retard the transfer of heat therethrough so as to substantially equalize the temperature in the checker chamber at any desired horizontal zone thereof.

2. A hot blast stove for heating blast furnace combustion air, comprising a hollow structure including an outer annular brick wall, an upright division wall, a body of checker brick between the other face of said division wall and said annular wall, and a combustion chamber bounded by the other face of said division wall and said annular wall, said division wall consisting of two layers of conventional refractory brick spaced apart by a layer of material of lower heat conductivity than that of the brick layers, the composite wall being effective to retard the transfer of heat therethrough so as to substantially equalize the temperature in the checker chamber at any desired horizontal zone thereof.

3. A hot blast stove for heating blast furnace combustion air, comprising a hollow structure including an outer annular brick wall, an upright division wall, a body of checker brick between the other face of said division wall and said annular wall, and a combustion chamber bounded by the other face of said division wall and said annular wall, said division wall consisting of two layers of refractory brick spaced apart by a layer of material of lower heat conductivity than that of the brick layers, the composite wall being effective to retard the transfer of heat therethrough so as to substantially equalize the temperature in the checker chamber at any desired horizontal zone thereof.

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