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FURNACE WALL AND PART THEREOF AND METHOD

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Fig. 1.

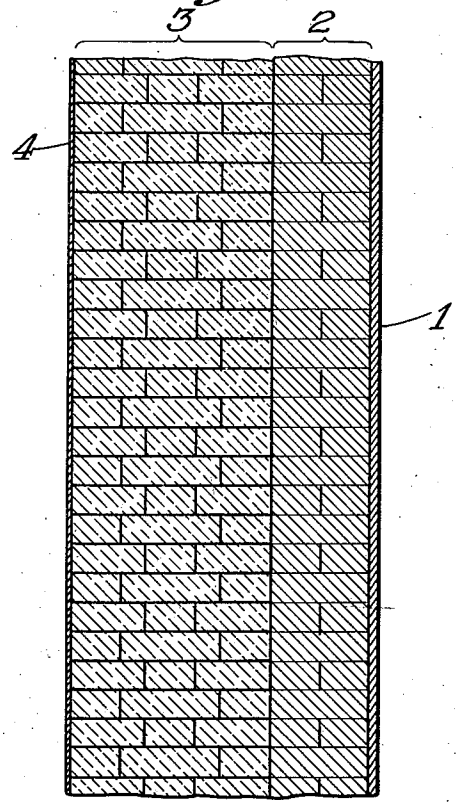
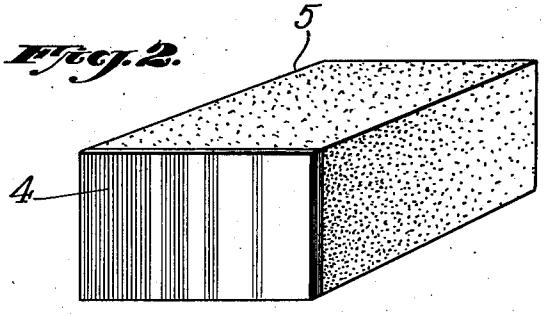


Fig. 2.



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FURNACE WALL AND PART THEREOF AND METHOD

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17 Claims. (Cl. 72—36)

The invention provides a method of making the walls of boiler furnaces and other furnaces in an economical way more durable.

The invention is particularly applicable to the improvement of ordinary furnace walls built of high refractory material, such as ordinary fire brick or tile and special fire brick or tile, for example. Such walls deteriorate rapidly under modern high temperature firing as in the use of oil, gas or pulverized coal. These fuels burn in suspension, producing very high temperatures. The ordinary walls are attacked by slag formed from the fine mineral matter in fuel also. The material of even the best fire brick is reduced to some extent to slag on its exposed face. The walls are cracked and the brick deformed. Such walls do not have a long life.

We have found that the life can be greatly prolonged by spraying molten metal, such as aluminum, on the bricks or other refractory material exposed to the fire. This may be done either before or after laying up the brick in the furnace walls. A surface is obtained which is highly resistant to the effects of heat at the high temperatures generally encountered in boiler furnaces for power plants and in other furnaces.

For best results the spraying should be done so as to apply a metal coating very uniformly and over the entire surface exposed, coating the depressions and elevations and filling in small surface cracks and the like. Our theory is that the metal film oxidizes and that it is this oxidizing or the combination of the oxide with the bricks or other refractory material which produces a surface resistant to high temperatures.

As an example of the process, we have sprayed the four vertical walls of a furnace in a large power house boiler with aluminum by the use of a spray gun of standard type to which the aluminum is fed in the form of wire. The boiler was operated at about 200% of rate for a period of 2500 hours. The walls were all found to be in perfect condition; the walls being straight and the brick being their original shape and no sign being found of slagging or spalling on the exposed surface.

This was a great improvement over the operation of similar furnaces with the old style walls operated under the same conditions and length of time. Similar improved results were obtained for portions of the walls of the furnace compared with the unsprayed remainder of the same walls.

The process may be selectively applied, in special cases, to any portions of the wall which are more exposed to the eroding and destructive tendencies of the flames on account of the rotation of the burners or for other possible reasons.

The coated walls have not cooled down as rapidly as the unsprayed walls when a boiler has been taken out of service, which indicates that the fire-exposed face has acquired an increased insulating as well as fire resisting property. The color of the sprayed surface was dull brown rather than the usual glazed black, indicating that the surface had never reached the molten state. No special care was taken, after taking the boiler out of service, in again firing the furnace and bringing the boiler up to the regular temperature and service. In this re-firing no spalling or other damage of the wall took place. The sprayed walls suffered no change of shape when being heated, remaining straight and plumb. Neither do the usual contraction cracks appear when the furnaces cool down, as the brick faces are not fused together and each brick is free to move a small amount necessary under the thermal strains involved.

The cost of spraying is very little, only a few cents per square foot of surface. The aluminum or other metal coating may be applied by other methods than spraying, though a sprayed coating is probably most readily oxidizable. And a coating of oxide might be provided before putting the furnace into use.

In fact the improved wall may be made of brick which are sprayed or otherwise coated before they are put into the wall. Handling the brick does not damage the coating because it is firmly attached to the brick.

It appears that the resistance acquired is due to the oxide of the metal, the oxide being formed promptly upon the firing of the furnace. Similar results can be obtained by providing the metal oxide before the furnace is in actual use; that is, by applying the coating beforehand to the wall or bricks and heating them to a temperature approximately equal to or greater than that to which they are to be subjected in use.

The accompanying drawing illustrates embodiments of the invention.

Fig. 1 is a vertical section of a furnace wall. Fig. 2 is a perspective end view of a single brick.

The wall of Fig. 1 has an outer shell 1 of steel or other metal next to which is a course 2 of ordinary fire-brick amounting to a third or a fourth of the total thickness, and inside of this is a course 3 of special fire-brick of superior refractory qualities, the whole wall being of the order of three feet in thickness. The bricks are laid up loosely; that is without mortar, so as to

yield to the expansion and contraction caused by the firing and the shutting down of the furnace. Such walls generally carry their own weight only, the tubing and boiler proper being suspended above.

The wall is coated on the inner face with a coating or film 4 of aluminum applied by a spray, as above explained.

Fig. 2 illustrates the application of the invention to separate bricks before laying them up in the wall. A fire-brick 5 has an aluminum coating 6 applied to the end which is to be exposed and extending slightly back from that end along the sides sufficiently to cover the corners of the brick.

The process of metal coating as herein described applies not only to furnace walls in which the brick are laid up loosely, but also to any style of furnace wall wherein the brick or other linings are laid in cement, mortar or other refractory binding.

The principle of the invention applies not only to aluminum but also to other metals whose oxides are highly refractory; such, for example as chromium, tungsten, molybdenum.

Various other modifications may be made by those skilled in the art without departing from the invention as defined in the following claims.

What we claim is:

1. The method of increasing the life of a furnace wall which consists in forming on the inner face thereof a thin coating of a metal of which the oxide is highly refractory.

2. The method of increasing the life of a furnace wall which consists in forming on the inner face thereof a thin coating of aluminum.

3. The method of increasing the life of a furnace wall which consists in spraying on the inner face of the wall metal whose oxide is highly refractory.

4. The method of increasing the life of a furnace wall which consists in spraying aluminum on the inner face of the wall.

5. The method of increasing the life of a furnace wall of refractory brick which consists in providing on the inner face thereof a coating of a highly refractory oxide formed in place thereon.

6. A high temperature furnace having a wall of refractory material on the inner face of which is formed in situ a coating of a metal whose oxide is highly refractory.

7. A high temperature furnace having a wall of refractory material on the inner face of which is a sprayed on coating of a metal whose oxide is highly refractory.

8. A high temperature furnace having a wall of refractory material on the inner face of which is formed in situ a coating of aluminum.

9. A high temperature furnace having a wall of refractory material on the iner face of which is a sprayed on coating of aluminum.

10. A high temperature furnace having a wall of refractory bricks on the inner face of which is formed in situ a coating of a highly refractory metal oxide.

11. A brick, tile or the like for use in the building of furnace walls having a face intended for exposure to high temperatures, on which face is formed in situ a coating of metal whose oxide is highly refractory.

12. A brick, tile or the like for use in the building of furnace walls having a face intended for exposure to high temperatures, on which face is a coating of aluminum formed in situ.

13. A brick, tile or the like for use in the building of furnace walls having a sprayed on coating of a metal whose oxide is highly refractory.

14. A brick, tile or the like for use in the building of furace walls having a sprayed on coating of aluminum.

15. A brick, tile or the like for refractory walls of furnaces having on the face which is to be exposed a coating of a highly refractory metal oxide formed in situ.

16. A high temperature furnace having a wall of refractory material and having sprayed thereon a metal whose oxide is highly refractory and which is oxidized inwardly from the exposed surface thereof.

17. A high temperature furnace having a wall of refractory material and having sprayed theron a coating of aluminum oxidized inwardly from the surface thereof.

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