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PATCHING INTERIOR SURFACES OF FURNACES

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This invention relates to the patching of interior surfaces of continuously operated furnaces, without interrupting or unduly disturbing the operations thereof. More particularly, this invention includes a practical method for building up a patch of refractory material upon a flame-exposed surface of a high temperature continuously operated furnace, such as the side walls or roof of a metallurgical or glass furnace, without interrupting the operation of the furnace or superheating the surface to be patched.

It has heretofore been proposed to patch interior surfaces of such a furnace during a period when the furnace is shut down and while the surface to be patched is relatively cool compared with the normal operating temperatures of the furnace. Patching under such conditions does not involve exceptional problems, but shutting down the furnace for repairs or patching greatly increases the maintenance and operating costs thereof. It has also been proposed to patch the interior surface of a furnace while in a heated state by applying a flame to the surface to be patched to superheat and soften the surface, and then blowing a granular refractory material against the softened surface in such a manner that the added refractory becomes embedded in the softened surface being treated. Such a procedure involves the expense and inconvenience of superheating the surface to be patched and requires the use of complicated apparatus to carry out the method while the furnace is being operated. This is especially true where the surface to be patched is not readily accessible from the outside of the furnace and a long operating nozzle is required.

It is an object of this invention to provide a method for patching an interior surface of a high temperature furnace during operation of the furnace and without superheating the surface to be patched.

It is also an object of this invention to build up a patch on a flame-exposed surface of a furnace, without interrupting the operation thereof, by spraying successive thin coats of pulverized refractory material on the surface to be patched in such a manner that the patch becomes thermally bonded and adhesively secured to the treated surface.

A further object of this invention is the provision of a patching method utilizing a slurry of refractory material having a particle size suitable for obtaining good adhesion when applied to the surface and having a chemical composition so proportioned as to form a durable integral patch.

We have discovered that a flame-exposed surface, such as the arch, side wall, or uptake of a reverberatory furnace can be successfully patched, without interrupting the operation of the furnace, by applying to such surface successive thin coats of a pulverized refractory material suspended in water in the form of a slurry. To obtain the best results, it is important that the particle size and chemical composition of the refractory material, and the plasticity of the slurry be properly regulated to effect good adhesion of the deposit when initially applied, and to effect hot bonding of the material after exposure to the heat of the furnace. The exact proportions of particle size and chemical composition will vary somewhat depending on the temperature of the surface to which the material is applied, the highest temperature to which this material is exposed under operating conditions, the durability required of the patch, and the location and position of the surface to be patched. For example, if a patch is to be applied to the underside of a furnace arch, better results will be obtained in general, by the use of a thinner slurry containing more water, whereas a thicker slurry containing less water is preferable for application to a side wall of a furnace.

We have discovered that the best results are obtained for high temperature metallurgical furnaces constructed of silica by using a refractory material composed of a sandstone or commercial silica high in SiO_2 , together with a small amount of a fire-clay up to about 10%. These refractory materials, preferably both pulverized to a particle size such that a major portion thereof will pass through a 200 mesh screen, should be mixed before application with a suitable quantity of water to obtain the desired plasticity. The actual quantities of water employed may be varied with the chemical composition of the refractory materials, although it is preferred that the resultant slurry have a specific gravity of approximately 1.5 to 1.9. Such a slurry is easily sprayed, using pneumatic pressure, and is easily transported through a simple delivery pipe to the place of application.

One very satisfactory way of making the slurry is to mix the fire-clay with a smaller amount of water than will be required ultimately and to subject this mixture to heat and agitation for a sufficient time to obtain a homogeneous suspension of the fire-clay. This clay suspension may then be thoroughly mixed with additional water and pulverized silica to provide a uniform aqueous suspension or slurry of refractory material