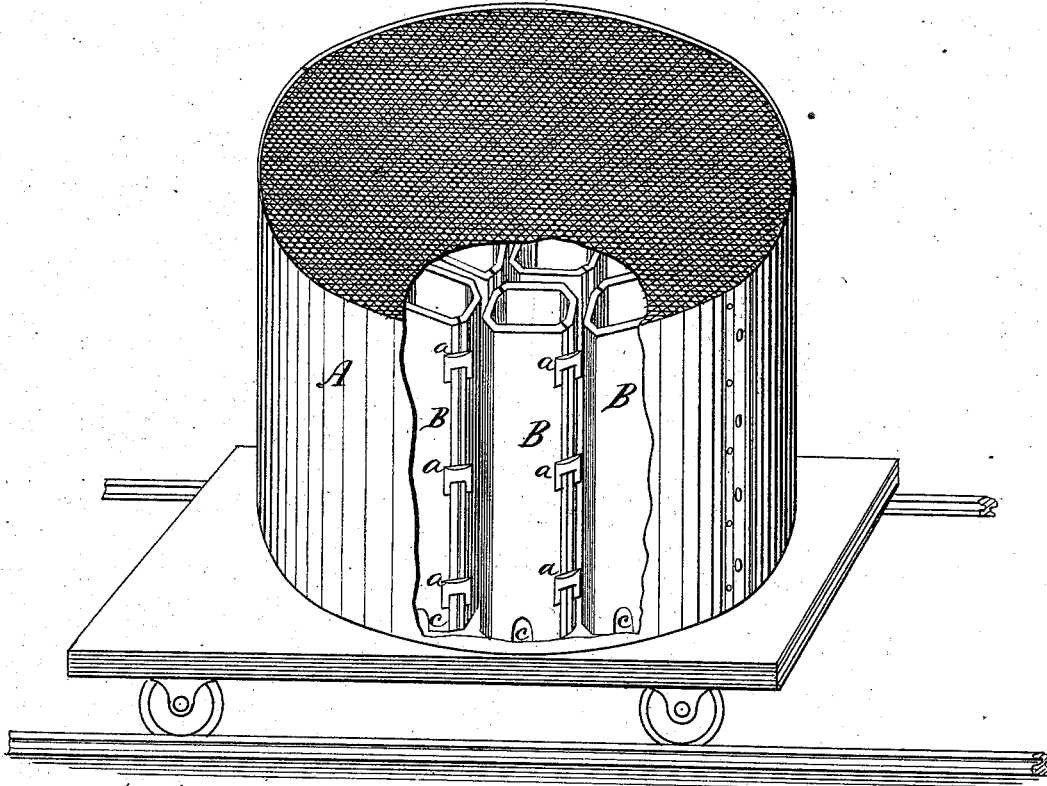


F. A. LUCKENBACH.  
 Annealing Furnace-Slag Castings.

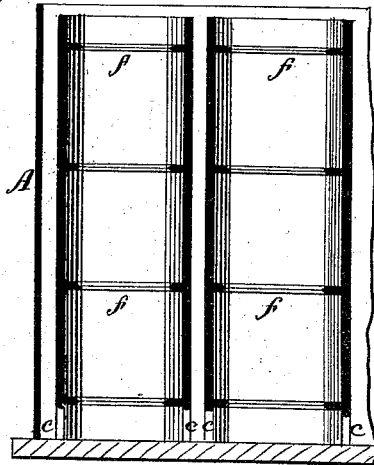
No. 162,932.

Patented May 4, 1875.

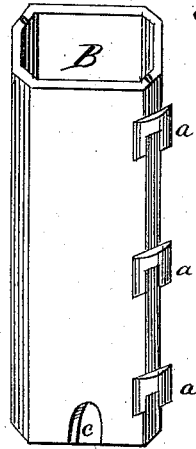
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



Witnesses.

*W. Edwards*  
*J. H. Matthaei*

Inventor.

*Fredrick A Luckenbach*  
 Per *James A Whitney*  
 Atty

# UNITED STATES PATENT OFFICE.

FREDERIC A. LUCKENBACH, OF NEW YORK, N. Y.

## IMPROVEMENT IN ANNEALING FURNACE-SLAG CASTINGS.

Specification forming part of Letters Patent No. **162,932**, dated May 4, 1875; application filed December 31, 1874.

*To all whom it may concern:*

Be it known that I, FREDERIC A. LUCKENBACH, of the city, county, and State of New York, have invented certain Improvements in Process of Annealing Castings formed of Blast-Furnace Slag, of which the following is a specification:

This invention is designed to provide for the manufacture of paving and building blocks, fire-brick, and other articles, from the slag of blast-furnaces, which shall be of even and uniform texture and homogeneous character throughout, and which shall be refractory in a degree hitherto unknown, possessed of unusual hardness, and consequent capacity for resisting wear, concussion, and attrition, as well as of resisting the action of fire when required. My invention comprises a novel process of annealing such castings, by providing around them an external mass of molten slag, which, inclosing the casting, and itself slowly cooling, retards radiation of heat from the castings, and thus insures the correspondingly slow cooling of the casting with even and uniform contraction in all its parts, thereby insuring its homogeneity and solidity throughout.

Figure 1 is a perspective and partial sectional view, showing the combination of the molds within the box or casing, with the required chambers between, as arranged preparatory to the practice of my invention. Fig. 2 is a detached sectional view on a larger scale of the molds, and Fig. 3 is a side view of one of the latter.

A is a box or casing of boiler-plate or other suitable material, and of any preferred shape and configuration. For convenience of moving, this box A may be mounted upon a truck or wheeled support of any kind. This box is made in vertical sections, united by bolts or keys that may be easily withdrawn to permit the removal of the same after the solidification of the slag, as hereinbefore explained. B are the molds, made in two vertical or longitudinal sections, held together by clamps *a* or other well-known or suitable devices, each mold having an opening at opposite sides of its lower end, as shown at *c*. Each mold has annular ribs *f*, of angular cross-section, ex-

tending around its inner circumference, at any required distances apart, as indicated in Fig. 2, the molds being of iron, either cast or wrought, each mold being put together, as shown in Fig. 3. Any desired number are set on end within the box A, and molten slag from the blast-furnace is run into the box. The slag, passing through the openings *a* on the bottom of each mold, fills the mold to the same height as it reaches in the box, or rather in the chambers formed by the interspaces between the molds, until the molds are filled, and also the chambers or interspaces between them and within the box, the slag in the said chambers surrounding the molds, which are embedded therein. The box thus filled is then allowed to stand, whereupon the mass of molten slag surrounding the molds, being itself of an intensely high temperature, effectually retards the radiation of heat from the molds, or rather of the slag contained in them. Moreover, the mass of slag surrounding the molds being uniform in its temperature, such slow radiation of heat from the molds as does occur is uniform from all parts thereof. From this it follows that uniform contraction in all its parts is secured to the casting within each mold. And inasmuch as difference in the texture, hardness, density, and refractoriness of slag castings are always due to differences in the temperature, time occupied, and other conditions attendant on the cooling of the casting, it follows that my invention, insuring as it does perfect uniformity of cooling, with the requisite slowness for annealing, provides for the production of slag castings perfectly uniform in texture of homogeneous character throughout all portions of them.

In some cases a more perfect annealing of the castings than is required for their use for ordinary purposes may be desired. In the event of this I place the box charged with the external mass of molten slag surrounding the inclosed molds bodily within an oven or system of ovens—such, for example, as shown and described in my Patent No. 133,466, dated November 26, 1872, by which means the radiation of heat from the external mass of slag is itself measurably retarded, and this, by aiding the action of the said mass in retarding

radiation from the castings within the molds, prolongs the annealing process, and renders it in some degree more thorough and effective.

When the box A, with its contents, has become coiled to the requisite degree, the sections of the said box are removed from the solidified contents, the external mass of slag is pried or knocked away, which in practice is readily done, and the molds are taken apart to permit the removal of the annealed castings contained therein.

What I claim as my invention is—

The process of annealing slag castings by the gradual cooling of a surrounding mass of slag cast simultaneously therewith, substantially as set forth.

FREDERIC A. LUCKENBACH.

Witnesses:

JAMES A. WHITNEY,  
WM. EDWARD.