

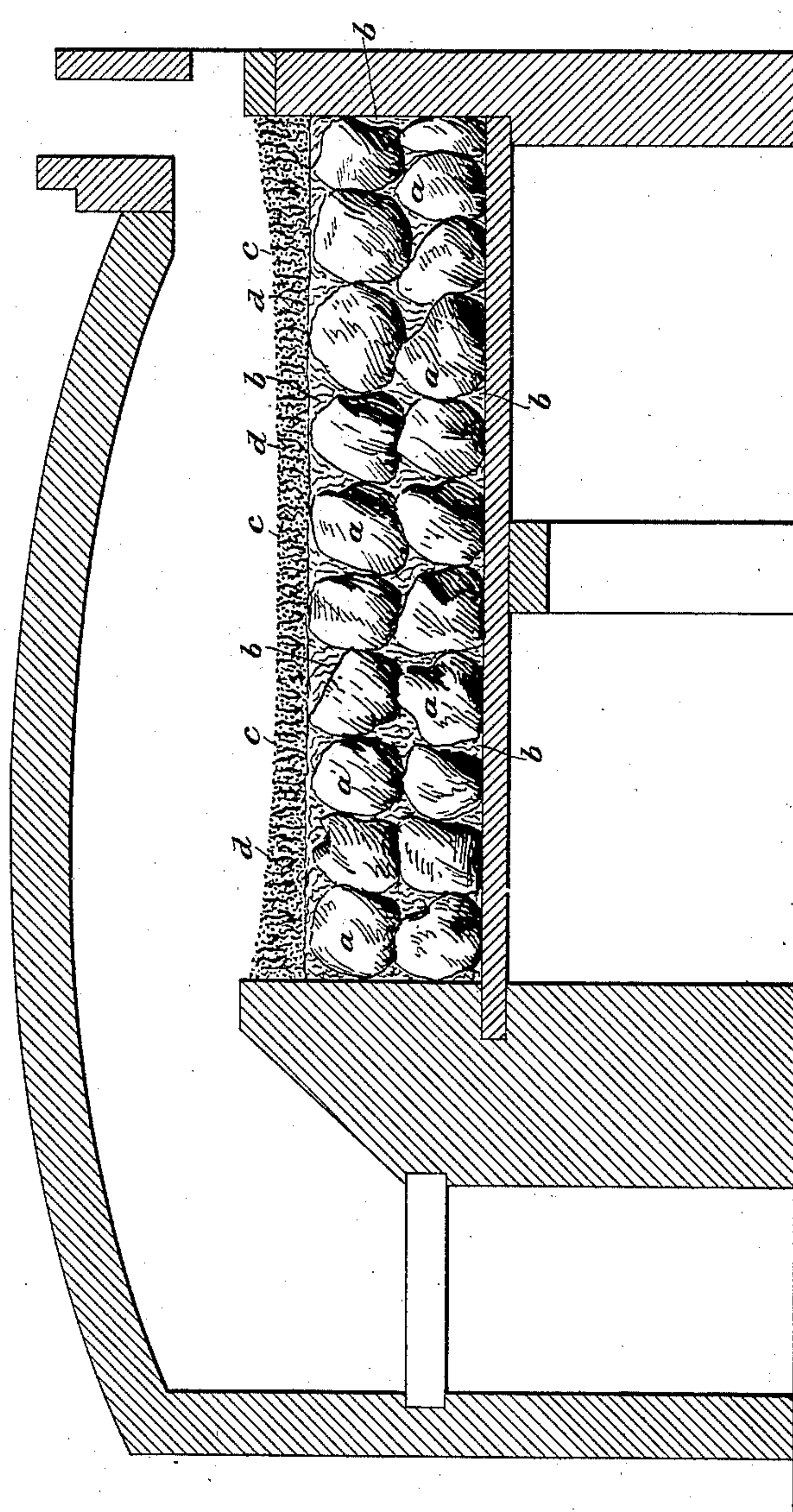
(No Model.)

C. J. EAMES.

COMPOUND GRAPHITIC HEARTH FOR METALLURGIC FURNACES.

No. 396,992.

Patented Jan. 29, 1889.



Witnesses,

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By his Attorney

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# UNITED STATES PATENT OFFICE.

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## COMPOUND GRAPHITIC HEARTH FOR METALLURGIC FURNACES.

SPECIFICATION forming part of Letters Patent No. 396,992, dated January 29, 1889.

Application filed February 3, 1887. Serial No. 226,359. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES J. EAMES, a citizen of the United States, residing in the city of New York, county and State of New York, have invented a certain new and useful Compound Graphitic Hearth for Metallurgic Furnaces; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing, and to the letters and figures marked thereon, which form a part of this specification.

The object of my invention is to provide a graphitic hearth or lining for furnaces that are used in the deoxidation of iron ores in the manufacture of iron sponge, which hearth shall be so constructed that the lumps of graphite shall be held together by the formation of iron sponge in the interstices between the lumps, forming a compact hearth and foundation which will preserve its form, thus protecting the sole-plate and walls of the furnace.

My invention has the additional object of providing a hearth of such solidity and strength that it will bear the weight of the reduced metal without losing its form or being broken or depressed, and that the reduced metal may be balled or manipulated upon the hearth without disintegrating the hearth or causing any portion of the hearth to be balled up with the metal, the effect being always to preserve a clean smooth hearth.

My invention is attained by forming the bed or hearth of ore-reducing furnaces of lumps of graphite and powdered iron ore. Hitherto the hearths of such furnaces have been formed by mixing with graphite or plumbago various proportions of fire-clay, fire-brick, &c., and forming the mixture into slabs, or plastering it on the sides and bottom of the furnace. This form of sole or hearth is liable to become soft when heated, and the superimposed charge of ore or metal is liable to sink through this soft substance and prevent the chemical action that should take place between the iron ore and the carbon in the deoxidation of iron ores. Again, in such cases, when it becomes necessary to remove the metal from the furnace, the weight of the metal frequently

breaks up and destroys this soft material, and thus makes it necessary to construct an entirely new sole or hearth before another charge can be worked. When a hearth is made merely of lumps of graphitic carbon without the addition of the ore or wrought-iron in the interstices, the lumps of carbon are liable to become displaced, and are sometimes balled up with the iron, thus preventing the proper welding of the sponge.

The material which I employ for the deoxidation of the iron ores and the formation of the sole or hearth of my furnace is plumbago or graphite, preferably the graphitic carbon of trade, such as is obtained at Cranston, Rhode Island, and elsewhere.

The construction of my hearth is indicated in the annexed drawing, which is a longitudinal vertical section of the same.

I prefer to make my hearth in the following manner: I place upon the sole of an ordinary reverberatory furnace a layer of graphitic carbon in the form of lumps. These lumps may be of any size that will pack well and form a comparatively level surface. I prefer, however, to use lumps of about twelve inches in thickness, or, in other words, lumps that are of about the size of a man's head. I make this first layer of carbon from twelve to twenty-four inches in depth. After the carbon layer has been made as level as possible I fill up the interstices between the lumps of carbon with any finely-powdered iron ore. Then I cover the entire surface of the graphitic lumps and the iron ore with ground graphitic carbon of about the size of grains of wheat, and to a depth of from two to four inches on the level middle portion, and from three to six inches near the sides and walls. I then raise the furnace to a temperature that will expel the moisture from the ore and graphite. When the moisture has been thus expelled, I place another layer of finely-powdered iron ore on top of the last layer of graphite, making the layer of iron ore from about half an inch to an inch thick. Then I raise the temperature of the ore and graphite gradually or by degrees up to about 2,500° Fahrenheit or more, taking care not to increase the heat to such a point as to melt the ore before it has



been deoxidized. It is important in this part of the operation that the temperature should be increased gradually from the commencement of the heating. When these several  
5 layers of iron ore have become deoxidized and reduced into iron sponge, which will take from three to five hours or more, I discontinue the high temperature, but hold sufficient heat in the furnace to keep the newly-converted  
10 iron in a soft condition. The iron sponge produced by the last heating will be found to have become so incorporated with the carbon as to form an integral compound hearth with a suitable surface of carbon and iron. When  
15 the hearth is in this condition, I proceed to pound it with a heavy wrought-iron maul or dolly until it becomes compact and forms a solid combined graphitic and iron-sponge bottom. The hearth will then be in a form such  
20 as is represented in the annexed drawing.

*a* is the bottom layer of graphitic carbon.

*b* represents the iron sponge after it has been reduced from the iron ore.

*c* is the upper layer of graphite in finer  
25 lumps or grains intermingled with the iron sponge *d*. The hearth is slightly bowl-shaped, as is shown in the drawing.

When the hearth has been made as above described, it is then ready for use. The charge  
30 of iron ore to be deoxidized and reduced to

sponge, together with the reducing agent, is spread upon this solid compact bottom, and remains in that position until the process of deoxidation is complete and the iron is ready  
35 for balling. The charge will not adhere to the hearth, but can be easily raised from off the hearth and balled and taken thence to the blooming-hammer. The hearth will be found to be very durable, and will not require  
40 further manipulation until it has become worn by long usage. When this compound hearth has been worn away to any considerable extent, it can be renewed or repaired by spreading a fresh layer of fine graphite and  
45 powdered iron ore on the top of the hearth, and pounding down the hearth, as before described, without cooling off the furnace.

What I claim as new, and desire to secure by Letters Patent, is—

A hearth or sole for furnaces for deoxidiz- 50  
ing or reducing iron ores, composed of lumps of graphitic carbon and iron sponge between the lumps, the carbon and the sponge being compact and integral with each other, substantially as shown and described.

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Witnesses:

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