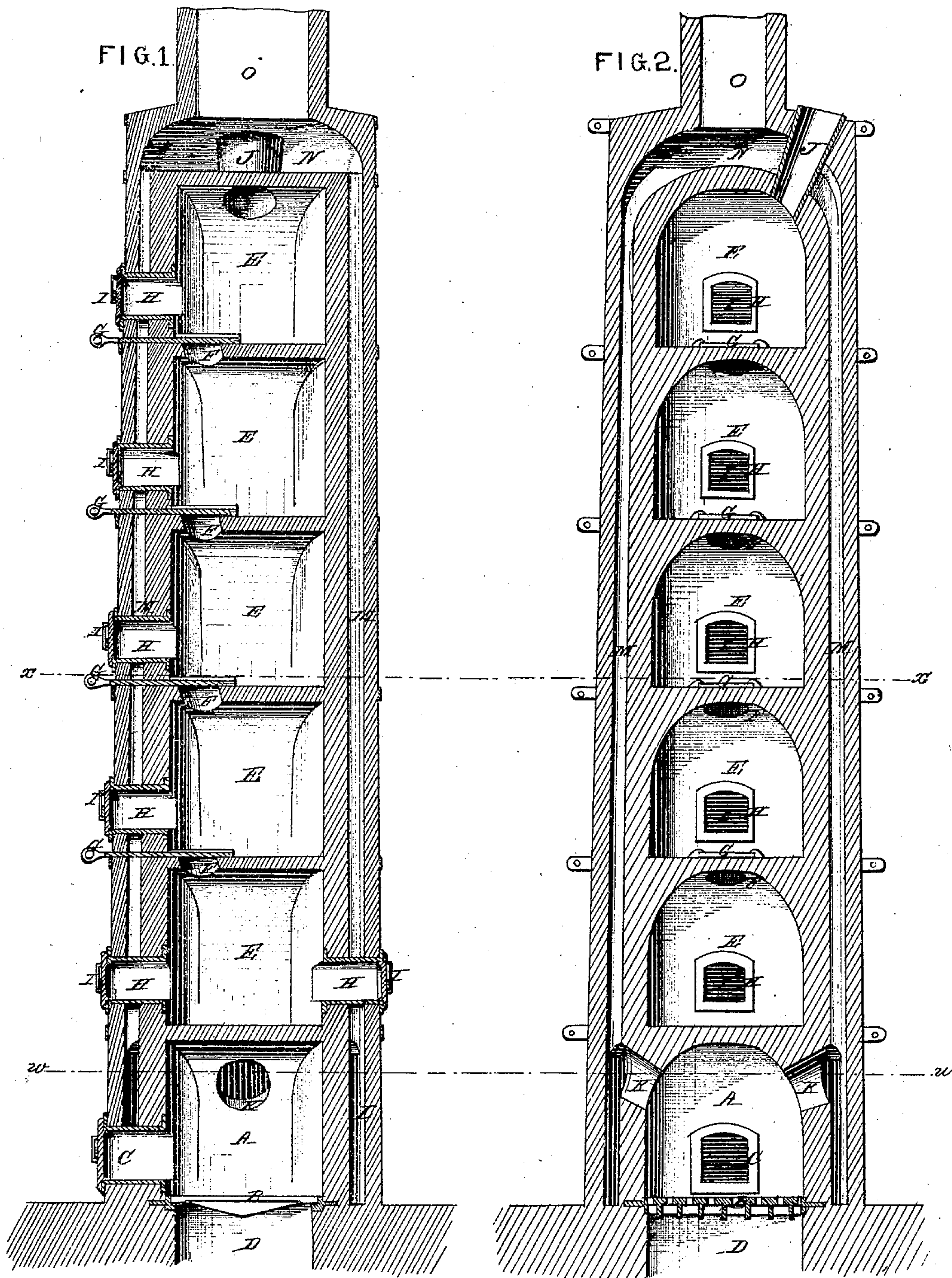


G. NOCK.

Iron Ore Furnace.

No. 103,489.

Patented May 24, 1870.



Witnesses:
 Jas. L. Ewin
 J. Scheitlin

G. Nock
 By Knights
 atty.

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FIG.3.

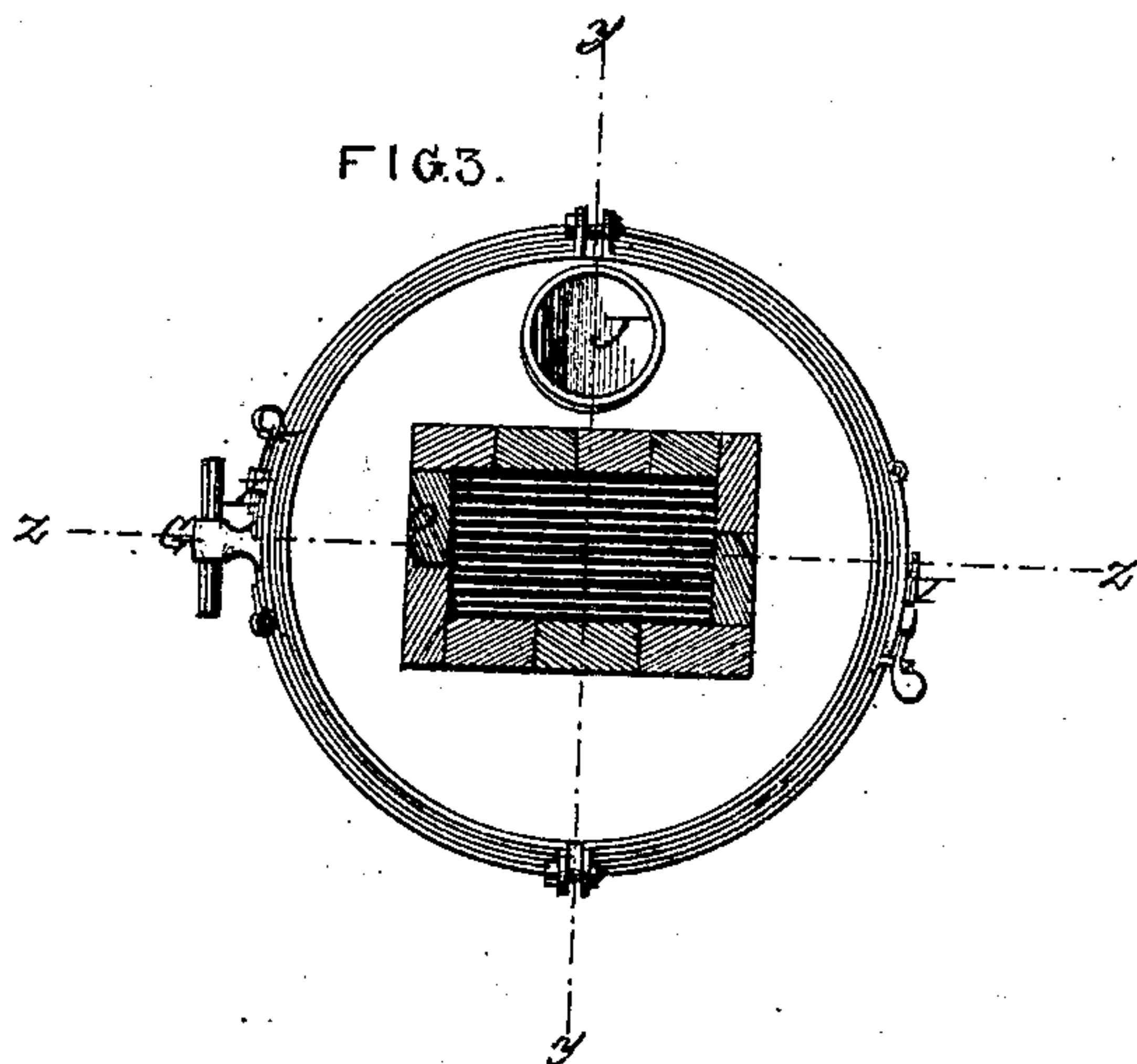


FIG.4.

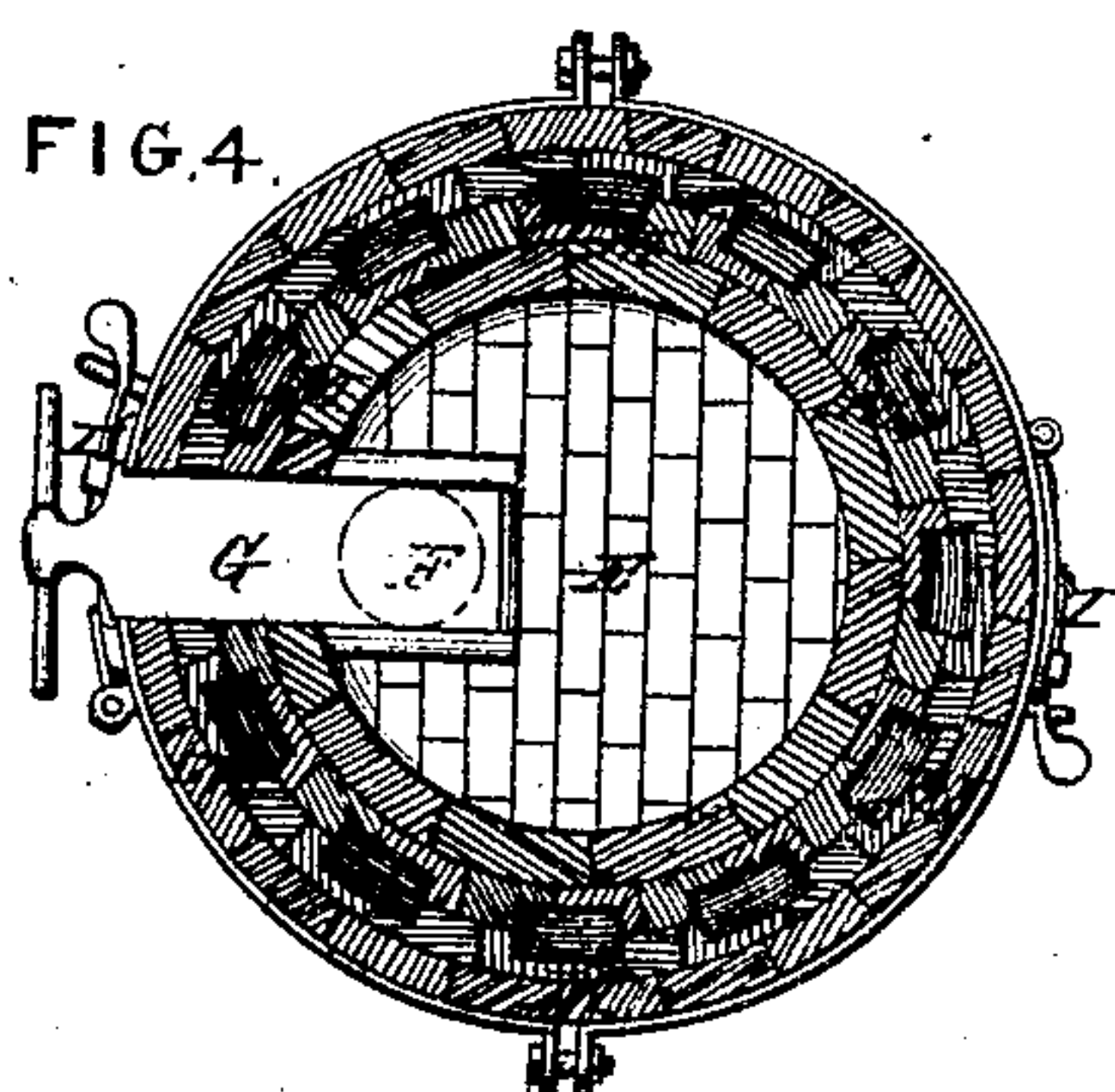
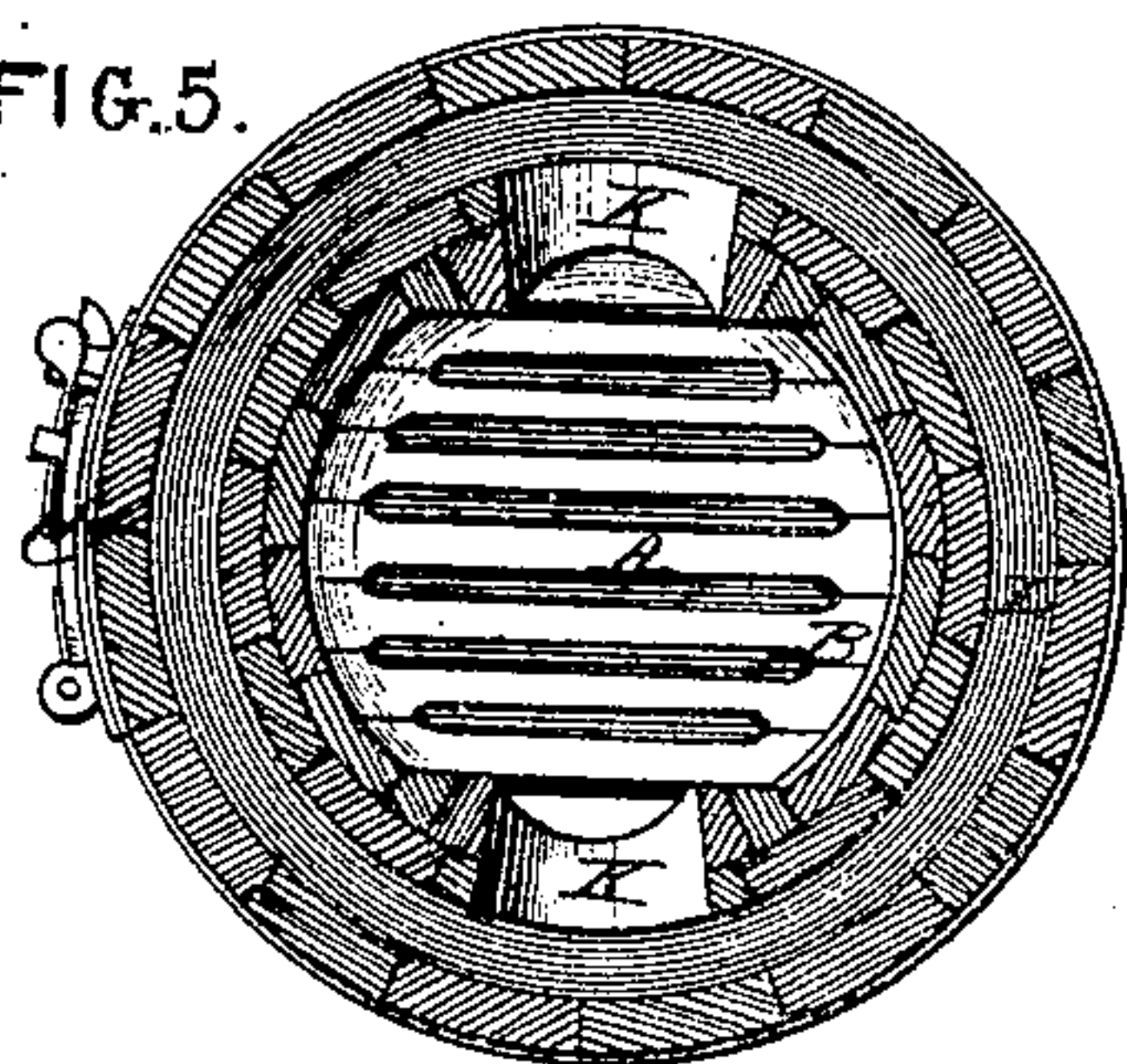


FIG.5.



Witnesses:
Jas. L. Ewin
J. Scherlin

Geo. Nock
By Freightman atty

UNITED STATES PATENT OFFICE.

GEORGE NOCK, OF NEW MONMOUTH, NEW JERSEY.

IMPROVEMENT IN FURNACES FOR PRODUCING SPONGE FROM IRON ORE.

Specification forming part of Letters Patent No. 103,489, dated May 24, 1870.

To all whom it may concern:

Be it known that I, GEORGE NOCK, of New Monmouth, in the county of Monmouth and State of New Jersey, have invented a new and useful Furnace for Converting Iron Ore into Sponge, of which the following is a specification.

The nature of my invention consists in constructing a furnace for deoxidizing or converting iron ore with a vertical series of roasting-chambers arranged over a fire-chamber, and adapted to receive the ore at the top, and have it fed by the gravity from one to another, and removed from the lower, as hereinafter set forth. I am thus enabled to treat a number of charges simultaneously and with a single fire, while the mixing of the ore is performed in the most advantageous manner, and the heated gases evolved from the respective charges are utilized in the treatment of those following. The process is, further, continuous and of highly augmented rapidity and efficiency.

The accompanying drawings represent a furnace illustrating my invention.

Figures 1 and 2 are vertical sections on the lines *zz* and *yy*, Fig. 3. Fig. 3 is a plan view. Figs. 4 and 5 are horizontal sections at *xx* and *ww*, Figs. 1 and 2.

Similar reference-letters indicate like parts in the several figures.

My improved furnace may be of cylindrical or other approved external form, and may be built of usual or other suitable materials. Formed in the lower part in any suitable manner is the fire-chamber A, with its grate B, fire-door C, and ash-pit D. Over this is arranged a number (five, more or less) of chambers, E, of proper size and shape to receive the charges and afford proper facilities for their treatment. These chambers are arranged one above another, as shown, and communicate, by means of apertures F, closable by suitable slides, G, or equivalent means. They are further accessible by means of openings, H, (one or more,) provided with doors I, to permit of the arrangement and withdrawal of the charges. A funnel, J, or its equivalent, leading into the upper chamber, forms the means for introducing the ore, and additional doors may be provided in the lower chamber, as shown, where the "sponge" is removed. The products of combustion of the

fire-chamber, passing through openings K into an annular flue-space, L, may be conducted by a number of small flues, M, ascending through the wall surrounding the roasting-chamber E into a crown-space, N, and pass from thence directly into the chimney O. An orifice in the wall or ceiling of the upper chamber may permit the escape of the liberated oxygen and other gases into the flue-space. The chambers E may be about eighteen inches in height and of about the relative size and proportion shown. I prefer to employ five of them.

Instead of the stationary floors of the roasting-chambers E, with apertures F and slides G, which are shown and above described, I propose using pivoted floors for said chambers, operated by cranks or wheels outside of the furnace. These floors may be composed of a cast or wrought iron plate or frame covered with fire-brick or its equivalent.

I further propose arranging a number of series of roasting-chambers, with their accessories, side by side in a single structure, in which case one or any sufficient number of fire-chambers, with properly-arranged flues, may be provided for the whole.

Charcoal, bituminous coal, or other suitable carbonaceous material may be employed to produce the carbon.

The operation of my furnace is as follows: The first charge is arranged in the upper one of the chambers E, the ore being introduced through the funnel J. The door I of said chamber is then closed and the ore allowed to remain a proper length of time, when said door is opened, the slide G, closing the aperture F in the bottom of said chamber, withdrawn, and the charge raked through said aperture into the second chamber, where it is again spread. The communication between the first and second chambers is meanwhile closed, and a new charge arranged in the former. The charge in the second chamber is in turn precipitated into the third, that in the first coming into the second, and a new charge arranged in the first, in which manner the operation is continued. On a charge reaching the lower chamber, either with or without waiting for a course of treatment there, as required, the finished sponge is removed. As the several charges are precipitated from one chamber to another they are so mixed as to insure uniform treatment, while the heated

gases discharged from the previous charges occupying the chambers, permeating them, hasten their conversion. Sponge of the very best quality may be thus produced in a few hours, with one-fourth the fuel usually required.

I claim as new—

The furnace for converting iron ore into sponge, consisting of a series of chambers, E,

arranged directly over the fire-chamber A and over each other in succession, the bottom of one forming the roof of the next, and surrounded by one or more flues, L M, substantially as set forth.

GEORGE NOCK.

Witnesses:

N. J. PIBES,
AARON CLARK.