

(No Model.)

2 Sheets—Sheet 1.

J. McNAB.

FURNACE FOR CALCINING BONE BLACK.

No. 412,781.

Patented Oct. 15, 1889.

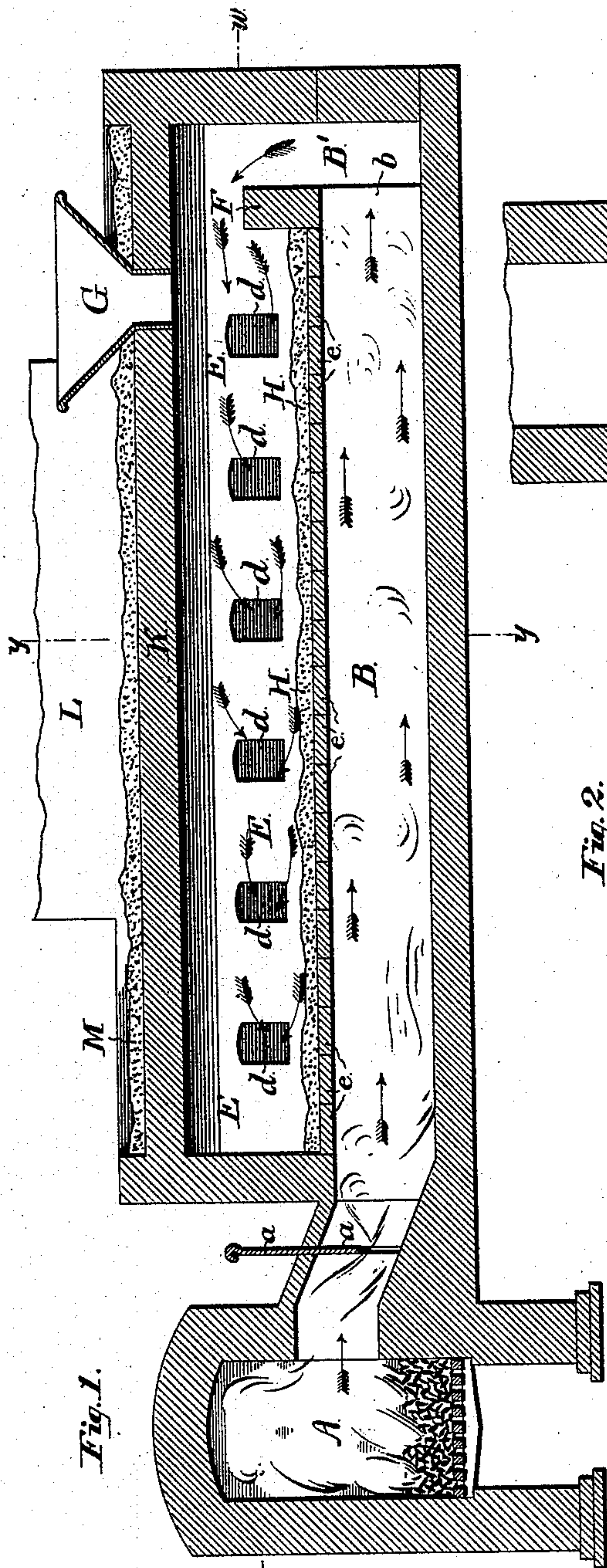


Fig. 1.

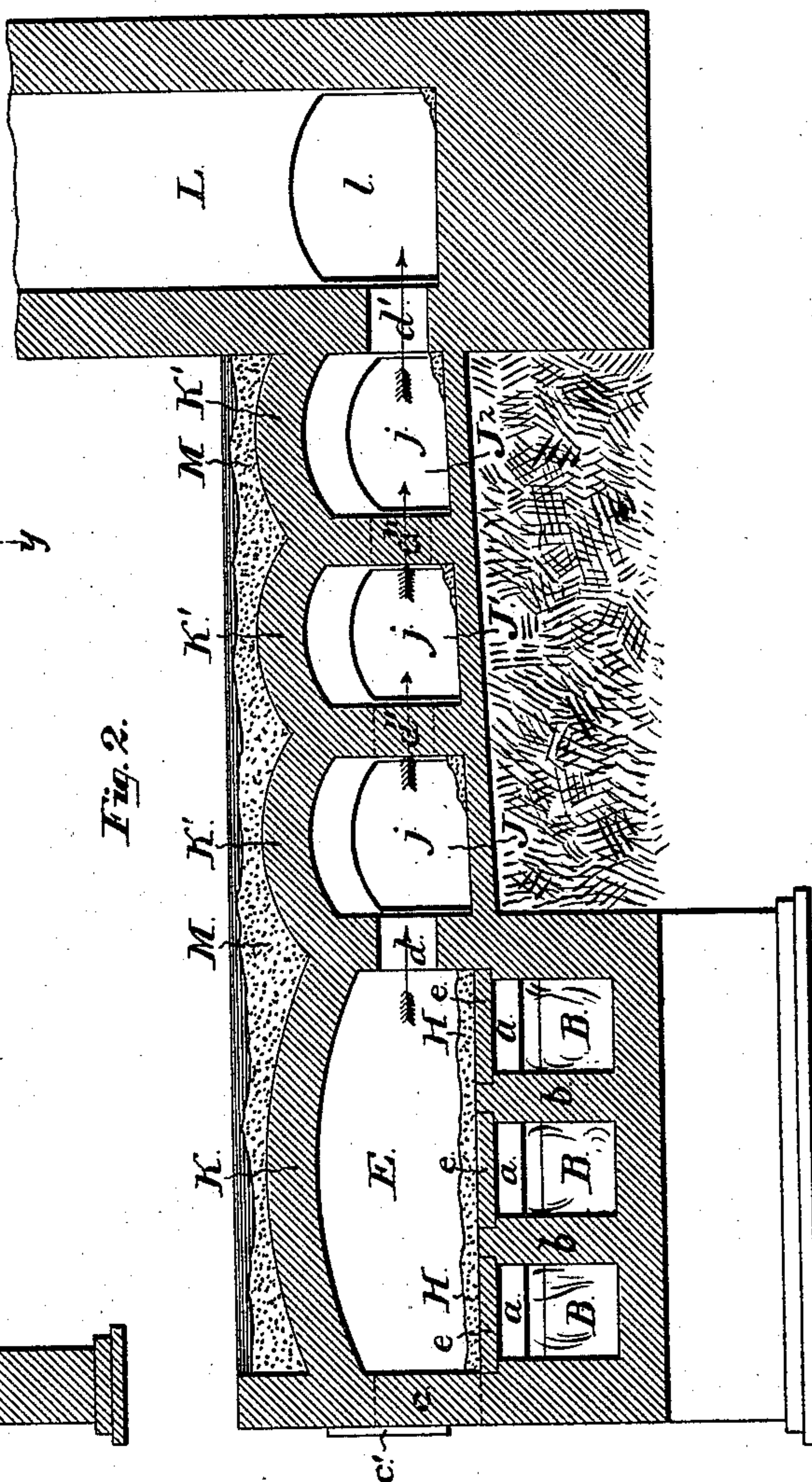


Fig. 2.

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INVENTOR

*James McNab*  
*by his attorney*  
*Francis T. Chambers*



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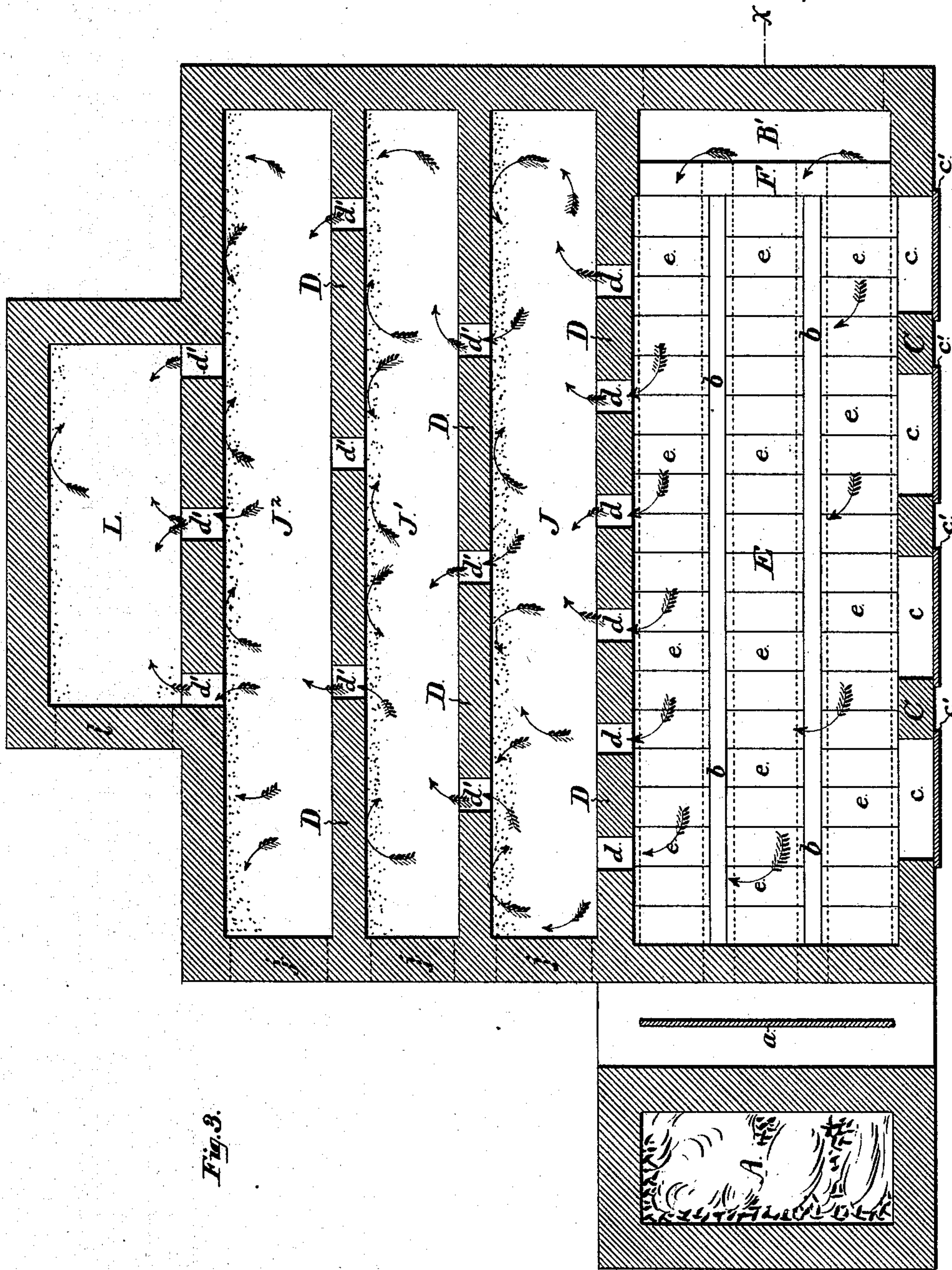


Fig. 3.

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# UNITED STATES PATENT OFFICE.

JAMES McNAB, OF CAMDEN, NEW JERSEY, ASSIGNOR TO THE UNITED STATES CHEMICAL COMPANY, OF SAME PLACE.

## FURNACE FOR CALCINING BONE-BLACK.

SPECIFICATION forming part of Letters Patent No. 412,781, dated October 15, 1889.

Application filed June 22, 1887. Renewed March 19, 1889. Serial No. 303,943. (No model.)

### *To all whom it may concern:*

Be it known that I, JAMES McNAB, a citizen of the United States, residing in Camden, county of Camden, State of New Jersey, have  
5 invented a new and useful Improved Furnace for Calcining Bone-Black or Animal Charcoal, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part  
10 of this specification.

My invention has especial reference to the calcining of bone-black or animal charcoal which has been used for the purification of sugar, oil, or similar purposes, and which is  
15 therefore filled with organic impurities which must be gotten rid of before the bone-black is fit for further use or treatment; and I have designed this furnace particularly for the calcination of the bone-black preparatory to  
20 treating it for the extraction of acid phosphate of calcium, having also in view the utilization of the surplus heat of the furnace for drying the wet masses of gypsum and other similar substances which require dry-  
25 ing to fit them for sale or use.

My object is to provide a furnace which will thoroughly calcine the impure bone-black with the minimum use of fuel, the greatest economy in saving the bone-black, and with  
30 provision for the utilization of the surplus heat of the treatment.

Reference is now had to the drawings, which represent a furnace constructed in accordance with my invention, and in which—

35 Figure 1 is a vertical longitudinal section of my furnace on the line  $x x$  of Fig. 3; Fig. 2, a vertical cross-section of the furnace and its connections on the line  $y y$  of Fig. 1, and Fig. 3 a plan view of the furnace on the hori-  
40 zontal section  $w w$  of Fig. 1.

A is the grate or fire-chamber; B B B, flues opening into the fire-chamber and extending beneath the calcination-chamber longitudinally until at the extreme end they open into  
45 it at B'. The flues B are separated from each other by walls of masonry  $b b$ , and upon these walls and the front and back walls of the furnace C and D the flooring  $e e$  of the calcination-chamber E is supported. As shown,  
50 and as I prefer to construct it, the flooring of the chamber E is made of stone slabs  $e e$ , the

stone, of course, being of a kind which will not disintegrate under the influence of heat—such, for instance, as soapstone. I do not, however, limit myself to the use of a stone  
55 floor, as obviously iron or brick might be used, though not, I believe, with equal advantage.

F is a bridge-wall of masonry or metal. It forms the end of the calcination-chamber E, 60 and over it the flame and gases from the flues B pass into said chamber.

G is a hopper or hole through which the impure bone-black is introduced into the furnace.

$c c$ , &c., are openings in the front wall C of the furnace, by means of which the furnacemen can gradually move the bone-black back from below the hopper G to the other end of the chamber E, where it is withdrawn after  
65 thorough calcination and purification. These openings  $c$  are provided with doors  $c'$ , by means of which the draft admitted into the various parts of the chamber E can be regulated.  
75

K is the top of the chamber E, preferably made of arched masonry, as shown.

J J' J<sup>2</sup> are settling-chambers situated in, or rather forming, the flue leading from the chamber E to the stack L. They are roofed, 80 like the chamber E, by arched masonry K', though, of course, iron or flat slabs of stone may, if desired, be used to roof them.

$d d' d' d'$ , &c., are passages or flue-holes leading from the calcination-chamber E into 85 the first of the chambers J J' J<sup>2</sup>, and through the walls D' from chamber to chamber and into the stack L. The passages  $d$  are, as is shown, situated all along the back wall D of the chamber E, and the passages  $d'$  are 90 also equally distributed along the dividing-walls D'.

$j j j$  and  $l$  are man-holes at the ends of the chambers J J' J<sup>2</sup> and the stack L, by means of which they can be opened and cleaned out 95 from time to time.

H represents the bone-black in the calcination-chamber E, and M represents material spread out over the roof of the furnace and chambers J J' J<sup>2</sup> to be dried. 100

$a$  is of course a damper for regulating the draft in the fire-chamber A.



The dimensions of my furnace may of course be varied to suit the work it has to do. I have found one in which the calcination-chamber from front to bridge-wall F was  
5 about thirty feet long, having a breadth of about six feet and a height of about three feet and a-half, to give excellent results.

In operating my furnace, a fire is made in the chamber A, and the flame and gases led  
10 through the flues B, beneath the chamber E, into said chamber at the point B'. They then pass through said chamber, into which air is admitted through openings *c*, and escape from it, through the flue-passages *d d'*,  
15 into the settling-chambers J J' J<sup>2</sup>, and finally into the stack L. The impure bone-black is introduced into the chamber E through the opening G, and from time to time moved along the flooring *e* by the operator at the  
20 point of entrance. It is not only subjected to the heat of the hot flooring *e*, but to the direct action of the flame and gases entering the chamber E over the bridge F, and at this point abundant air is also admitted to ignite  
25 the combustible organic matter in the bone-black, which soon, under these conditions, comes to a state of high combustion and rapidly frees itself from impurities, and as it is moved back from its point of entrance  
30 and exposed to the continuous heat of the chamber E, into which less air is admitted as the capacity of the purifying bone-black to support combustion diminishes, it is finally withdrawn substantially free from impuri-  
35 ties.

By utilizing the impurities of the bone-black as fuel, as before described, a great economy in coal is obtained; but the draft in the chamber E is necessarily strong, and  
40 much of the valuable bone-black is carried with it into the exit-flues, and the gases thus escaping are very hot. By passing these gases through the flue-holes *d d'* into chambers J J' J<sup>2</sup>, and from one such chamber to  
45 another before they are permitted to enter the stack L, the bone-black held in suspension is deposited in the chambers J J' J<sup>2</sup> and the bottom of the stack, and can be withdrawn for use through the man-holes *j l*. In  
50 passing through the chambers J the gases heat them to a high degree, and any bulky substances requiring to be dried can be spread out over the arches K K' K', where any moisture will be rapidly driven off. By  
55 providing flue-openings *d* all along the back wall of the calcination-chamber E and connecting them with the stack I prevent a strong draft from sweeping through the

calcination-chamber, and thus diminish the quantity of powdered bone-black carried out 60 of the chamber, and I also by this device am better able to control the ignition of any part of the black under treatment, as when I open a door *a* the draft is substantially from front to back, instead of along the chamber. 65

My furnace may be modified somewhat. For instance, the fire-chamber A may be situated beneath the calcination-chamber E, and where it is not desirable to use the surplus heat for drying wet material the chambers 70 J J' J<sup>2</sup> may be arranged one over the other and all over the top of the chamber E.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is— 75

1. In a furnace for calcining and purifying bone-black, the combination of the fire-chamber A, flues B, passing from the fire-chamber beneath the calcination-chamber and opening into it at their back end, the calcination-chamber E, having a feed-opening G at the end where flues B enter it, doors *c* in its front wall, and multiple flues *d*, arranged from front to rear along its back wall, and a stack L, connected with said flues *d*, so as to draw the 85 gases from the back of calcination-chamber E all along its length.

2. In a furnace for calcining and purifying bone-black, the combination of the fire-chamber A, flues B, passing beneath the calcination-chamber, the calcination-chamber E, having doors *c* in its front wall and flues *d* in its back wall, and a feed-opening G at the end where the flues B open into it, one or more settling-chambers, and a stack L, connecting with the flues *d d'* through the settling-chambers, all substantially as and for the purpose specified. 95

3. In a furnace for calcining and purifying bone-black, the combination of the fire-chamber A, flues B, passing beneath the calcination-chamber, the calcination-chamber E, having doors *c* in its front wall and flues *d* in its back wall, and a feed-opening G at the end where the flues B open into it, one or 105 more settling-chambers lying alongside of the chamber E, and having their roofs K' substantially on a level with the roof K of said chamber to form a drying-platform, and a stack L, connecting with the flues *d d'* through 110 the settling-chambers, all substantially as and for the purpose specified.

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Witnesses:

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