

(No Model.)

2 Sheets—Sheet 1.

T. McNEAL.  
CALCINING APPARATUS.

No. 577,059

Patented Feb. 16, 1897.

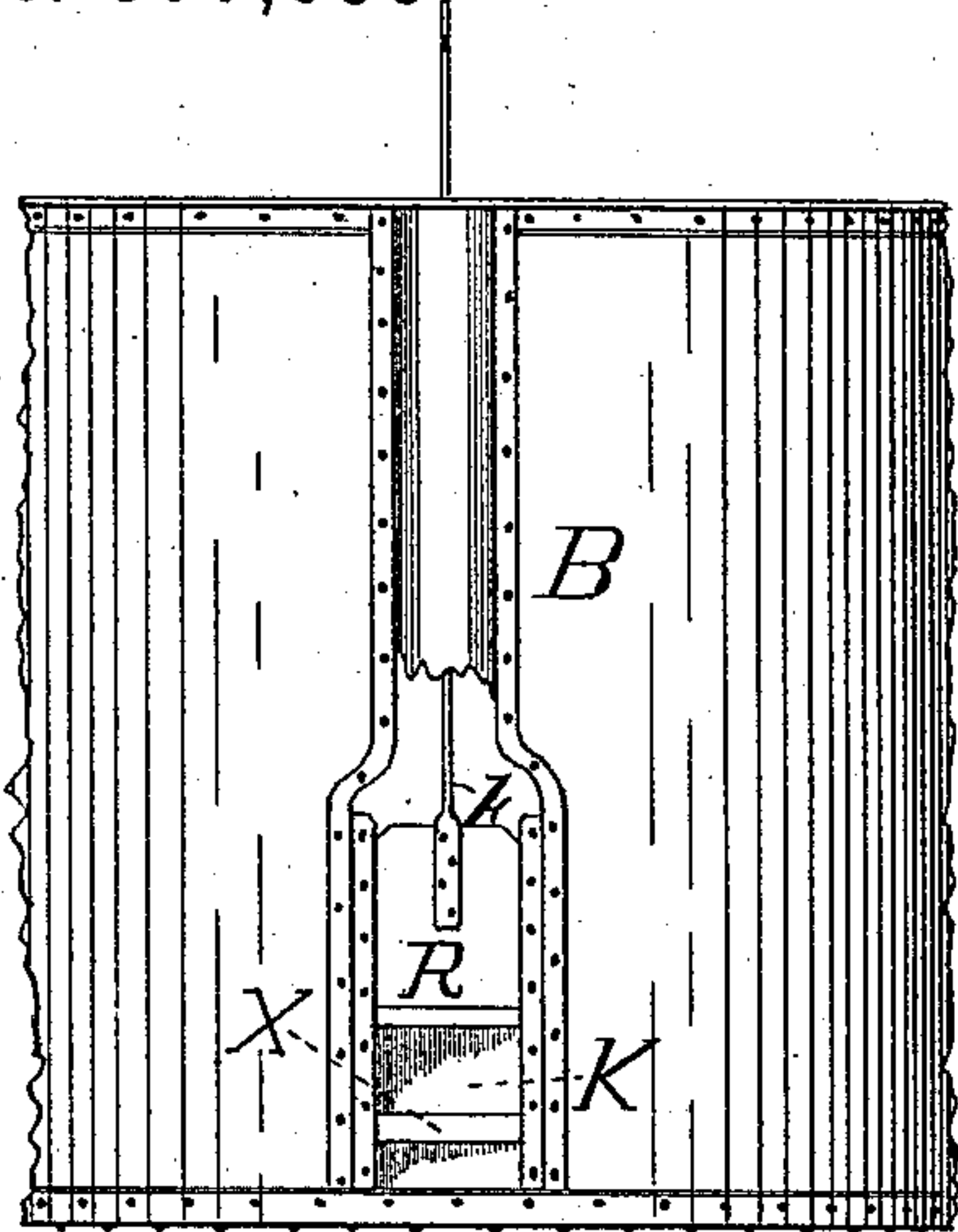


Fig. 4.

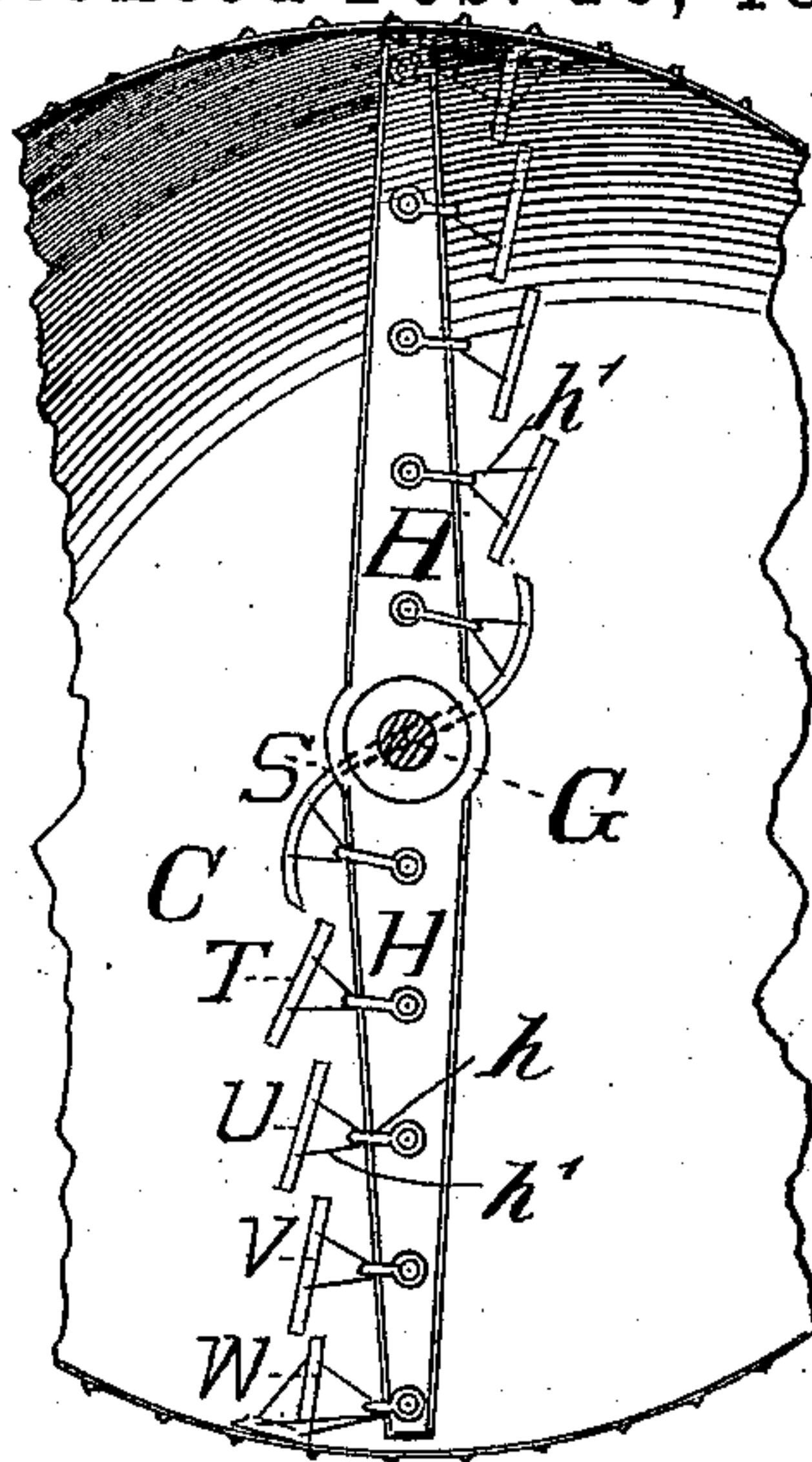


Fig. 3.

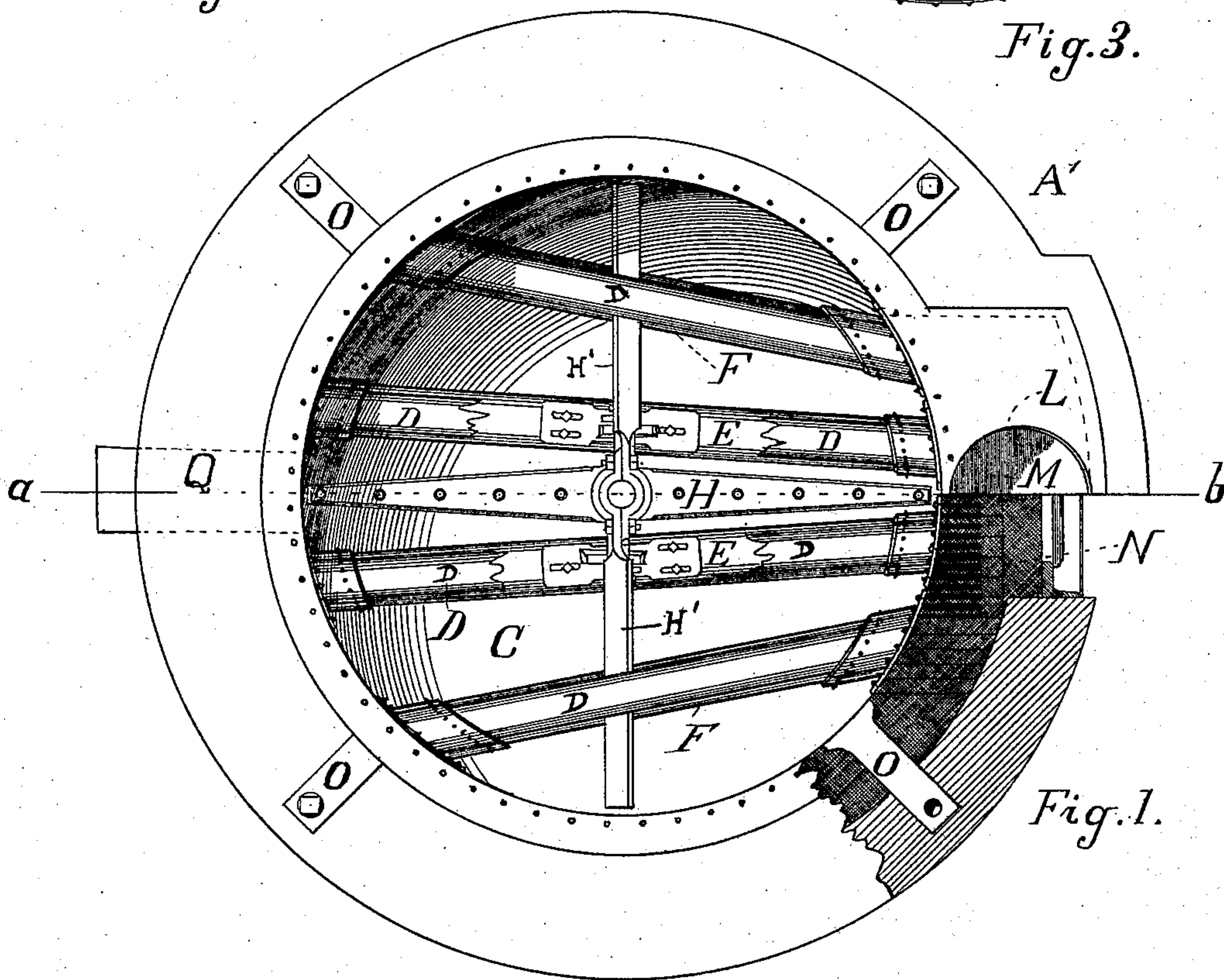


Fig. 1.

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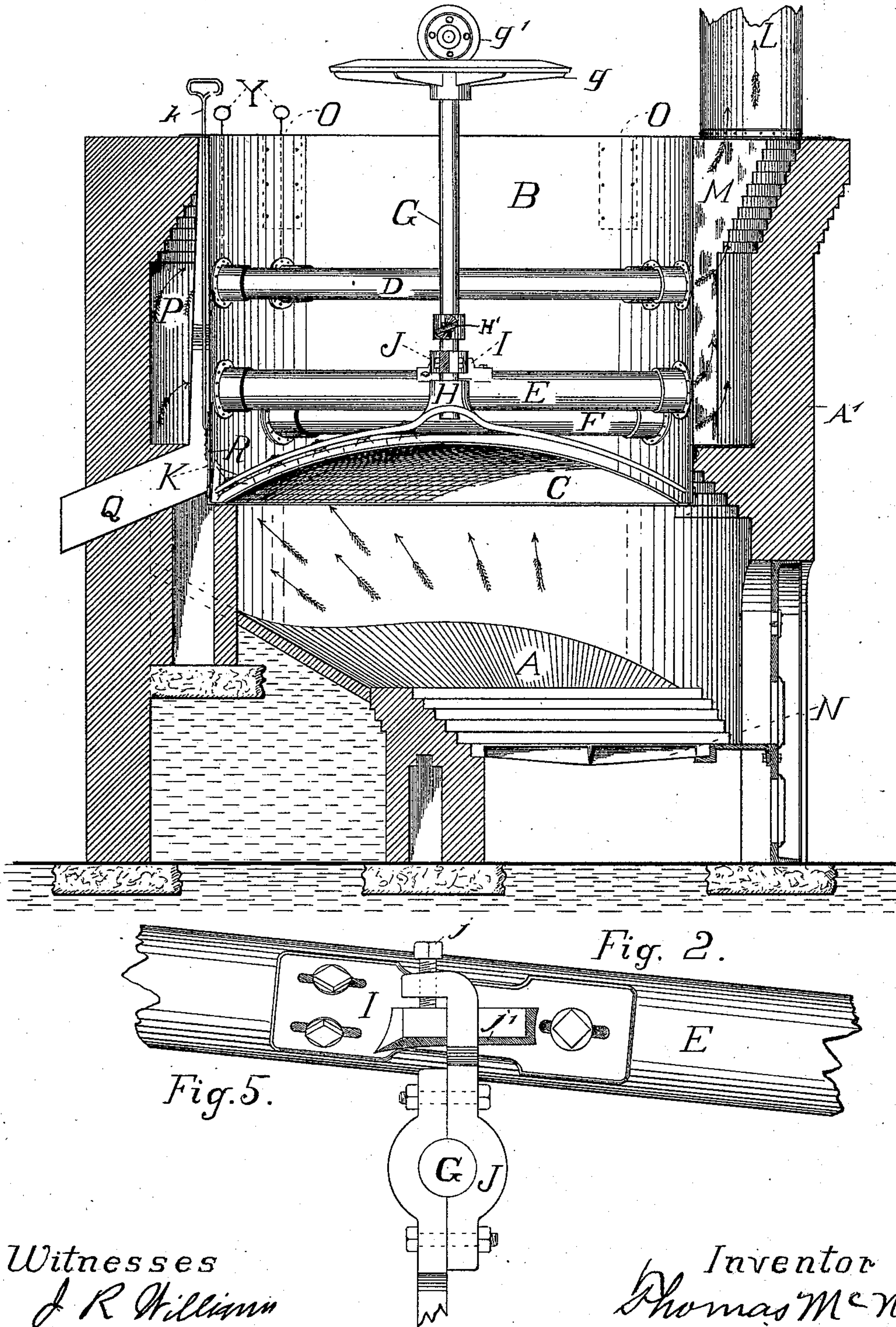
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2 Sheets—Sheet 2.

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# UNITED STATES PATENT OFFICE.

THOMAS McNEAL, OF GYPSUM CITY, KANSAS.

## CALCINING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 577,059, dated February 16, 1897.

Application filed December 11, 1895. Serial No. 571,742. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS McNEAL, of Gypsum City, in the county of Saline and State of Kansas, have invented a certain new and useful Improvement in Calcining Apparatus, of which the following is a full, clear, and exact description.

This invention relates to apparatus for cooking or calcining plaster and similar material.

The object of the invention is to provide a calcining apparatus of such construction that the whole body of material under treatment is subjected to a practically even degree or distribution of heat by an economical use of fuel.

With this end in view the invention consists in so supporting the calcining vessel with relation to a furnace that the products of combustion will be directed over the entire bottom and side surfaces of the vessel, and in carrying the products of combustion transversely through the vessel by means of flues at different levels, and also in means for the thorough agitation of material in the vessel.

The invention further consists in the construction and novel arrangement of parts, as will hereinafter appear, and be more fully pointed out in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of a calcining apparatus embodying my invention with a portion broken away to more clearly show other parts. Fig. 2 is a vertical section thereof on the line *a b* of Fig. 1. Fig. 3 is a plan view of an agitator employed. Fig. 4 is an elevation showing a closure of an outlet-spout; and Fig. 5 is a fragmentary plan, on an enlarged scale, showing means for supporting and adjusting the agitator-shaft.

Referring to the drawings, A designates the fire-box or furnace, having a suitable grate and located beneath a calcining vessel B, suspended within the casing or wall A' of the furnace by means of angle-irons or hangers O, having one arm secured to the vessel B and the other arm extending over and secured to the top of the casing or wall A'.

There is a space or annular chamber P between the vessel B and the inner surface of

the casing A', through which the products of combustion circulate and discharge into a smoke-box M and out through a smoke-stack L.

The bottom C of the vessel B is preferably convexed, as shown, so that a larger heating-surface is presented to the furnace than would be the case were the bottom straight, and as the products of combustion circulate around the side wall of the vessel through the chamber P it is obvious that all parts of the vessel are subjected to the direct action of the heat. The bottom C, I construct of comparatively light wrought-iron and secure it to the shell by means of rivets, thereby wholly preventing leakage of material through joints, besides nearly equalizing the volume of metal to be affected by heat at the point of junction between the bottom and shell.

D E F indicate flues extending within and across the vessel and providing a communication between the smoke-box N and the space P at the opposite side.

The flues E are on a lower plane than the flues D and are directly under the same, and the flues F are on a lower plane than the flues E, but are located nearer the periphery of the convex bottom, so that the relative distance between the bottom and the flues F and between the bottom and the flues E is substantially the same.

As a means to distribute the heat through the vessel B in a manner to derive the greatest benefit therefrom I so place each tier or pair of flues that they radiate one from the other from the front or smoke-box side to the opposite side, thus concentrating the flues at the smoke-box, while their opposite ends are spread over a much larger area of the vessel. Further, I have found that the rear ends of the flues, being the first to receive the heat from the furnace, are of higher temperature and will impart heat to a greater mass of material, and for this reason, as well as that before given, the rear ends of the flues are placed farther apart than the front ends.

The upper tier of flues D are of smaller diameter than the other flues, and I find it advisable to provide their entrance ends with dampers, which may be adjusted or operated by means of rods Y.

Q is a discharge-outlet extended through



the casing A' and communicating with the interior of the vessel B through the aperture K. A closure or slide-door R is provided for the outlet and may be opened or closed  
5 by means of a hand-rod *l*, extended upward and above the top of the vessel B.

I will now describe means for stirring or agitating material during its calcining, first stating, however, that in practice it is found  
10 essential to well and completely stir or agitate the material where in contact with the bottom and wall of the vessel most exposed to excessive heat, and that in the first stages of the calcining the material is refractory  
15 and disposed to clog and bank against the action of the stirrer when stirrers of the ordinary kind are used and consisting of fingers or scrapers rigidly extended from a sweep or sweeps, and, further, the rigid scrapers not  
20 being self-adjustable with relation to the bottom of the vessel are apt to contact too closely therewith when the said bottom is expanded or forced upward by the heat.

G indicates a vertical stirrer or agitator  
25 shaft having at its upper end a bevel-wheel *g*, engaging with a bevel-gear *g'*, to which motion may be imparted from any desired source. At its lower portion the shaft G has a bearing in bearing-clips J, supported by the  
30 flues E. The ends of the clips are turned at an angle to the body portion, and adjusting-screws *j* pass through tapped holes in said ends and engage the outer sides of lugs *j'*, extended upward from saddle-plates I, secured to the flues E. The saddle-plates I are  
35 secured to the flues by means of set-screws engaging with the flues and extended through slots in the plates. By this construction it will be seen that the shaft and the agitator  
40 or stirrer arms H at their lower ends are held sufficiently out of contact with the bottom C and that the stirrer parts may be adjusted transversely with relation to the sides of the vessel B as its deviations of form under ex-  
45 pansion and contraction may require.

The arms H extend from the shaft G in opposite directions and they are curved longitudinally to conform to the bottom C. Mounted on the shaft G above the arms H and at  
50 right angles thereto are stirrer-arms H'.

S T U V W show the self-adjusting gravity-scrapers carried by the arms H. The scrapers consist of suitable iron plates or bars, and each scraper is attached to its arm H by  
55 means of a link or clevis *h* and a flexible connection *h'*, as plainly shown in Fig. 3, whereby the scrapers may yield both vertically and laterally to accommodate themselves to variations in the bottom of the vessel due to ex-  
60 pansion and contraction.

The central scraper S is substantially S form and has its opposite ends attached to the opposite arms H. The scrapers T U V are straight strips of metal, and the scrapers  
65 W are substantially V-shaped and are so attached by the flexible connections *h'* that one arm or member will engage upon the bottom

of the vessel B and the other arm or member will engage against the inner surface of the wall thereof.

To prevent an interruption or deflection of the angle-scrapers W in passing the outlet K, I extend a bridge or bar X across the opening. The front or scraping faces of the  
70 scrapers are preferably inclined upward and rearward, so that a sharp scraping edge is formed.

In practice the upper flues D are to be closed by their dampers until submerged by material to be calcined or cooked, thus utilizing the heat from the furnace in the lower  
80 flues until, in the process of filling the vessel, heat is needed at the upper part and in the upper flues.

Having thus described my invention, I  
85 claim as new and desire to secure by Letters Patent—

1. In a calcining apparatus, the combination with a furnace, of a smoke-box at one side thereof, a vessel supported in the furnace and  
90 having a space between it and the furnace-wall and also having a convex bottom, an upper set of flues extended across the interior of the vessel, a middle set of flues extended across the vessel directly under the upper set,  
95 and a lower set of flues extended across the vessel in a plane lower than the middle set, there being substantially the same relative distance between the bottom of the vessel and the said lower set of flues as between the bot-  
100 tom and said middle set of flues, and all of said flues providing a communication between the smoke-box and the space at the opposite side of the vessel, substantially as specified.

2. In a calcining apparatus, the combination with a furnace, of a vessel having a convex bottom suspended in the furnace and having a space between it and the wall of the furnace, a smoke-box for the furnace at one side of the vessel, flues extended horizontally  
105 through the vessel, providing communication between the smoke-box and the space at the opposite side of the vessel, the said flues being arranged in pairs one above another, the flues of each pair converging toward the  
110 smoke-box, the flues of the two lower pairs having substantially the same relative distance from the bottom of the vessel, and the flues of the upper pair being of smaller diameter than the flues of the other two pairs, and dampers  
115 in the upper pair, substantially as specified.

3. The combination with a calcining vessel provided with an upwardly-convex bottom forming an acute angle to the side wall, of a vertical stirrer-shaft in the vessel and adjustable laterally with relation to the sides of the  
120 vessel, arms extended horizontally from the shaft, a series of plate-like scrapers having loose connection with the arms, and comprising an S-shaped scraper having its opposite  
125 ends loosely connected with the arms adjacent to the shaft, and substantially V-shaped scrapers having their ends loosely attached to the ends of the arms and adapted to engage



the bottom and inner side wall of the vessel, substantially as specified.

4. A calcining apparatus, comprising a furnace, a vessel suspended therein provided with an upwardly-convexed bottom and having an outlet for material, a bridge or bar extended across the outlet, a vertical shaft in the vessel, arms extended from said shaft, and scrapers moved by said arms and comprising substantially V-shaped end scrapers, the said end scrapers being guided across the outlet by said bar or bridge, substantially as specified.

5. The combination with a calcining vessel, flues extending across the same and a vertical shaft in the vessel, of saddle-plates on, and adjustable longitudinally of the flues, and shaft-bearing clips secured to and adjustable transversely of the saddle-plates, substantially as specified.

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