No. 654,335. Patented July 24, 1900.

U. WEDGE.

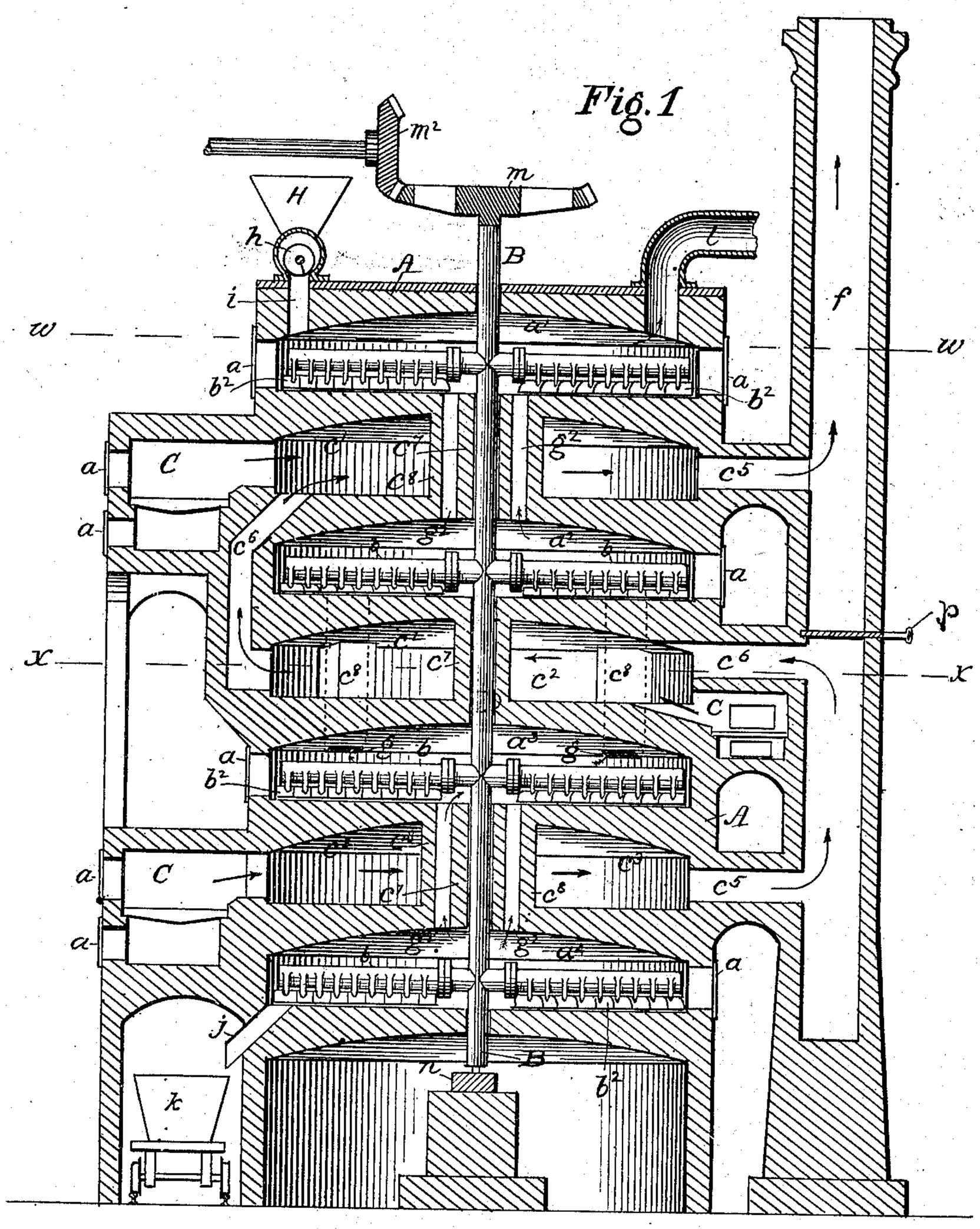
ROASTING FURNACE.

(Application filed Mar. 13, 1899.)

(No Model.)

5 Sheets—Sheet 1.

Fig. 1



Witnesses.
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Patented July 24, 1900.

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5 Sheets—Sheet 2.

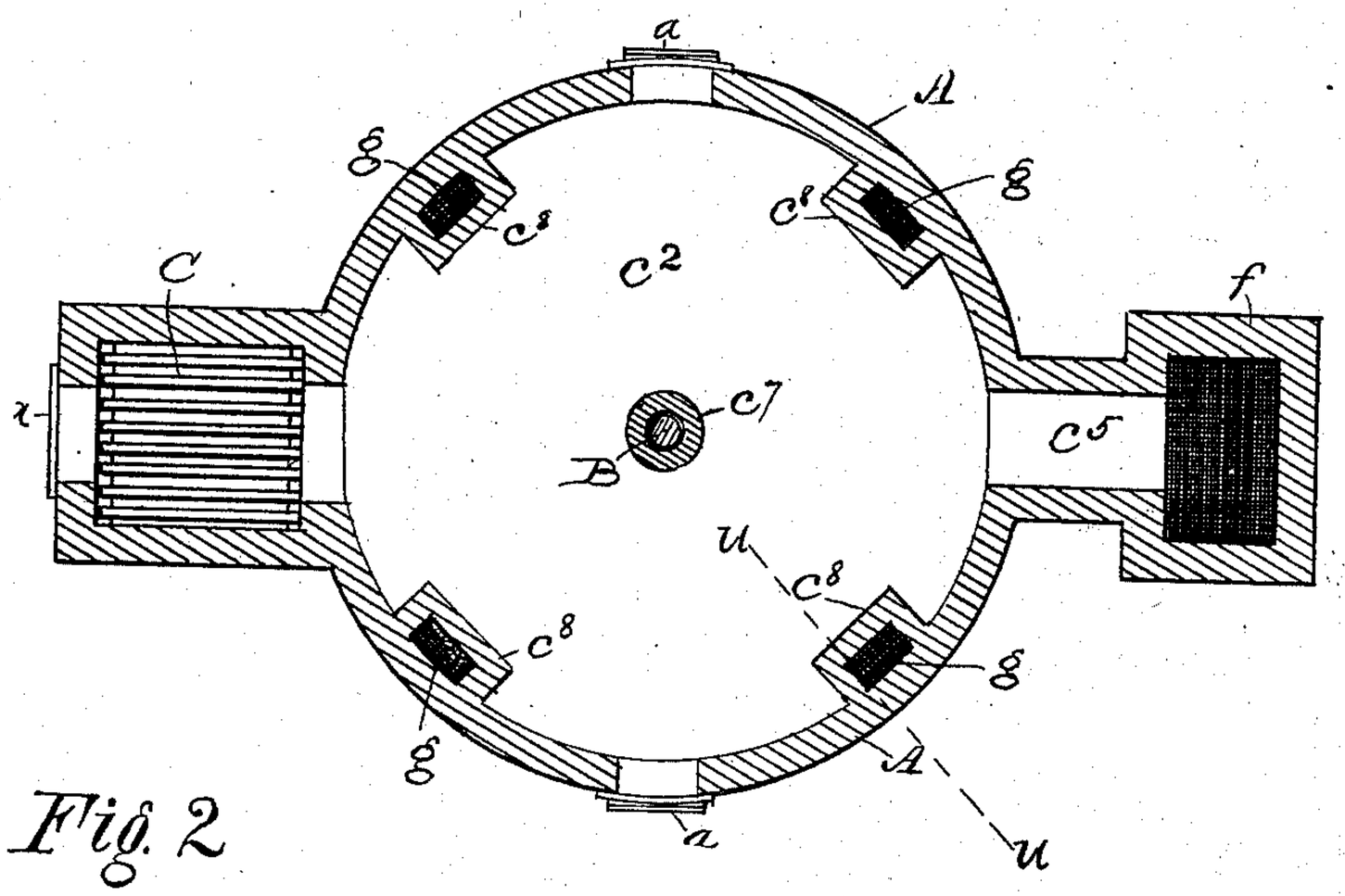

Fig. 2

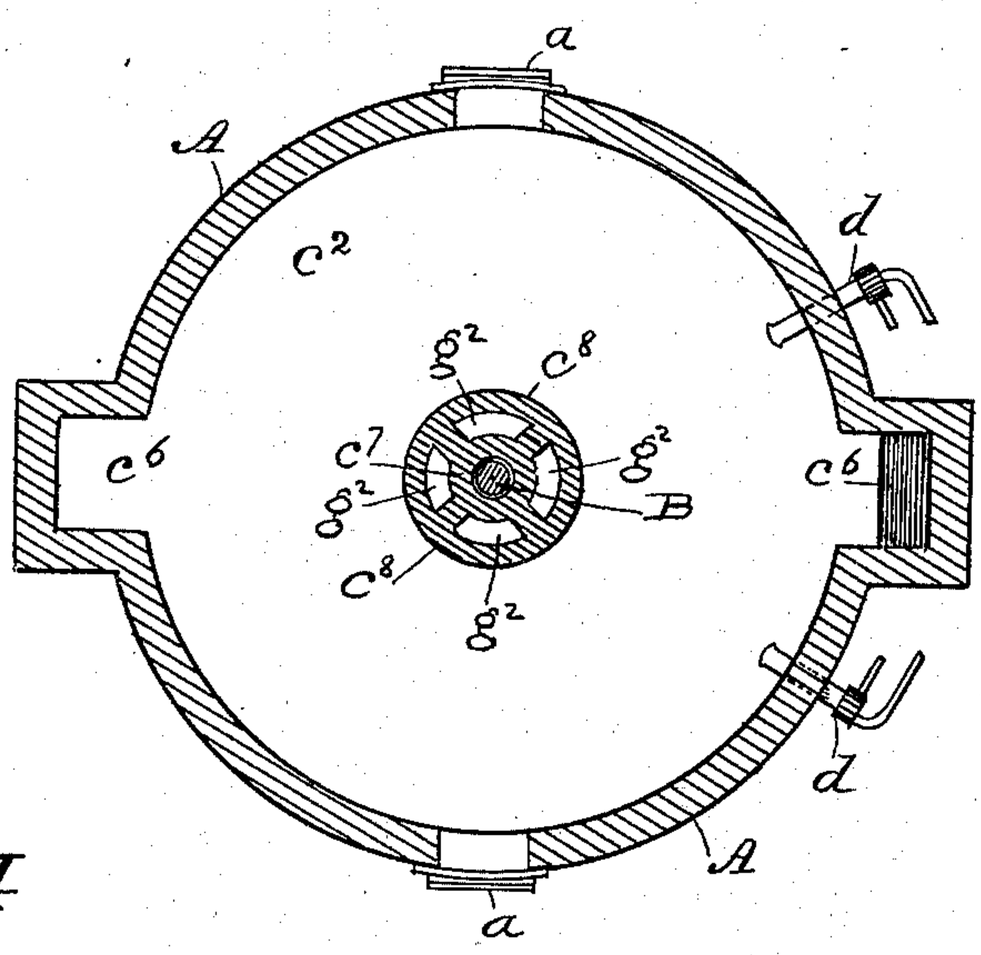

Fig. 4

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5 Sheets—Sheet 3.

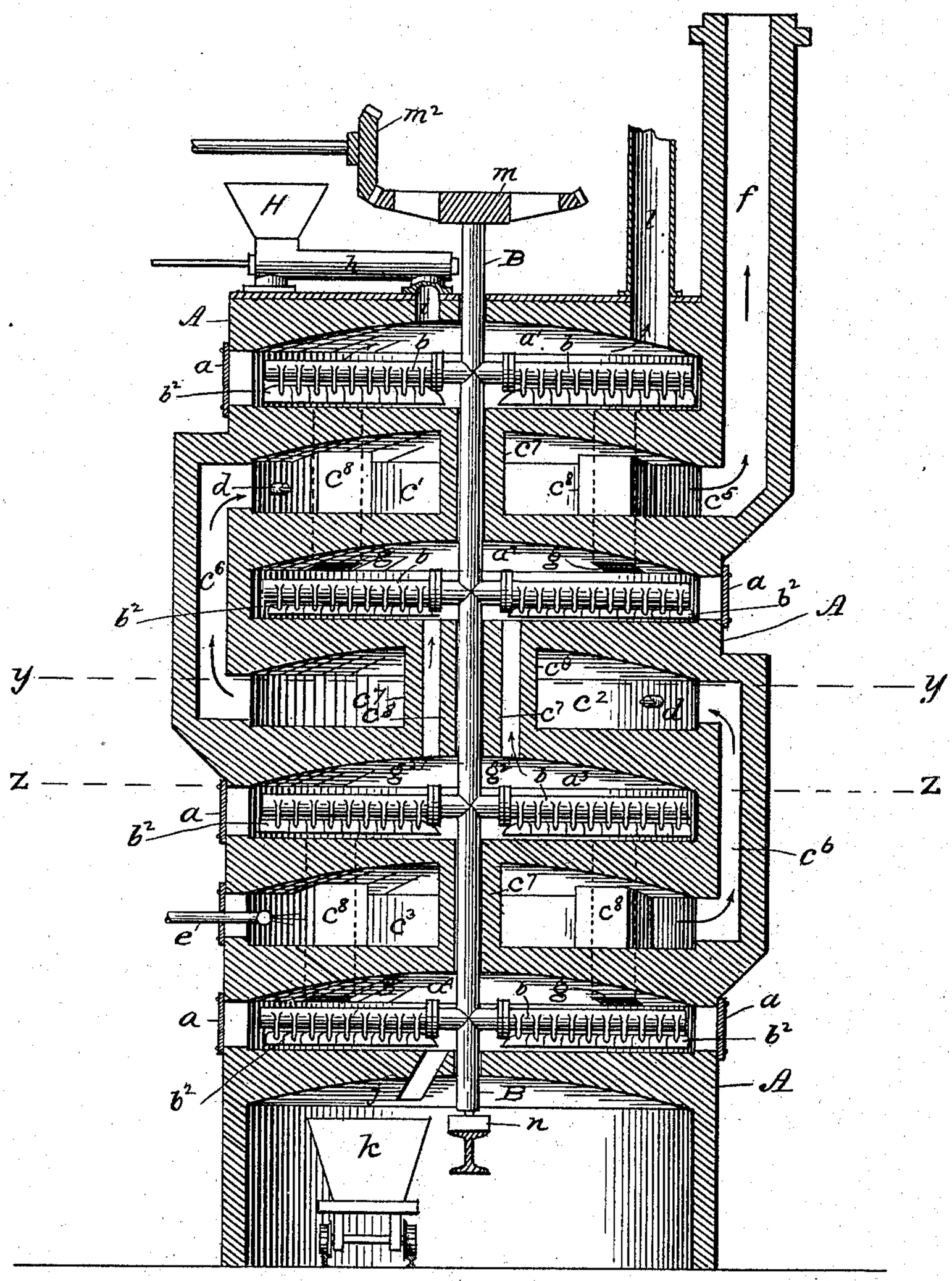

Fig. 3

Witnesses
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ROASTING FURNACE.

(Application filed Mar. 13, 1899.)

(No Model.) 5 Sheets—Sheet 4.

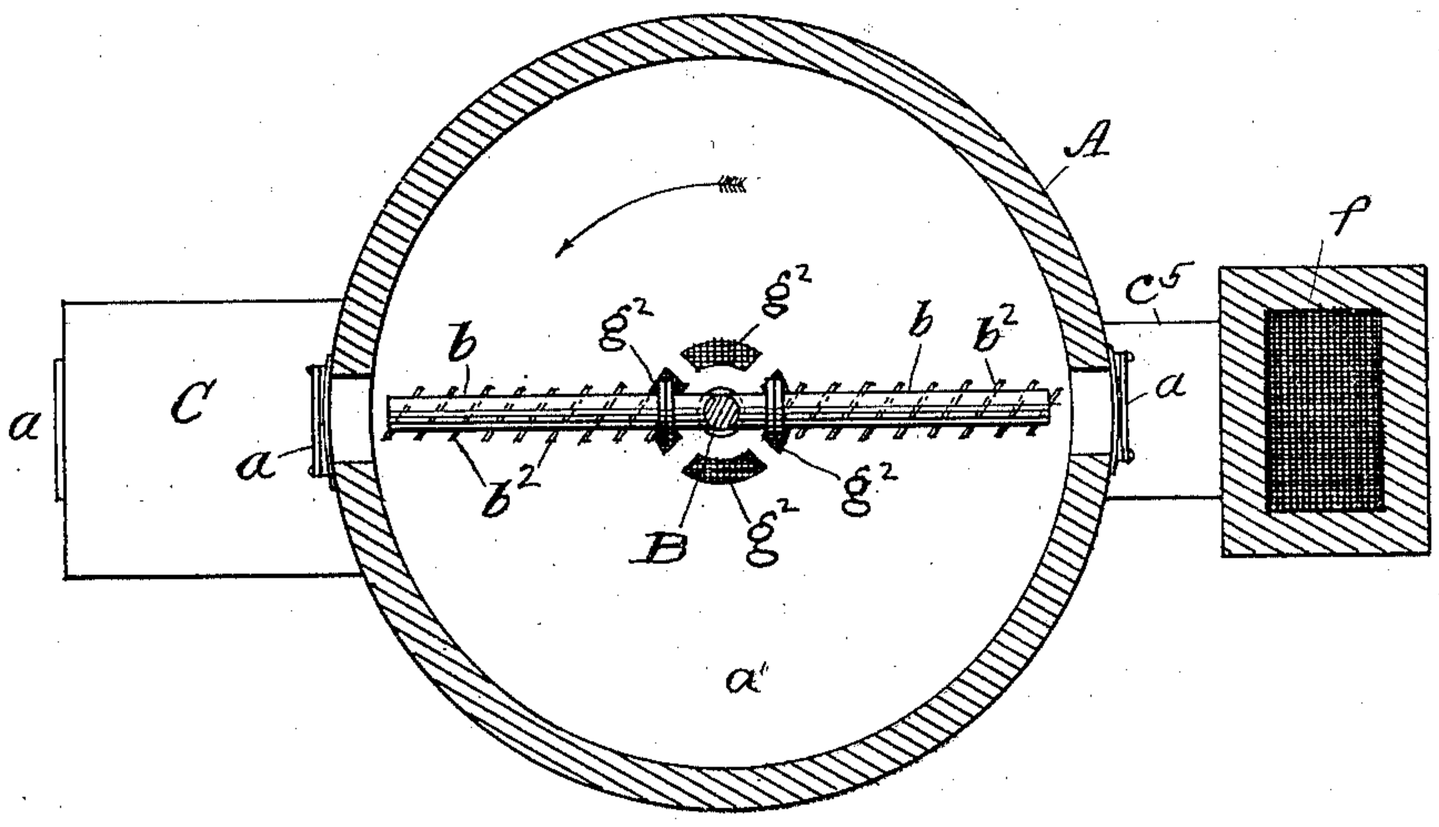

Fig. 5

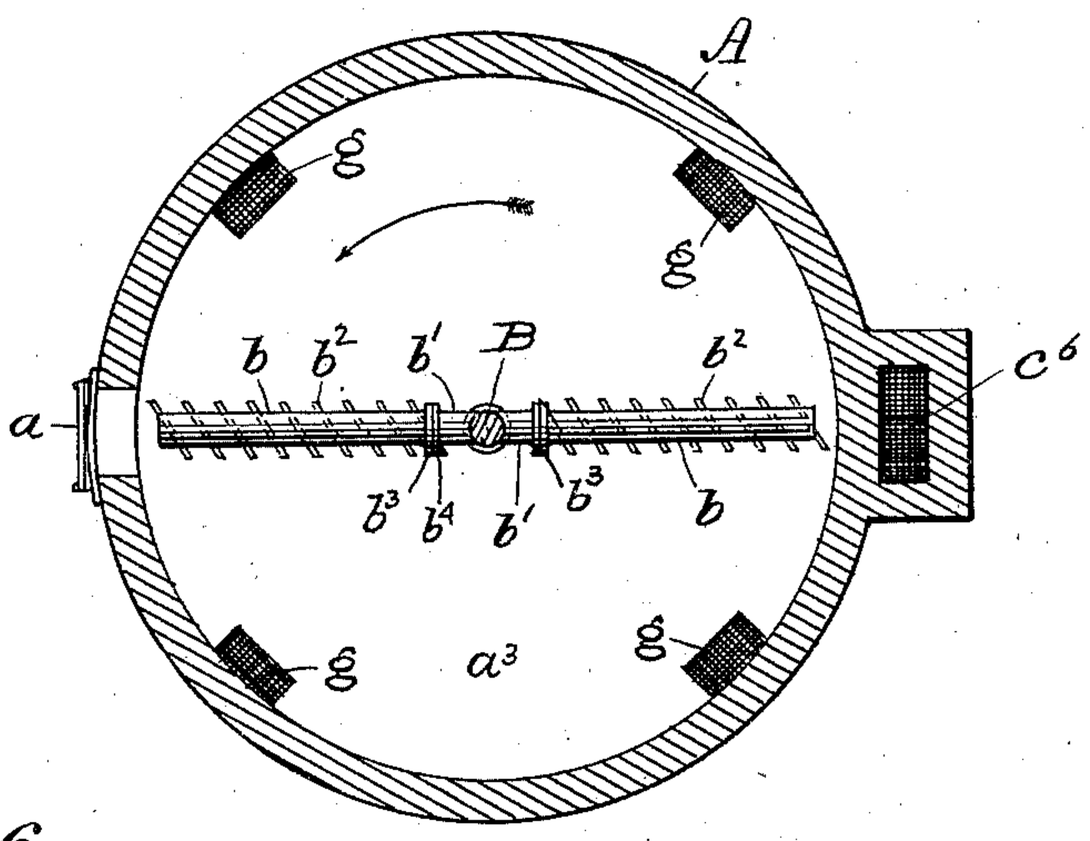

Fig. 6

Witnesses
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Patented July 24, 1900.

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ROASTING FURNACE.

(Application filed Mar. 13, 1899.)

(No Model.)

5 Sheets—Sheet 5.

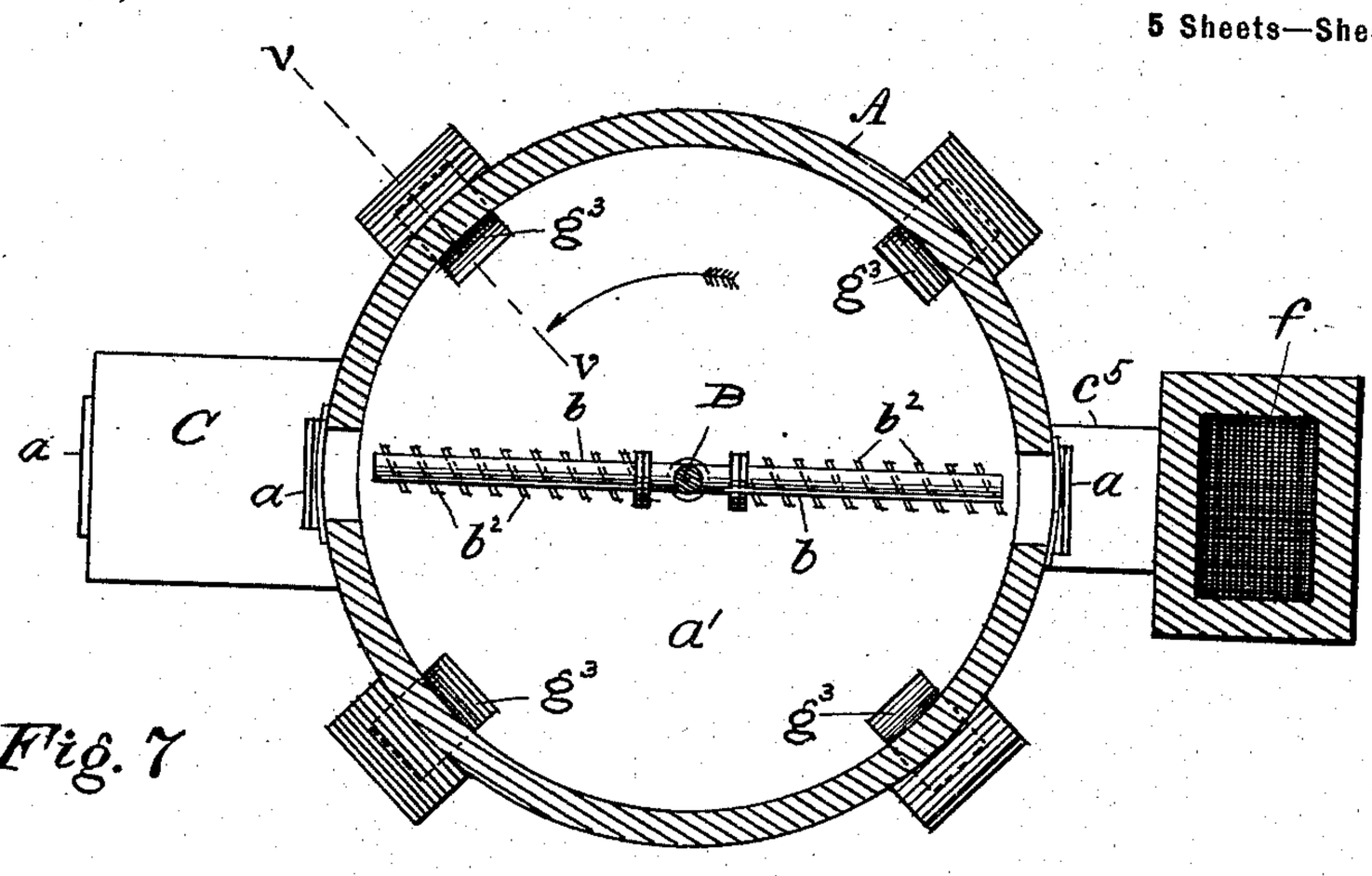

Fig. 7

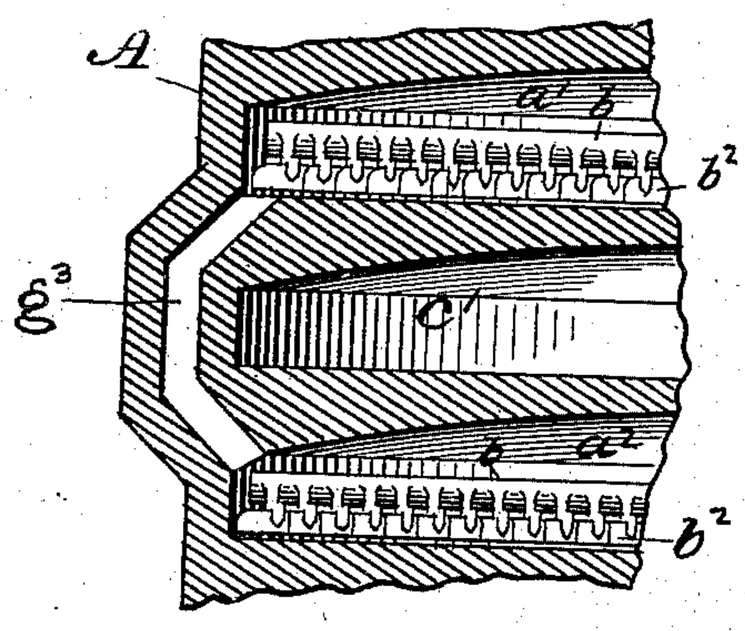

Fig. 8

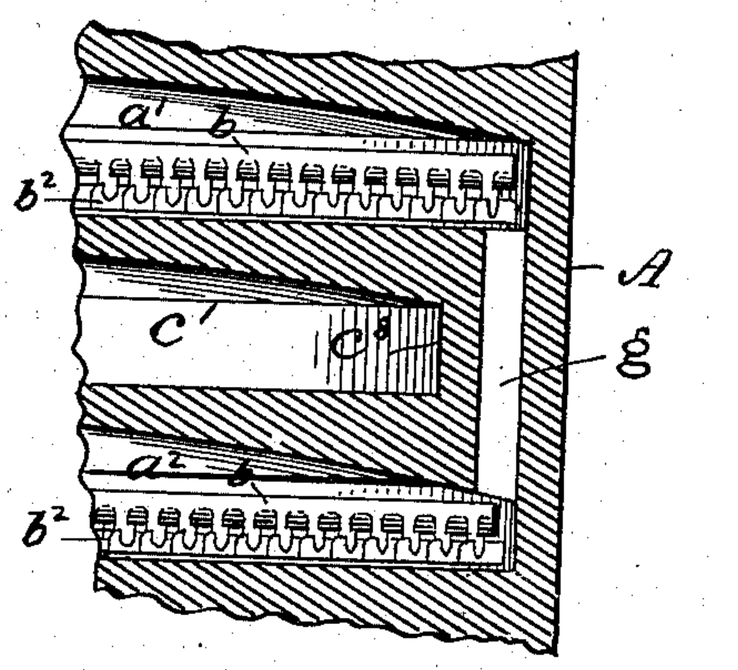

Fig. 9

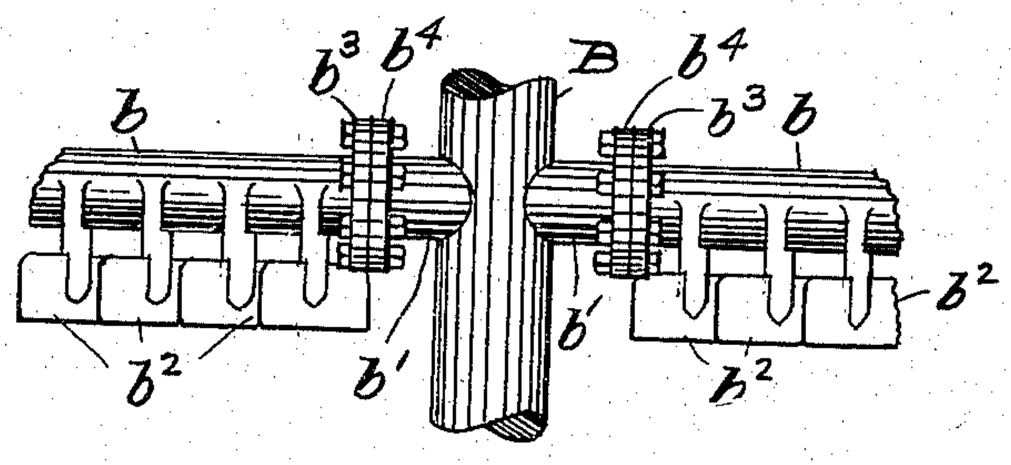

Fig. 10

Witnesses
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Ernest G. Wilcox

Utley Wedge Inventor
By his Attorney
C. M. Voree.

UNITED STATES PATENT OFFICE.

UTLEY WEDGE, OF BAYONNE, NEW JERSEY.

ROASTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 654,335, dated July 24, 1900.

Application filed March 13, 1899. Serial No. 708,806. (No model.)

To all whom it may concern:

Be it known that I, UTLEY WEDGE, a citizen of the United States, residing at Bayonne, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Roasting-Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in furnaces for roasting, calcining, oxidizing, and like operations, the object being to improve the construction of the furnace and obtain better results in its operation; and the invention consists in the novel features of construction, combination, and arrangement of the various parts for coaction to produce such results, all as hereinafter described, and set forth in the claims.

In the drawings, Figure 1 represents in central vertical section a furnace in the construction of which my invention is embraced. Fig. 2 represents a horizontal section through one of the furnace-chambers of the furnace shown in Fig. 1, the plane of section being indicated by the broken line $x\ x$ in Fig. 1. Fig. 3 represents a central vertical section of a furnace embracing certain modifications of construction. Fig. 4 is a horizontal section through the furnace shown in Fig. 3, taken on the plane indicated by the broken line $y\ y$ on Fig. 3. Fig. 5 is a horizontal section through the furnace shown in Fig. 1, taken on the plane indicated by the broken line $w\ w$ on Fig. 1; and Fig. 6 is a like section through the furnace shown in Fig. 3, taken on the broken line $z\ z$ on Fig. 3. Fig. 7 is a horizontal section on the same plane as Fig. 5, but illustrating a modified construction wherein the passages from one roasting-chamber to the next are carried outside of the furnace-chambers. Fig. 8 is a vertical sectional detail on the plane indicated by the broken line $v\ v$ on Fig. 7, illustrating more clearly the construction shown in Fig. 7. Fig. 9 is a sectional detail through one of the passages g, taken on line $u\ u$ of Fig. 2; and Fig. 10 is a detail showing more clearly the connection of the stirring-arms to the shaft and the arrangement of the stirring-blades.

The furnace is constructed with chambers in a tier one above the other, forming what is commonly called a "tower" or "turret" furnace, and is provided with a central vertical shaft carrying horizontal stirring-arms in the several roasting-chambers, by the rotation of which the material under treatment is continuously stirred and moved so as to pass from chamber to chamber until it is finished and discharged.

My improved furnace is adapted to such operations as drying, desulfurizing, chloridizing, oxidizing, roasting, or calcining ores, mattes, metallic bodies, or compounds, oxids, or other crushed, ground, or comminuted materials; but for convenience I shall describe the operation of roating ores or sulfids—such, for instance, as "pyrites fines"—it being understood that wherever I use the term "roasting" such operations as chloridizing, oxidizing, drying, &c., are also included.

The furnace comprises the tower-like structure A, of brick or other suitable refractory material, divided into roasting-chambers a' a^2 a^3, &c., as many as are required. A central vertical shaft B is provided in each of the chambers a' a^2 a^3, &c., with one or more arms b, carrying stirring-blades b^2, which extend so near the floor of the chamber as to just have sufficient clearance and are set at such an angle to the arm which carries them as to pass the material on the floor outward or inward toward the passage into the next lower roasting-chamber, as seen in Figs. 5 and 6, where the inclination of the blades b^2 is indicated by the dotted lines on the arms b. The arms b are preferably attached to the shaft B by being bolted through flanges b^3 on the arm b to flanges b^4, formed on short lateral branches b' of the shaft B, as best seen in Fig. 10.

In some roasting operations the material itself has not sufficient combustible constituents to effect its own roasting, and in such cases it is necessary to supply some heat additional to that generated by the roasting ore itself. This has been done by arranging fur-

naces in connection with the roasting-chambers and burning fuel in such furnaces, the combustion-gases from the furnaces passing into and through the roasting-chambers and commingling with the gases given off by the roasting material. In many cases, however, this mingling of combustion-gases with the gases from the roasting material is very deleterious and even fatal to the operation. If the sulfurous gases from sulfid ores are to be used in manufacturing sulfuric acid or sulfates, the presence of the carbonaceous combustion-gases is extremely objectionable, while in many operations—such as the dead-roasting of ores, &c.—the presence of such carbonaceous gases in the roasting or oxidizing chamber at the high temperature employed exerts a reducing effect upon the material and very seriously interferes with the operation and also impairs the quality of the product. A further objection to such mingling of the gases in the roasting-chambers is that in many cases the material contains more or less dust, which is of value, and the increased volume of gases passing through the roasting-chambers carries out more of this dust than would otherwise be taken up, and some portion of the dust so carried out is not recovered in the dust-chamber, but is lost.

To supply the heat necessary to supplement that generated by the combustion of the material itself or to supply the heat required when the material is not itself combustible, I interpose between the roasting-chambers one or more furnace-chambers, preferably alternating the furnace-chambers c' c^2, &c., with the roasting-chambers a' a^2 a^3, &c., as shown in Figs. 1 and 3. The furnace-chambers may be more or less in number than the roasting-chambers, and two, three, or more of the roasting-chambers may intervene between the furnace-chambers, as the nature of the material treated may require; but for most purposes the alternate arrangement shown is to be preferred. The furnace-chambers are heated by any preferred means—as furnaces C, oil-burners d d, or gas-burners e—as I do not limit myself to any specific mode of heating. The combustion-gases from one furnace-chamber are preferably passed by a flue, as c^6, to the next furnace-chamber, thus further utilizing the heat of the combustion-gases, and from the last furnace-chamber the combustion-gases pass, as by flue c^5, to the stack f. In any case the gases may be passed to any device, as a boiler or feed-water heater, for utilizing their waste heat instead of passing them to the stack.

The shaft B is protected where it passes through the furnace-chambers by a wall c^7, of masonry, built around it, and a wall c^8, of masonry, incloses the passages g g^2, through which the material is passed from one roasting-chamber to the next, as seen in Figs. 1, 2, and 4, or the passages g may be formed in the outer wall of the furnace A without passing through the intervening furnace-chamber, as shown at g^3 in Figs. 7 and 8.

The material to be treated is fed by any suitable feeding device—such, for instance, as the hopper B and conveyer h—into the upper roasting-chamber through an inlet i, and from the lower chamber an outlet j delivers the finished product into cars k or into bins or other desired receptacle. From the upper chamber a gas-flue l conducts the gases thrown off from the material to any desired place of disposition, such as acid-chambers, dust-chambers, &c.

By the construction I have shown and described it will be seen that none of the combustion-gases are allowed to enter the roasting-chambers, but each kind of gases is kept separate and separately utilized and disposed of. The interposing of the furnace-chambers between two of the roasting-chambers heats both of the latter chambers by the same expenditure of fuel which would be required to heat one only, and this effect is increased by utilizing in the upper chambers the waste heat of the gases from the lower chambers.

The shaft B, which may be of any usual or suitable construction, is supported at the bottom, as by the step n, and is rotated by any suitable means—such, for instance, as the gear m and driven gear m^2. Doors a afford access to the various chambers for any desired purpose—such as inspection, sampling, adding reagents, or making repairs—and through these doors air can be admitted, if desired, at any point and in any quantity required, or the air can be entirely excluded, if the particular operation may require. The gases given off by the material pass up from chamber to chamber through the passages g g^2 and out of flue l, the course of the gases being indicated by light arrows. The course of the combustion-gases is in like manner indicated by heavy arrows.

p represents a damper in the stack f for controlling the combustion products and regulating the draft and heat in the furnace-chambers, as may be required.

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

1. In a roasting-furnace the combination of a tier of roasting-chambers, furnace-chambers interposed in the series of roasting-chambers and not communicating therewith, but so communicating with each other that the combustion products of one furnace-chamber are conducted into another, passages connecting the roasting-chambers with each other, whereby the material in the roasting-chambers may be passed from chamber to chamber out of contact with any gases other than those generated therein, and stirring mechanism in each roasting-chamber, substantially as described.

2. In a turret-furnace the combination of

a tier of roasting-chambers alternating with furnace-chambers which do not communicate therewith but which so communicate with each other that the combustion products of one furnace-chamber are conducted into another, an axial shaft extending through all the chambers and having stirring-arms in the roasting-chambers, passages connecting the roasting-chambers with each other but not communicating with the intervening furnace-chamber, and means for rotating said shaft, substantially as described.

In testimony whereof I hereto affix my signature in presence of two witnesses.

UTLEY WEDGE.

Witnesses:

CHAS. E. ANNETT,

M. P. STRINGHAM.