

No. 742,021.

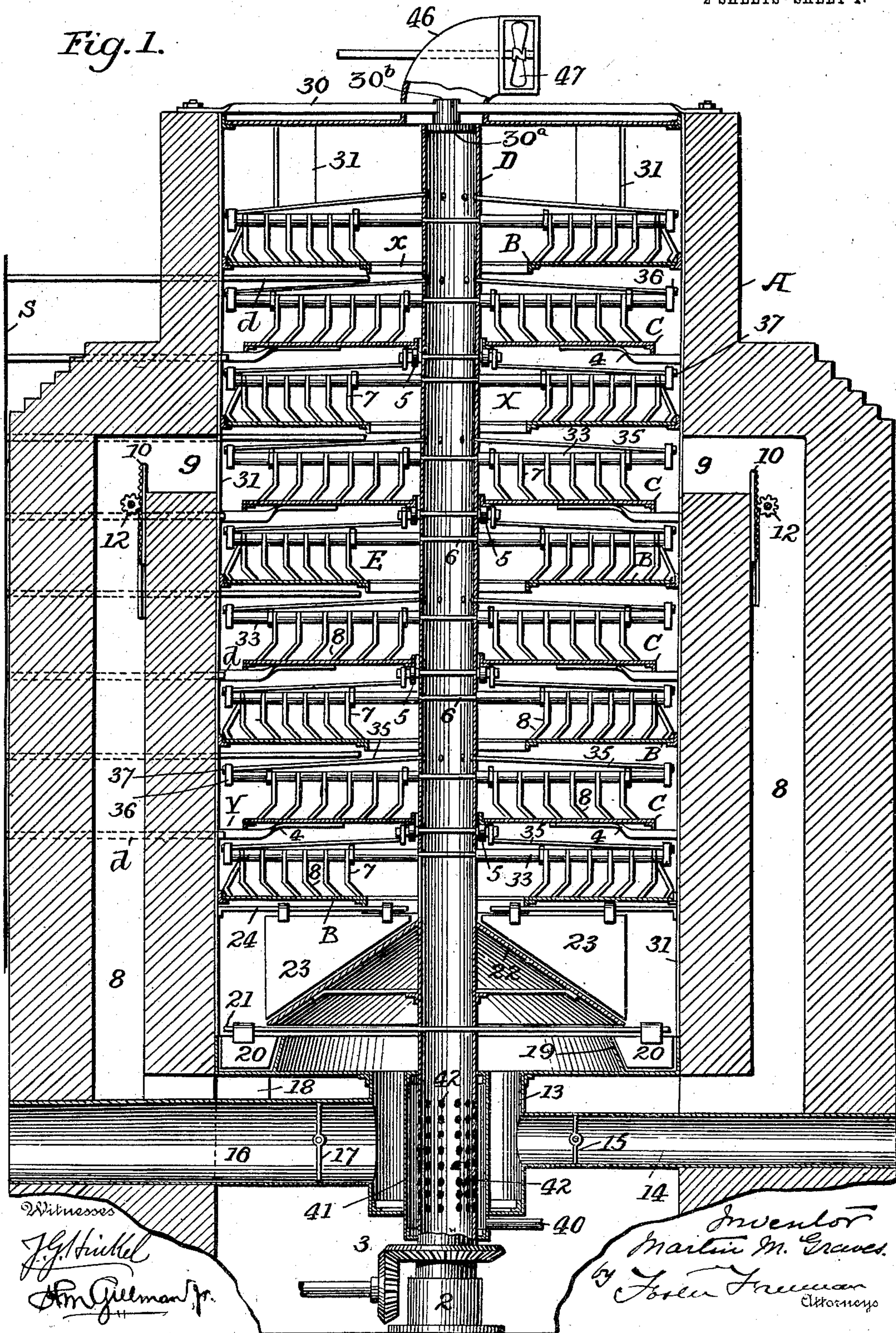
PATENTED OCT. 20, 1903.

M. M. GRAVES.
APPARATUS FOR DRYING.
APPLICATION FILED APR. 19, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses
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H. M. Gillman Jr.

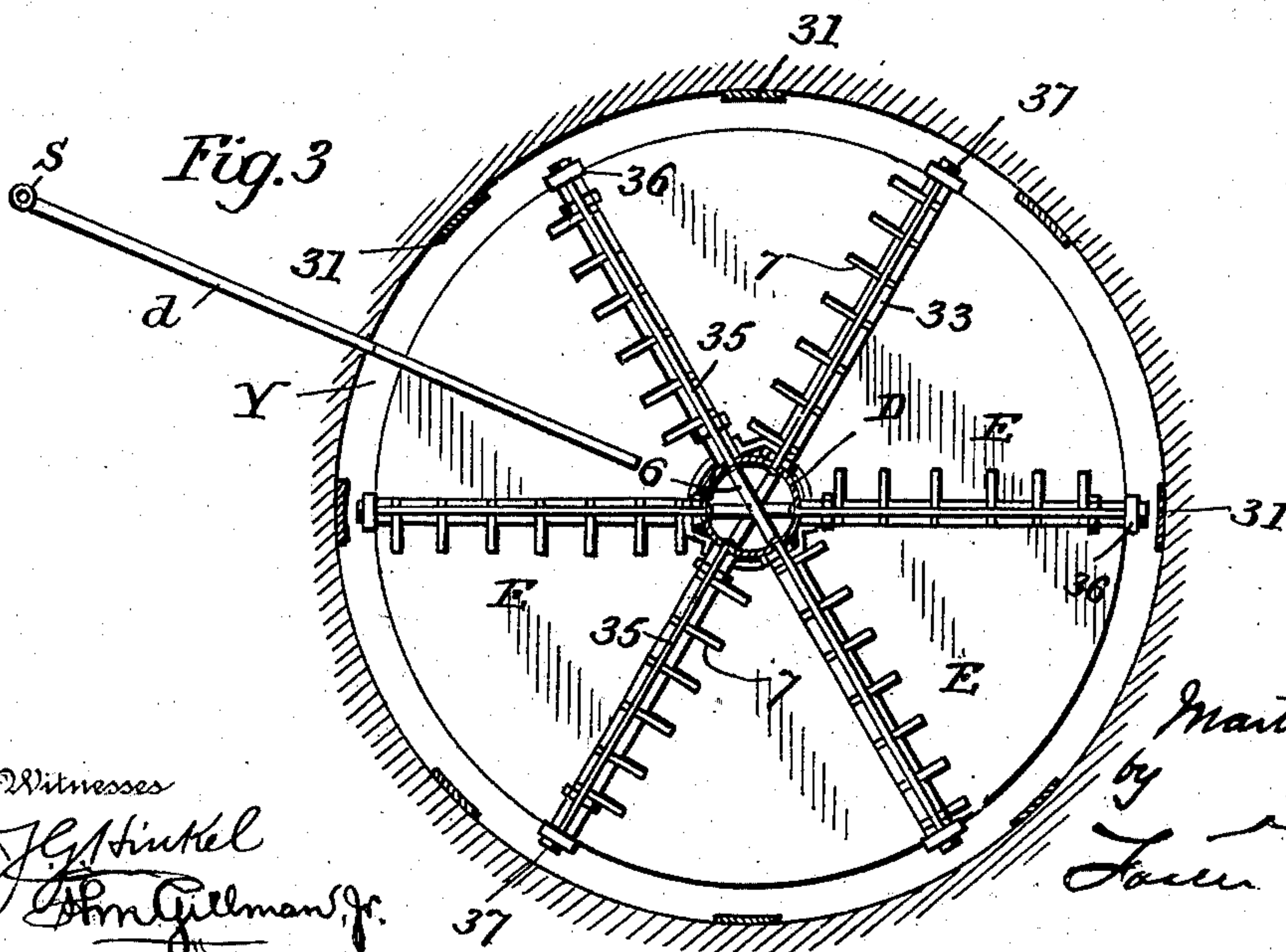
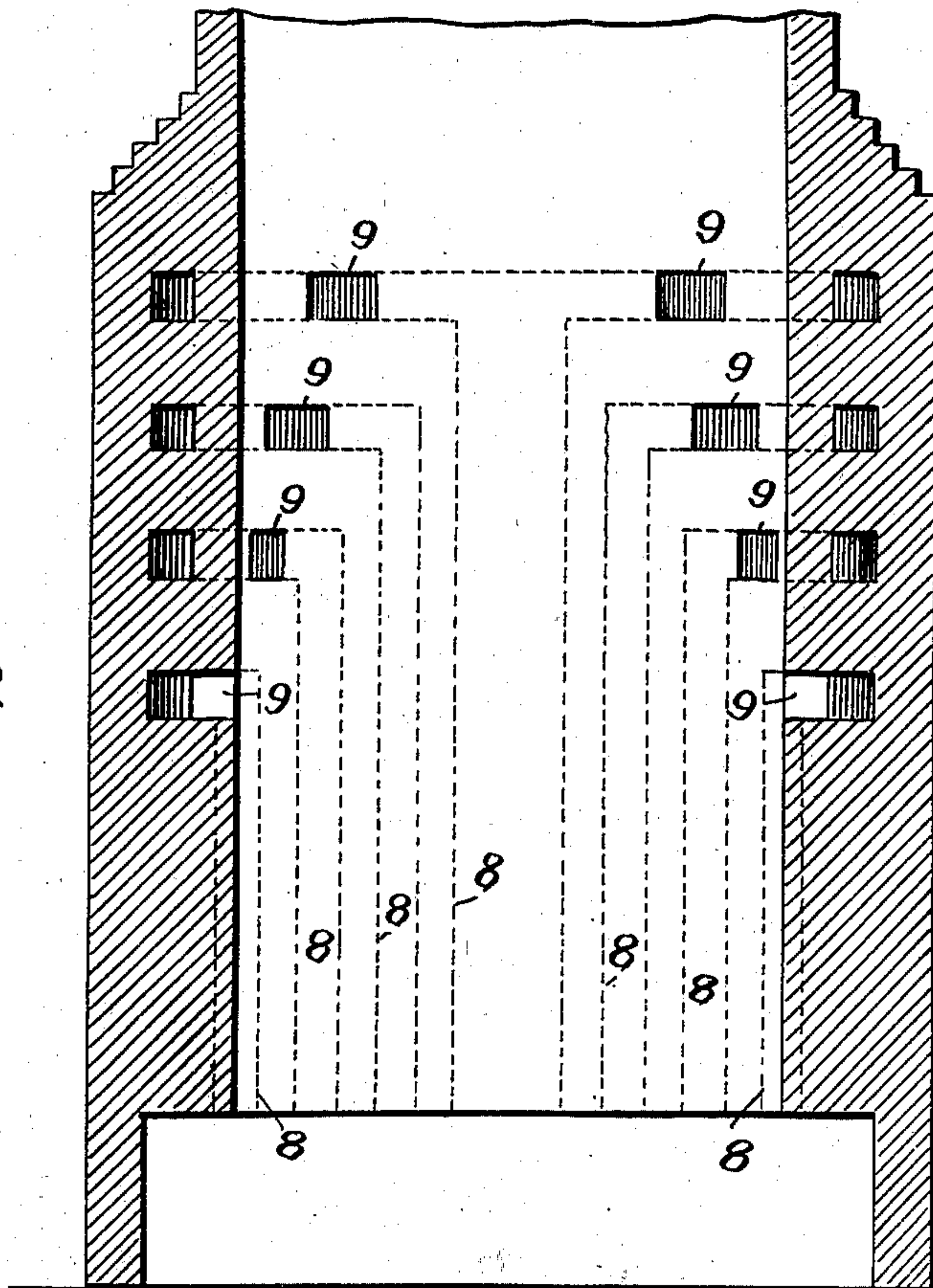
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NO MODEL.

2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

MARTIN M. GRAVES, OF LOUISVILLE, KENTUCKY, ASSIGNOR TO KENTUCKY DISTILLERIES & WAREHOUSE COMPANY, INCORPORATED, OF FRANKFORT, KENTUCKY, A CORPORATION OF NEW JERSEY.

APPARATUS FOR DRYING.

SPECIFICATION forming part of Letters Patent No. 742,021, dated October 20, 1903.

Application filed April 19, 1902. Serial No. 103,796. (No model.)

To all whom it may concern:

Be it known that I, MARTIN M. GRAVES, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Apparatus for Drying, of which the following is a specification.

This invention relates to that class of driers adapted for use in drying the refuse from distilleries, garbage, &c., and more especially to that class in which the material passes from one platform to another in a vertical chamber; and the invention consists of certain features whereby the overheating of any part of the material acted upon is prevented and whereby the entire mass within the drier may be brought into operative relation to the heating-gases and to certain details of construction, as fully set forth hereinafter and as illustrated in the accompanying drawings, in which—

Figure 1 is a sectional elevation of a drier embodying my improvements; Fig. 2, a sectional elevation illustrating the arrangement of flues, and Fig. 3 a transverse section. Fig. 4 is a plan view of the support for the upper end of the central shaft.

The drying-chamber X is inclosed within a circular wall or casing A, and centrally within the chamber is supported by a step 2 at the bottom and by a cross-bearing 30 at the top a shaft D, which preferably is hollow and of such diameter as to secure the stiffness necessary to properly support the parts connected therewith and as to afford a flue for the upward passage of air-currents, as hereinafter described.

Within the casing are alternating series of platforms B C, the platform B being supported at the outer edges by the wall A or, as shown, by angle-irons connected to vertical strips 31 within the wall and having central discharge-passages α , while the platforms C are smaller in diameter than the platforms B to afford peripheral discharge-passages Y, and the inner edges of the platform C are supported by the shaft D. This support preferably consists of antifriction-rollers 5, turning upon studs projecting from the shaft,

which therefore can turn without frictionally engaging the platform.

The material to be dried is fed to the top of the drier and falls upon the upper platform and is carried radially inward toward the passage α , falls onto the platform C, and is then carried radially outward through the passages Y, being thus fed by means of drags E. These drags may be constructed in different ways; but, as shown, each consists of a series of blades 8, provided with arms 7, through which extend cross-rods 6, the said blades and arms swinging freely on this cross-rod, so that the blades will remain in contact with the surface of the platform below, and each series of blades is so inclined as to feed the material radially in the proper direction as the blades are carried over the platform by the rotation of the shafts, which are driven by gears 3 or otherwise. An effective and convenient construction of the drags consists in forming them of plates of metal of proper shape to constitute the blades and arms bent to set the blades in proper position, perforated for the passages of the rods 6, with tubes 33 of suitable length placed upon the rods between the arms to constitute distance-pieces, setting them in proper position.

The platforms C are supported at their outer edges by means of brackets 4, extending through the strips 31, and in order that the rods 6 may not sag under the weight of the blades brace-rods 35 extend from the shaft through blocks 36 on the ends of the rods and are provided with tightening-nuts 37 or other tightening devices.

Below the lower platform, which has a central discharge-opening, is arranged a cone 22, preferably carried by the shaft, the lower edge extending over an annular trough 19, and a cross-rod 21, carried by the shaft, carries swinging blades 20, which as they are carried in the trough feed the material which passes down the cone into the trough toward a discharge-opening communicating with a discharge-chute 18. To insure the removal of the material from the cone, I make use of drags in the form of triangular blades 23, the lower edges of which are in immediate prox-

imity to the face of the cone, these blades being suspended to swing freely from radial arms 24, supported within the chamber.

The class of material which is intended to be dried by the improved apparatus—as, for instance, that discharged from the filter-press of a distillery or garbage or other like material—will contain anywhere from forty to sixty per cent. of its weight of moisture, and in order to rapidly dry this material it is necessary to employ hot air or gases at a high temperature. It has been found that when the gases are introduced at the bottom of the drier at such a temperature as will enable the entire mass to be heated to any material extent the bottom portion will become overheated, while the upper portion will not be sufficiently heated, with the result that portions of the material are burned or carbonized. Further, the heat imparted to the central shaft will cause it to bake the material in contact therewith, which adheres to the shaft and becomes burned or carbonized. To overcome these defects in this class of driers, I form the circular wall A of masonry, and in this wall I provide vertical flues 8, to which hot gases are conducted from any suitable furnace, and these flues are extended upward to different heights and communicate through lateral tubes or openings 9 with the interior of the chamber X at different heights, so that the heated gases are brought in direct contact with the mass of material simultaneously at different points throughout the height of the chamber, and owing to the presence of the large proportion of water at all these points there is no danger of overheating and burning the material at one point more than another, and by regulating the flow of the heated gases the proper temperature may be readily preserved. One means of thus regulating the flow is by dampers 10, which may be adjusted by means of racks and pinions 12 to open or close the flues 9 to any desired extent. In Fig. 1 only two of the flues 8 are shown, the others being omitted in order to more clearly show other parts of the apparatus. Fig. 3 is designed especially to show the arrangement of the flues.

In connection with the above I also provide means whereby either hot or cold air may be introduced into the chamber near the bottom. This may be done in different ways; but, as shown, a cylindrical casing 13, open at the top, surrounds the bottom of the shaft B, and with this casing communicate pipes 14 and 16 with intermediate dampers 15 and 17, one of the pipes receiving cold air and the other hot air from any suitable source of supply. By opening or closing or regulating the position of the dampers the passage of cold or hot air may be so regulated as to maintain the proper temperature within the chamber.

To prevent the shaft D from becoming overheated, the shaft is supplied with cold air in any suitable manner, as by a pipe 40, communicating with a jacket or casing 41, sur-

rounding the shaft, which has openings 42 for the passage of air from the casing to the shaft. In order to provide an outlet for the air at the top of the shaft, openings may be made in the disk 30^a, about which the upper end of the shaft turns, or the connection 30^b between the cross-bars 30 and said disk may be tubular, or both such provisions may be made, as shown in Fig. 4.

The heated gases flowing upward through the flues 8 and passing through the chamber not only heat the contents of the chamber directly, but also indirectly by heating the walls, which in turn impart their heat to the material in the chamber.

In order to secure a more forcible flow of the gases than would naturally result, the chamber may be closed at the top, with the central opening communicating with a casing 46, leading to the casing of an exhaust-fan 47.

In driers of the character described it is necessary to prevent any of the material being dried from lodging or being detained for any length of time on any part of the apparatus, for the reason that such lodged or detained material is liable to become ignited. Some of the material is liable to lodge on the horizontal arms that carry the drags, and particularly that portion of them directly below the central openings *x*, and in order to prevent this I provide pipes *d*, extending through the wall A, for delivering hot air or steam under sufficient pressure to dislodge any of the material which may lodge on the arms. The pipes *d* may all branch from a main supply-pipe S, to which the air or steam may be supplied from any suitable source. (Not shown.) Similar pipes may also be provided to dislodge material from the arms below the discharge-passage Y, and the discharge-openings of the pipes *d* may be either circular or oval, and if the latter the major axis will preferably be horizontal.

As shown in the drawings, the central shaft D is provided with six radiating arms carrying scrapers for each platform; but I do not intend to limit myself to such number, as it is obvious more or less may be employed. If less arms are employed, the shaft D may be rotated at a higher speed in order to move the material over the platforms with sufficient rapidity.

Without limiting myself to the precise construction and arrangement of parts shown and described, I claim—

1. The combination in a drier, of an outer casing or wall inclosing a central chamber, horizontal partitions within the chamber, means for feeding the material progressively downward to and from said partitions, separate flues in the said walls extending to different heights and communicating with said chamber at different points in its periphery, substantially as described.

2. The combination in a drier of an outer casing or walls inclosing a central chamber, horizontal partitions within the chamber,

means for feeding the material progressively downward to and from said partitions, flues extending upward to different heights and communicating with said chamber at different points in its periphery and means for directing cold air into the chamber, substantially as described.

3. The combination with the walls of the drier and inclosed chamber thereof, of a series of platforms alternately having central and peripheral openings, a central hollow shaft carrying a series of agitating-blades and means for directing currents of air through the shaft, substantially as described.

4. The combination with the walls inclosing a chamber and platforms supported within the chamber, and a hollow shaft arranged within the chamber feeding-blades carried by the shaft and means for directing currents of air through the shaft, substantially as described.

5. The combination with the walls inclosing a chamber and platforms supported within the chamber, and a hollow shaft arranged within the chamber, feeding-blades carried by the shaft and means for exhausting the gases at the top of the chamber, and means for directing currents of air through the shaft, substantially as described.

6. The combination with the walls, chamber and platforms of a drier, of a central rotating shaft, rods extending radially therefrom over the platforms, braces connected at one end to the shaft and at their other ends to the outer ends of the rods, and carrier-blades suspended to swing freely on said rods and resting on said platforms, substantially as described.

7. The combination with the walls, chamber and platforms, of a drier of a central rotating shaft, rods extending radially therefrom over the platforms, arms swinging on said rods and carrying carrier-blades at their lower ends and distance-pieces on the rods between the arms, substantially as described.

8. The combination with the wall inclosing a chamber and with a central rotating shaft and platform supported at the outer edges by brackets extending inward from said walls, and at the inner edges by rollers carried by the shaft, substantially as described.

9. The combination with the wall and platforms having central openings, of a rotating central shaft provided with antifriction-bearings for the inner edges of said platforms, substantially as described.

10. The combination with the walls and stationary platforms, of a rotating central hollow shaft, platforms supported at their inner edges by antifriction-bearings on the shaft, and means for directing currents of cold air through said shaft, substantially as described.

11. The combination of the wall inclosing a chamber, stationary platforms having central openings and supported within the chamber to leave discharge-passages near the wall, and

a shaft less in diameter than said openings and other platforms alternating with the first and having central discharge-passages, and flues in the wall opening at different heights into said chamber, and openings to admit hot and cold air to the bottom of the chamber, substantially as described.

12. The combination of the wall inclosing a chamber, stationary platforms having central openings and supported within the chamber to leave discharge-passages near the wall, and a shaft less in diameter than said openings and other platforms alternating with the first and having central discharge-passages, and flues in the wall opening at different heights into said chamber, and openings to admit hot and cold air to the bottom of the chamber, and openings to admit cold air into the shaft, substantially as described.

13. The combination of the wall inclosing a chamber, stationary platforms having central openings, and supported within the chamber to leave discharge-passages near the wall, and a shaft less in diameter than said openings and other platforms alternating with the first and having central discharge-passages, blades carried by the shaft to move the material radially over the platforms, a cone carried by the shaft near the bottom, an annular trough below the edge of the cone and blades supported above the cone, substantially as described.

14. The combination of the wall inclosing a chamber, stationary platforms having central openings and supported within the chamber to leave discharge-passages near the wall, and a shaft less in diameter than said openings and other platforms alternating with the first and having central discharge-passages, blades carried by the shaft to move the material radially over the platforms, a cone carried by the shaft near the bottom, an annular trough below the edge of the cone and swinging blades supported above the cone, substantially as described.

15. The combination with the walls, chamber and platforms of a drier, of a central rotating shaft, rods extending radially therefrom over the platform and carrying feeding-blades, and means for dislodging material from said rods, substantially as set forth.

16. The combination with the walls, chamber and platforms of a drier, of a central rotating shaft, rods extending radially therefrom over the platform and carrying feeding-blades, and pipes for discharging fluid under pressure onto said rods to dislodge material therefrom, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MARTIN M. GRAVES. [L. S.]

Witnesses:

WILLIAM E. SEELY,
FRED S. BUSH.