

No. 715,606.

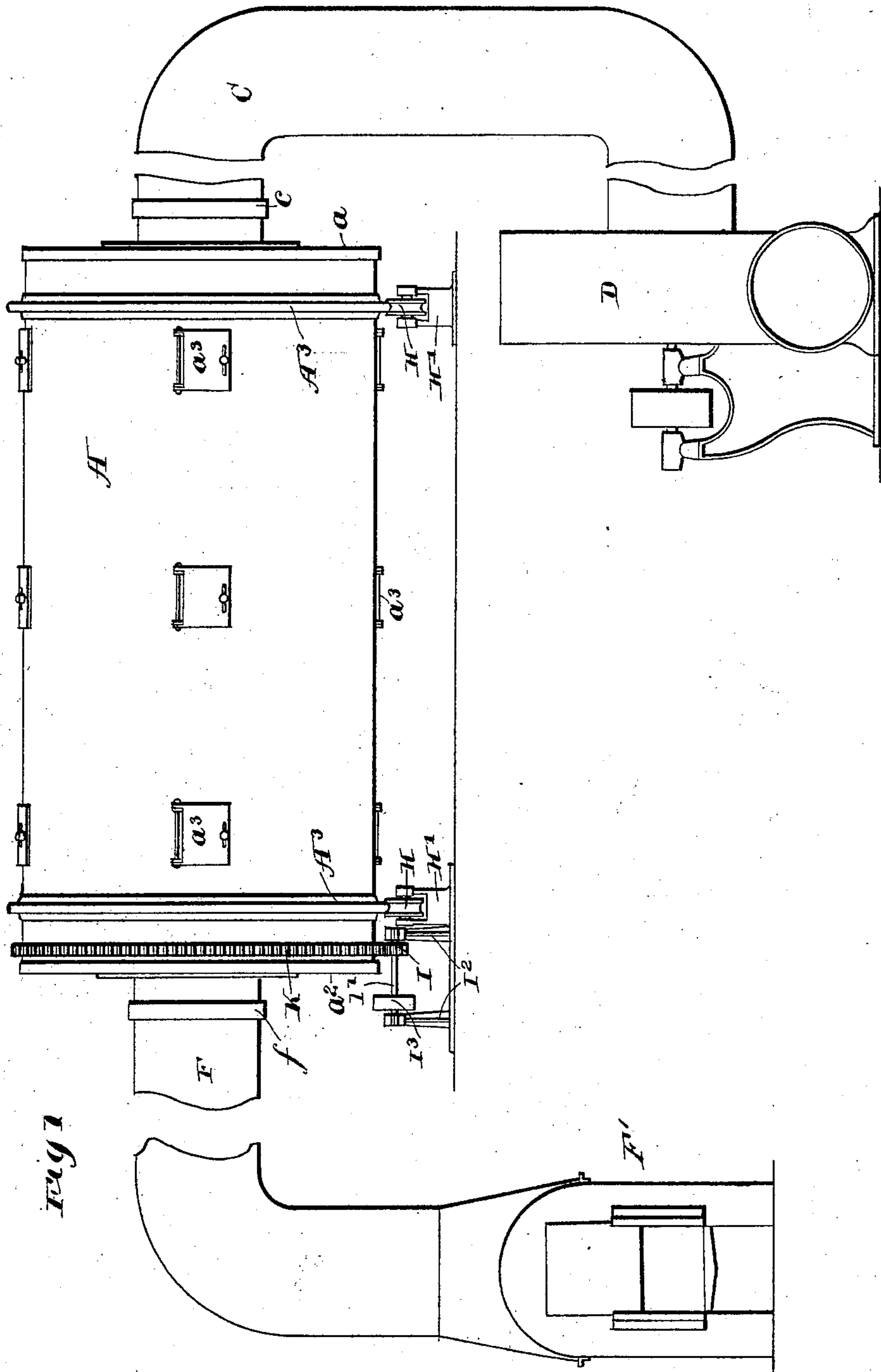
Patented Dec. 9, 1902.

W. P. RICE.
APPARATUS FOR DRYING MALT.

(Application filed Apr. 14, 1902.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:-

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2 Sheets—Sheet 2.

Fig 2

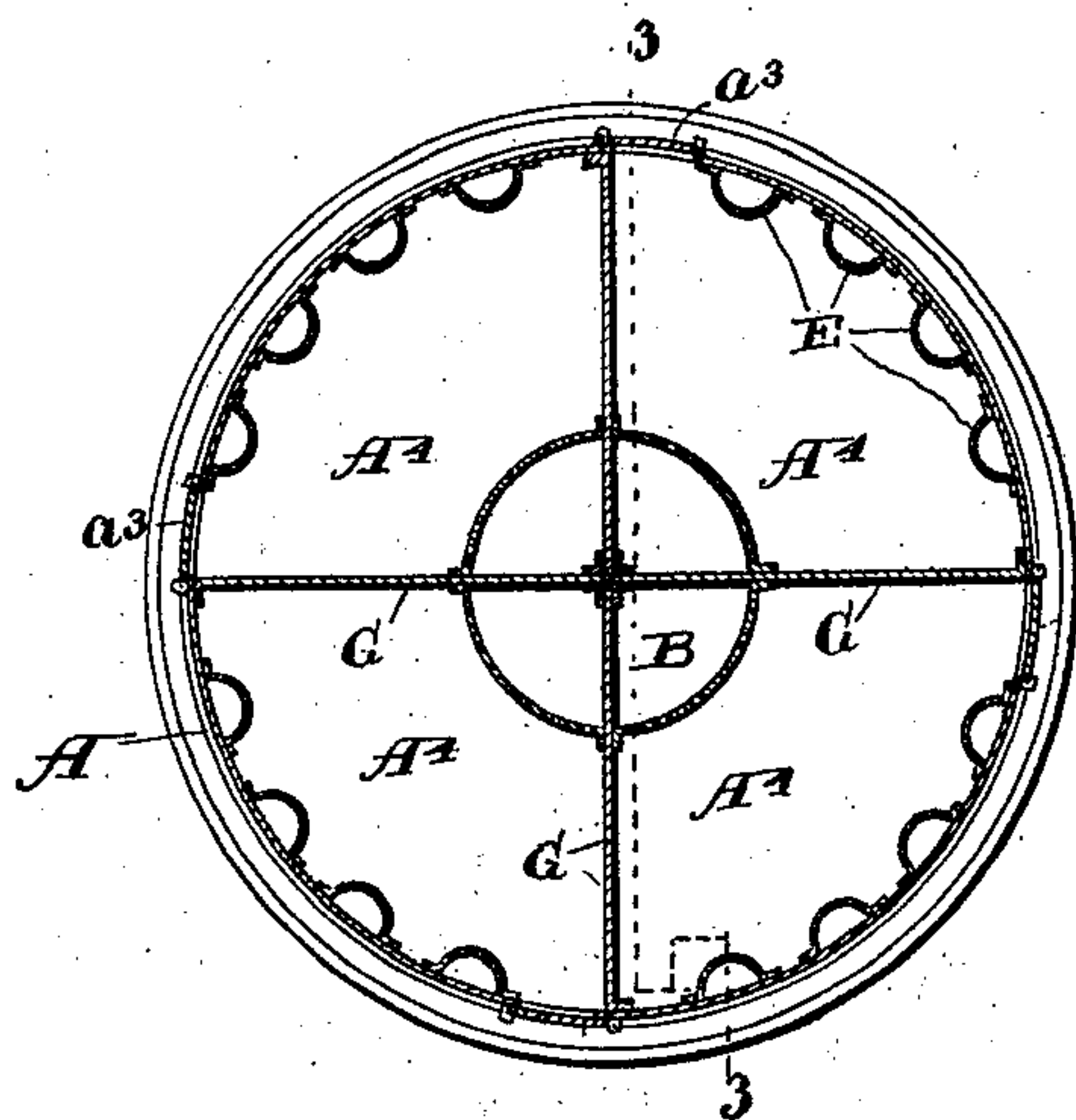
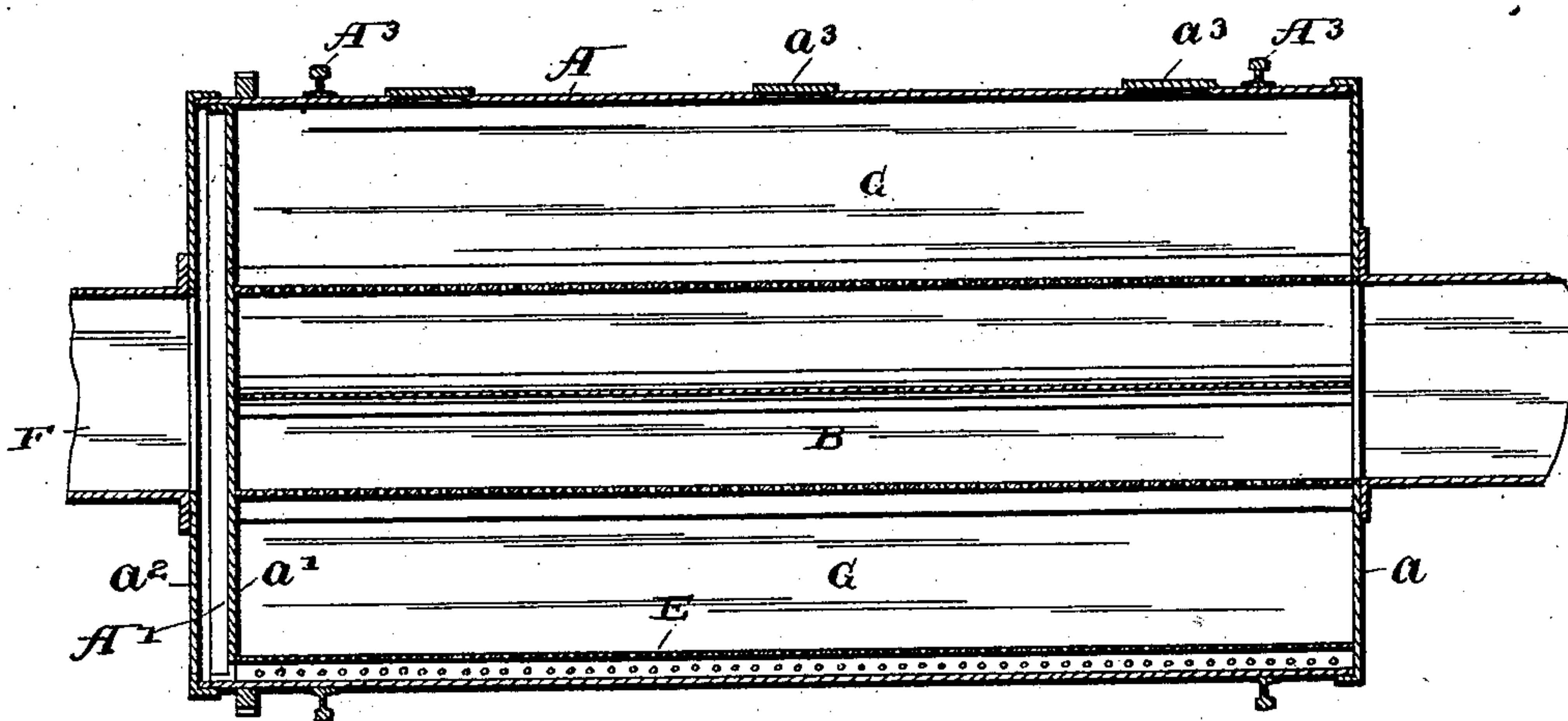


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM P. RICE, OF CHICAGO, ILLINOIS.

APPARATUS FOR DRYING MALT.

SPECIFICATION forming part of Letters Patent No. 715,606, dated December 9, 1902.

Application filed April 14, 1902. Serial No. 102,862. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM P. RICE, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Drying Malt; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to an improved apparatus for drying malt, and refers more specifically to that form of apparatus embodying a revolving drum in which the malt is subjected to the action of the drying-air as the air passes through the drum.

Among the objects of my invention is to prevent the weight of the malt in the drum compressing the lower layers of the malt masses to such extent as to prevent the free passage of the drying-air therethrough in suitable quantities to dry the malt in accordance with the best practice and also to enable the drum to be rotated with the expenditure of less power than drums heretofore constructed.

The drum is made of large capacity, and in order to prevent the weight of the malt from compressing the lower layers or parts of the malt masses in a manner to impede free passage of the drying-air therethrough I propose to divide the drum into a plurality of radial compartments by means of radial partitions extending from the central air-passage of the drum outwardly to the shell thereof and to make the depth of said radial compartments such that the weight of the malt when said compartments are filled with malt will not have an effect to so compress the lower layers of the malt as to prevent the free passing of air therethrough. The depth of each compartment is somewhat less than one-half the diameter of the drum, whereby the capacity of the drum is greatly increased over single-chamber drums, and at the same time the depth of the grain bodies therein does not exceed a practical maximum. Furthermore, the power necessary for rotating my improved drum is much less than that required for rotating a drum of the same diameter having no radial compartments, as the bodies of the grain in my improved drum are entirely separated and act in a measure to counterbalance each other.

rated and act in a measure to counterbalance each other.

In the drawings, Figure 1 is a side elevation of a drying apparatus made in accordance with my invention, showing a furnace for heating the air, a drying-drum connected by a pipe with the furnace, and an exhaust-fan connected with the drying-drum. Fig. 2 is a transverse vertical section of the drum. Fig. 3 is an axial section of the drum, taken on line 3 3 of Fig. 2.

As shown in said drawings, A designates a horizontal drum, having a cylindric wall and end walls a a' , and B a horizontal passage arranged concentrically in said drum and extending from one end wall thereof to the other. The wall of said central passage is perforated, and said passage communicates at one end with an air-pipe C, which latter communicates with an exhaust-fan D. The end of said passage remote from the pipe is closed by the end wall a' of the drum. Said drum is provided inside of its wall with a plurality of longitudinally-arranged air-passages E, which are concave in cross-section and are attached at their margins to the inner cylindric surface of the drum. The walls of said air-passages E are perforated. Said passages extend through and are closed at one end of the drum by the end walls a of the drum and communicate at the other end of the drum with a distributing-chamber A' , formed between the adjacent wall a' of the drum and a second end wall or head a'' , attached at its margin to the end margin of the cylindric wall of the drum. F designates an air-supply pipe communicating at one end with said distributing-chamber A' and at its other end with the discharge opening or openings of a furnace F' or other suitable source of heat through which the air is drawn by the exhaust-fan D and in which furnace the air is heated prior to its admission to the drum. The interior of said drum is divided into a number of compartments A^4 by a plurality of radial partitions G, herein shown as four in number and dividing said drum into four equal compartments. As herein shown, said partitions extend from the axial center of the drum to the shell thereof and are connected at their centers by means of suitable angle-bars. The central passage B is formed by

means of a plurality of cylindric segments, which are attached at their margins to the partitions G. Each of said compartments A⁴ is provided with one or more doors a³, through which the compartments may be charged and the contents discharged therefrom. Desirably each compartment will be provided with a plurality of doors arranged longitudinally of the compartment, so that when the drums are turned to bring the doors to the lowest side of the compartment and the doors opened the contents of the compartment may be discharged therefrom with little manual labor. The doors are herein shown as located adjacent to the partitions, as this location aids the discharging of the malt from the compartments when the drum is turned to bring the doors to the lowermost part of the drum. Each of said compartments is provided with a plurality of the air-passages E, four being herein shown and spaced at equal distances apart. The outer passages of each compartment are located a distance from the partition-walls, one of said passages of each series being located closely adjacent to the doors of its compartment and the passage at the opposite side of the series being located a distance from the adjacent partition approximately equal to the width of the doors. So far as the broader aspect of my invention is concerned the means for directing the drying-air through the malt bodies of the several compartments may be widely varied.

The drum is adapted to be slowly revolved upon its axis. For this purpose the said drum is supported on rollers H, which are rotatively mounted in the upper ends of stationary standards H'. Desirably the drum is provided at each end thereof with rigidly-applied stationary track-rails A³, which rest and roll on said supporting-rollers. Rotary movement is imparted to said drums through the medium of a rotative pinion I, affixed to a horizontal shaft I', mounted in upright standards I², located below the drums, and said gear-pinion I meshes with a circular rack K, affixed to the exterior surface of the drum in the manner shown in Fig. 1. Said shaft I' is provided with a belt-pulley I³, through which the shaft may be driven from any suitable source of power. The air-pipes C and F are connected with the rotary drum through the medium of revolving joints c and f of any suitable construction, as indicated in Fig. 1.

In the use of the drum described the compartments are successively charged with the proper amount of malt and the doors a³ closed. Thereafter the drum is rotated at a slow rate of speed—about two revolutions per hour—and the dry heated air is forced through the bodies of malt contained in the several compartments. As herein shown, the drying-air is supplied through the pipe F, the distributing-chamber A', the air-channels E to the outer sides of said compartments and is drawn by the exhaust-fans D through the

bodies of malt in said compartments and thence through the central passage B and the air-pipe C. If desired, the circulation of air may be induced from the opposite direction.

It will be observed that the maximum depth of the compartments of the drum is the distance between the shell of the drum and the inner or cylindric air-passage B, and said depth is so graduated as to prevent the weight of the grain from compressing the lower layers or parts of the malt bodies in the compartments. It will also be observed that the bodies of grain in the several compartments are entirely separate one from the other, so that in determining the maximum depth of the compartments each of said compartments is considered separately, and the weight of the malt in one compartment will have no effect on the body of malt in either of the other compartments. It will furthermore be observed that the walls of the compartments are entirely free from projections, that the malt lies loosely in said compartments in homogeneous masses which are shifted or turned as the drum rotates, and that the air which passes through said masses meets practically with a uniform resistance throughout the masses, so that the air is supplied to all parts thereof alike.

Another advantage of the construction described is that the drum may be rotated with the expenditure of less power than a drum of like capacity wherein the interior consists of a single chamber, as in my improved construction the bodies of the grain or malt in the several compartments are entirely separated one from the other, there being the same quantity of grain in each compartment, so that said drum is more nearly balanced than where the grain is contained within a single chamber or compartment. This advantage may be more readily understood from a consideration of the following: After the drying of the malt progresses and the drum is only partially filled, the unoccupied space of a single-chamber drum is located at one side of the drum and the greatest part of the weight of the malt is at one side of the axis of rotation thereof. In my improved construction, however, the several compartments contain like quantities of malt, and the masses of the malt, as well as the unoccupied spaces in said compartments, are symmetrically disposed about the axis of rotation of the drum and tend to counterbalance each other.

The structural details herein shown may be varied without departing from the spirit of my invention, and I do not wish to be limited to such details, except as hereinafter made the subject of specific claims.

I claim as my invention—

1. An apparatus for drying malt comprising a drum consisting of an outer shell which revolves on a horizontal axis and is provided at the shell with air-passages, an inner central passage or conduit which extends sub-

stantially throughout the length of the drum and is provided with a perforated wall, a source of heat communicating by a pipe with one end of said drum, an exhaust-pipe leading from the other end of the drum, said drum being provided with a plurality of independent, radial, segmental compartments, which have free and unrestricted areas in which the malt is confined in homogeneous masses, said compartments being made of such limited depth from the central passage or conduit to the shell that the weight of the granular contents of said compartments will not unduly compress the bottom or lower portions of such contents and thereby prevent free passage of air therethrough or allow such bottom portions of said contents to mat or become compact, and a door or doors affording access to said compartments.

2. An apparatus for drying malt comprising a drum consisting of an outer shell which revolves on a horizontal axis, and is provided at the shell with air-passages, an inner central passage or conduit which extends substantially throughout the length of the drum and is provided with a perforated wall, a source of heat communicating by a pipe with one end of said drum, an exhaust-pipe leading from the other end of the drum, said drum being provided with a plurality of independent, radial, segmental compartments, which have free and unrestricted areas in which the malt is confined in homogeneous masses, said compartments being made of such limited depth from the central passage or conduit to the shell that the weight of the granular contents of said compartments will not unduly

compress the bottom or lower portions of such contents and thereby prevent free passage of air therethrough, or allow such bottom portions of said contents to mat or become compact, and doors affording access to said compartments, said doors being located closely adjacent to the radial partitions, thereby facilitating the emptying of the compartments.

3. An apparatus for drying malt comprising a drum consisting of a horizontal outer shell, means acting on the drum to revolve the same on a horizontal axis, longitudinally-arranged perforated channels located at the outer cylindric surface of the shell, an inner central passage or conduit extending substantially throughout the length of the drum and provided with a perforated wall, a source of heat communicating by a pipe with one end of said drum, an exhaust-pipe leading from the other end of the drum, a chamber at one end of said drum communicating with said channels, radial partitions extending from said central passage to said shell and dividing said drum into a plurality of radial compartments, and a door for each compartment located between one of the partition-walls thereof and the associated perforated air-channel.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 12th day of April, A. D. 1902.

WILLIAM P. RICE.

Witnesses:

WILLIAM L. HALL,
CARL H. CRAWFORD.