Feb. 28, 1939. C. W. GORDON 2,149,018

DRYING APPARATUS

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Fig. 1

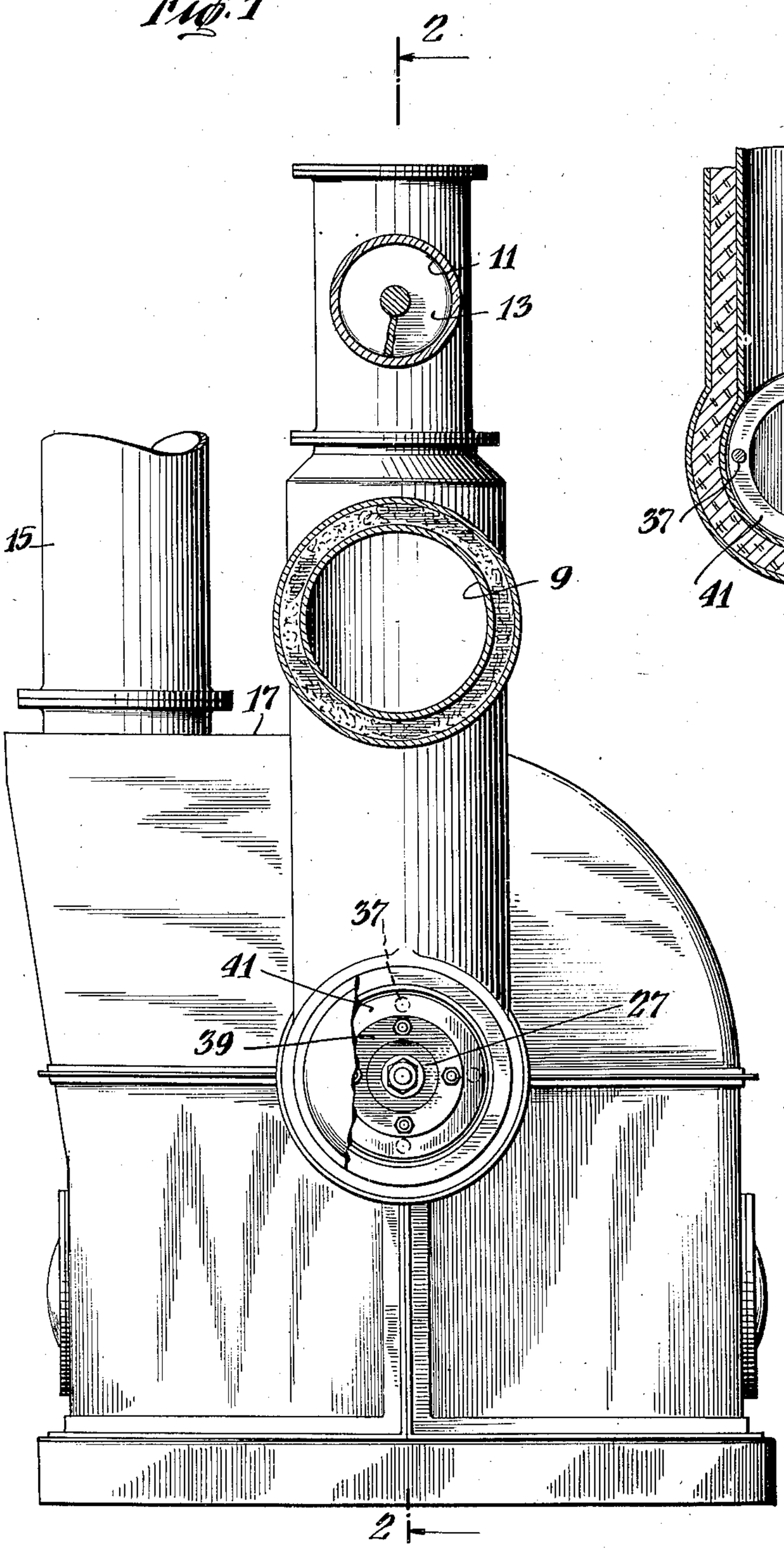

Fig. 4

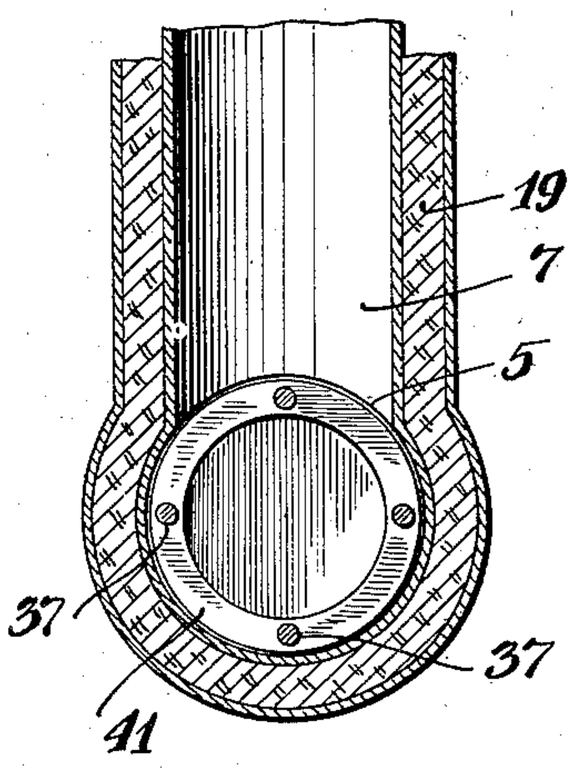

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Fig. 2

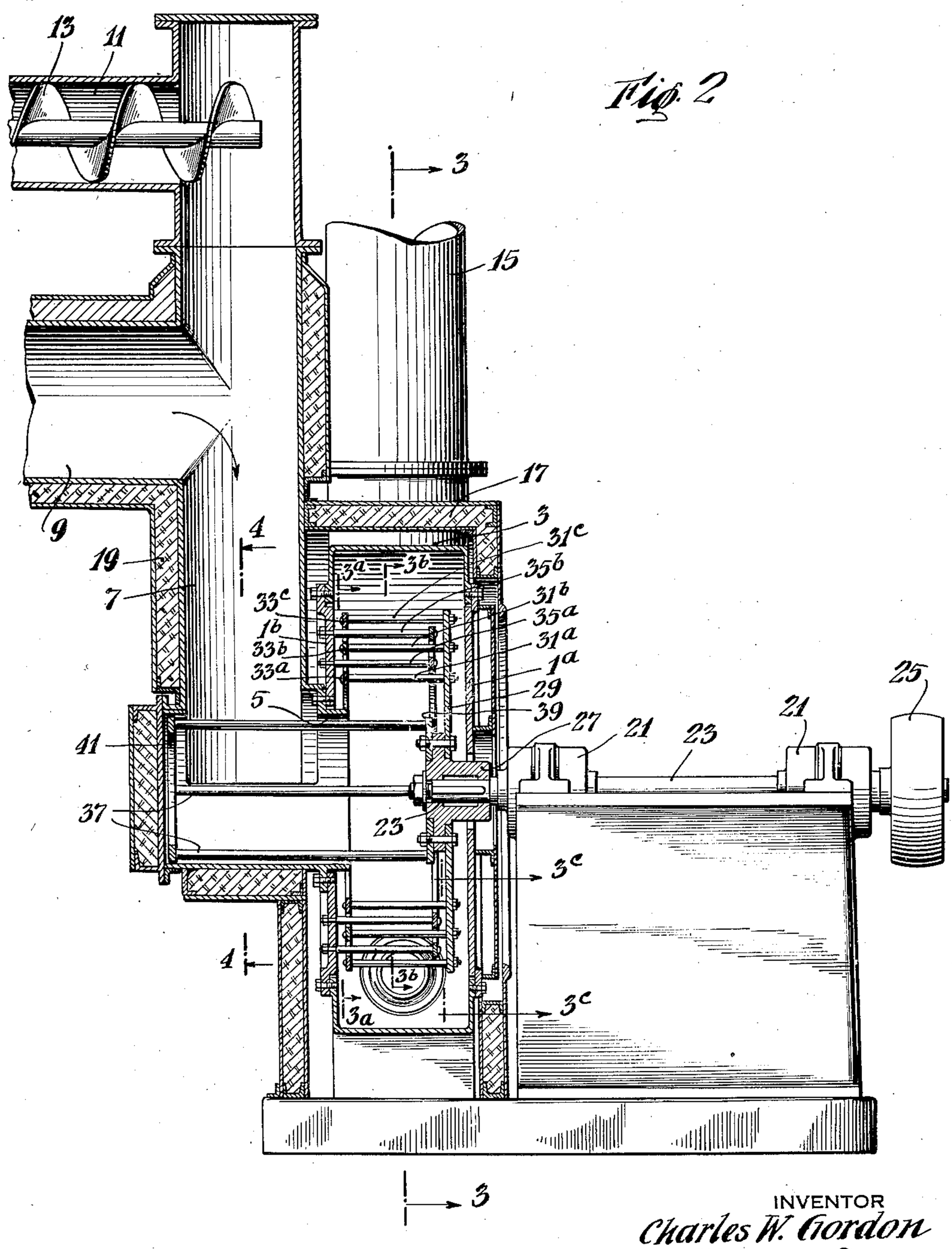

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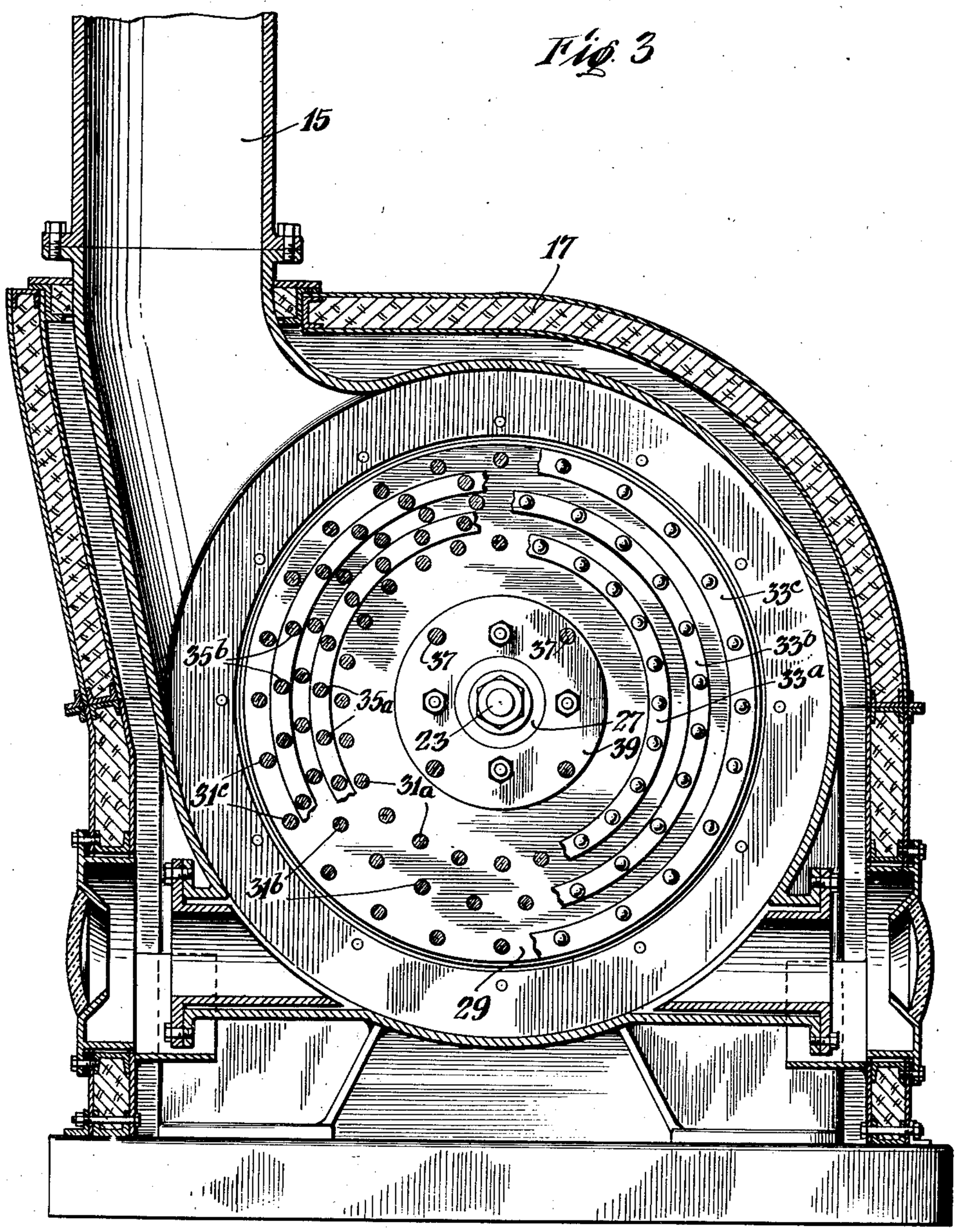
Fig. 3



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Patented Feb. 28, 1939 2,149,018

UNITED STATES PATENT OFFICE

2,149,018

DRYING APPARATUS

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Application August 12, 1937, Serial No. 158,625

3 Claims. (Cl. 83—11)

The present invention relates to apparatus for pulverizing and drying very wet materials. It has for its purpose the provision of improved apparatus of this sort. The character of the improvement will be readily understood from a reading of the following specification.

In this specification reference is made to the accompanying drawings in which Fig. 1 is an elevation of the apparatus embodying my improvement; Fig. 2 is a central vertical section on line 2—2 of Fig. 1; Fig. 3 is a section generally along line 3—3 of Fig. 2, parts however being on lines 3a—3a, 3b—3b and 3c—3c of said figure; and Fig. 4 is a section on line 4—4 of Fig. 2.

The apparatus comprises in general a casing in which there is mounted a beater or disintegrator and to which the wet material is fed together with a stream of hot gases. The inlet to the casing for these hot gases and wet material is located centrally at one side. The dried material and the gases are carried off through a duct extending tangentially from the casing.

The casing comprises two lateral circular plates 1a and 1b and a circumferential plate 3 securing the other two plates together. In the particular form illustrated this circumferential plate is U-shaped in cross section although this is not necessary. The inlet 5 to the casing is coaxial with it and opens from the foot of a drying tower 7. This drying tower receives hot air or other hot gases from a duct 9. The material to be treated in the apparatus is brought to the drying tower through the channel 11 by means such as screw 13, this channel 11 being located above the duct 9 for the hot gases so that the wet material drops through the hot gases entering from 9. The outlet for the dried material and gases is shown at 15 and is preferably tangentially arranged with respect to the casing. Preferably the casing is insulated against heat radiation as at 17 and similarly the drying tower is preferably insulated as indicated at 19.

Mounted in bearings 21—21 and extending into the casing is a shaft 23, arranged to be rotated at a high speed by some means, such for example as pulley 25. On the end extending into the casing there is mounted on this shaft 23 a hub 27 and to this hub there is bolted a circular plate 29 from which there extend across the space in the casing a plurality of rods. These rods are arranged in circles concentric with the shaft 23. In the particular example shown in the drawings there are three such sets of rods arranged in three concentric circles, the innermost one being shown at 31a, the middle one at 31b and the outermost one at 31c.

The ends of the rods opposite the plate 29 are connected for the purpose of stiffening the structure. The rods 31a are connected to an annular plate 33a, the rods 31b are connected to the annular ring 33b and the rods 31c are connected to the annular plate 33c.

Extending into the space between the sets of rods 31a, 31b and 31c are other sets of rods connected to the plate 1b. Of these sets the one marked 35a extends between the sets 31a and 31b and the one marked 35b extends between the sets 31b and 31c.

This general type of mill is not novel. It is illustrated for example in United States Patent 2,033,757, granted on March 10, 1936, to J. Crites and in United States Patent 2,075,506 granted on March 30, 1937, to J. Crites et al.

In the forms of these prior patents both sets of rods are arranged to rotate. In the form of the present invention disclosed in this application the second sets referred to, i. e. 35a and 35b, are shown as mounted in the stationary plate 1b. This arrangement is adopted by the present inventor as being simpler. His invention, however, has equal application to cases where this second set of rods rotates as in the prior patents.

In the prior patents there is mounted in each case in the duct serving as inlet to the beater casing a structure for stirring or moving along material in the duct. In the earlier of the two patents this takes the form of a screw conveyor for forcing material along the duct. In the latter of the two patents the structure is merely a set of scrapers or paddles which lift big particles that might collect at the bottom of the duct and drops them through the current of hot gases.

Both of these devices in the inlet duct require a relatively slow motion and the patentees therefore of necessity provide a separate drive for this part of the apparatus.

I have discovered that it is entirely feasible to dispense with this separate slow motor drive and to have an agitating or beating set of rods mounted on the rotating cage and extending through the casing into the inlet duct. This structure in the form illustrated comprises four rods 37—37. They are mounted advantageously on an annular plate 39 which is secured to the hub 27 preferably by the same bolts that hold plate 29 to this hub. Their opposite ends are secured to an annular ring 41 to stiffen the structure. While there are in the form illustrated

four rods 37, this number may of course be varied to suit conditions.

The action of the apparatus may be briefly stated as follows: The material, in the form of separate particles, is carried along by the conveyor screw 13 and discharged into the upper part of the tower 7. Falling through this space within this tower this material meets the hot gases delivered by the duct 9. As this mass of particles reaches the lower part of the drying tower it encounters the rapidly revolving rods 37 which beat up the particles and effectively keep any of them from reaching the bottom and collecting there. The current of hot gases conveys this agitated mass of comminuted particles into the casing where they move away from the center and encounter the rapidly revolving rods 31*a*, 31*b* and 31*c*. These further beat up the particles, the rods 35*a* and 35*b* serving to pulverize them farther as these particles are forcibly thrown against them. By the time the gases and particles have managed to pass through the set of rods in these two cages the particles have been reduced to extremely fine form and have been thoroughly dried. The current of gases then conveys them out through the duct 15 to a separator (not shown) where the solids are separated out from the gases and the gases disposed separately.

The current of hot gases is forced through the apparatus by any preferred means, such as a forced draft fan on the inlet side or a suction fan on the outlet side.

It will be obvious that the invention may take form somewhat different from that described in detail in the specification and shown in the drawings. The essential part is that a set of rods be connected to the rotating cage and extend through the outlet of the cage and across the bottom of the drying tower.

What I claim is:

1. In apparatus for drying materials of high moisture content, the combination of a generally cylindrical casing, an inlet comprising a generally cylindrical portion coaxial with the casing, and a vertical portion opening into the cylindrical portion on its upper side, an outlet at the circumference of the casing, two cages comprising sets of parallel rods arranged in circles coaxial with the casing, the rods in alternate circles constituting one set and the remaining rods constituting the other set, means to rotate one set relatively to the other about their common axis, and a further set of parallel rods also in a circle coaxial with the casing and arranged to rotate with one of the first-named sets, the said further set of rods extending across the casing and said generally cylindrical portion of the inlet.

2. In apparatus for drying materials of high moisture content the combination of a generally cylindrical casing, an inlet comprising a generally cylindrical portion coaxial with the casing, and a vertical portion opening into the cylindrical portion on its upper side, an outlet at the circumference of the casing, two cages comprising sets of parallel rods arranged in circles coaxial with the casing, the rods in alternate circles constituting one set and the remaining rods constituting the other set, one set being fixed relatively to the casing, means to rotate the second set about its axis, and a further set of parallel rods also arranged in a circle coaxial with the casing and arranged to rotate with the second set, the said further set of rods extending across the casing and said generally cylindrical portion of the inlet.

3. In apparatus for drying materials, the combination of a casing having a vertical wall, a horizontal cylindrical inlet communicating with the interior of the casing through an opening in said wall, a duct opening into the top side of the cylindrical inlet to deliver to said cylindrical inlet material to be dried, a plurality of rods parallel to the axis of said cylindrical inlet arranged in circles concentric with said axis and mounted to rotate about said axis, the rods in some of said circles extending across the casing and the rods in the innermost circle extending across the casing and to the outer end of the cylindrical inlet, and other rods fixed relatively to the casing and arranged in circles concentric with the circles of the first rods and alternating with them.

CHARLES W. GORDON.