

No. 687,787.

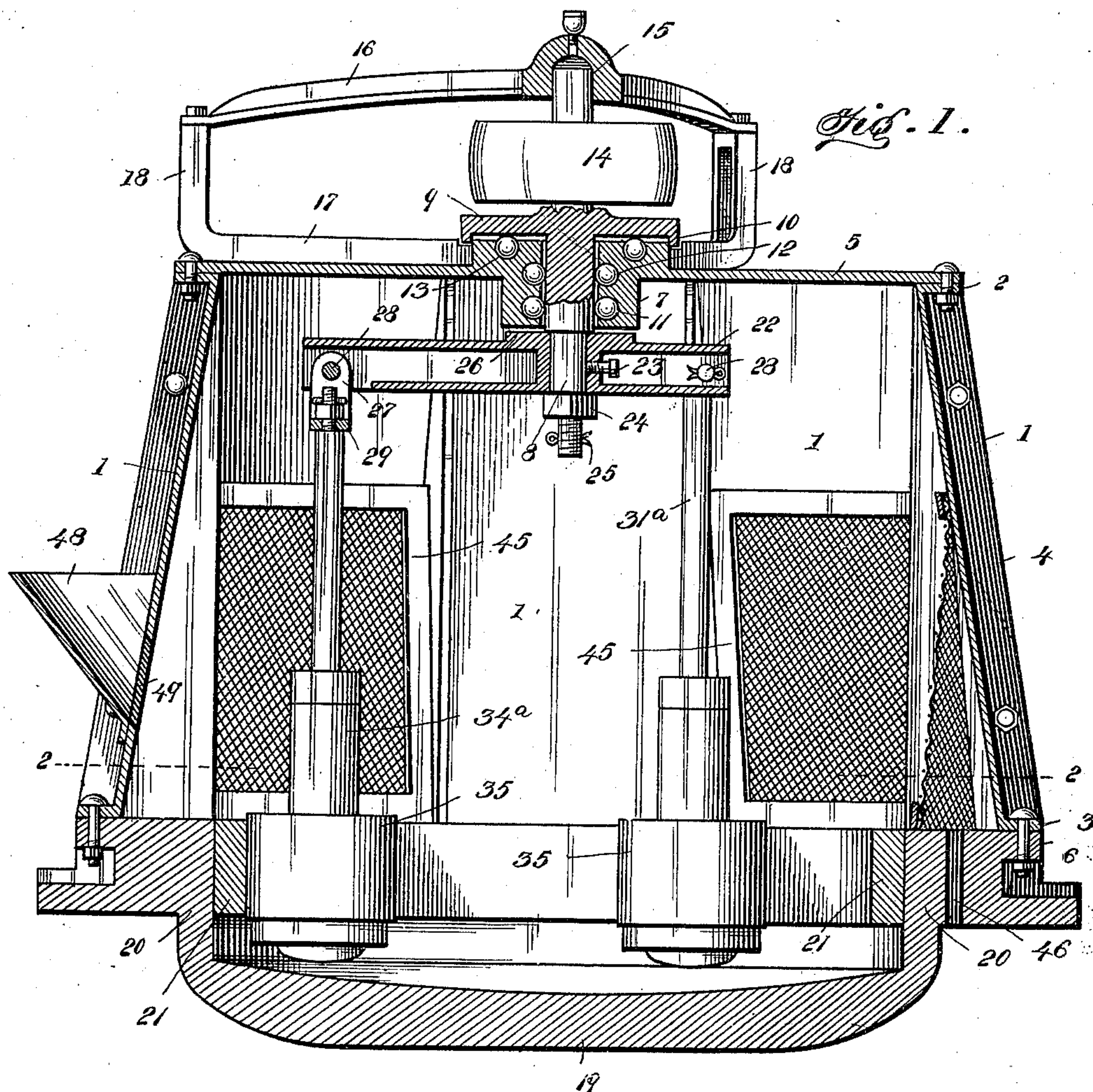
Patented Dec. 3, 1901.

P. RICHARDS.
PULVERIZING MACHINE.

(Application filed June 27, 1900.)

(No Model.)

3 Sheets—Sheet 1.



Inventor
Philip Richards,

Witnesses

H. W. Rely,

Hubert Lawson.

By

Victor J. Evans

Attorney

No. 687,787.

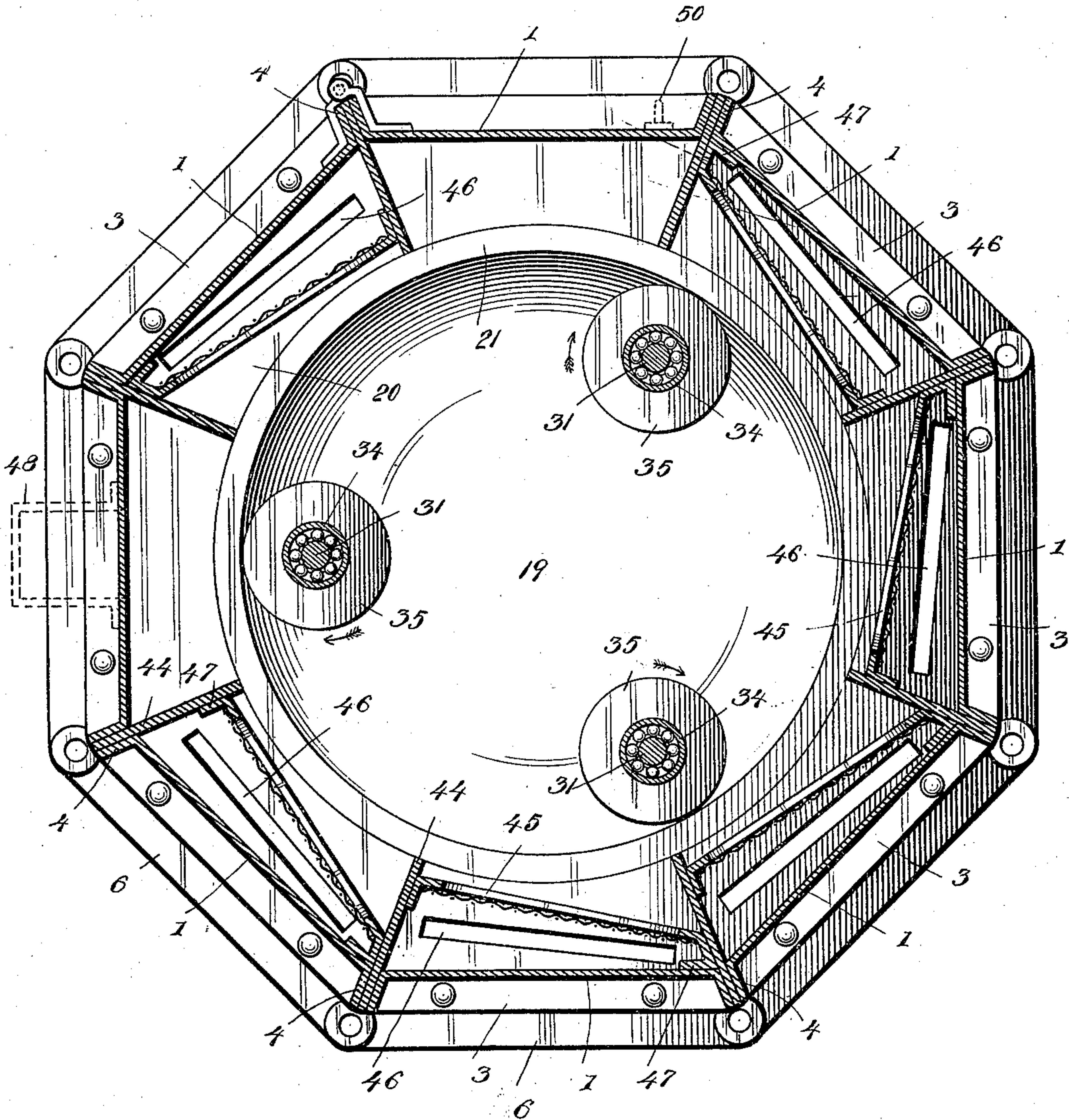
Patented Dec. 3, 1901.

P. RICHARDS.
PULVERIZING MACHINE.
(Application filed June 27, 1900.)

(No Model.)

3 Sheets—Sheet 2.

Fig. 2.



Inventor
Philip Richards,

Witnesses

F. W. Daley,

Herbert D. Lawson.

By

Victor J. Evans

Attorney

No. 687,787.

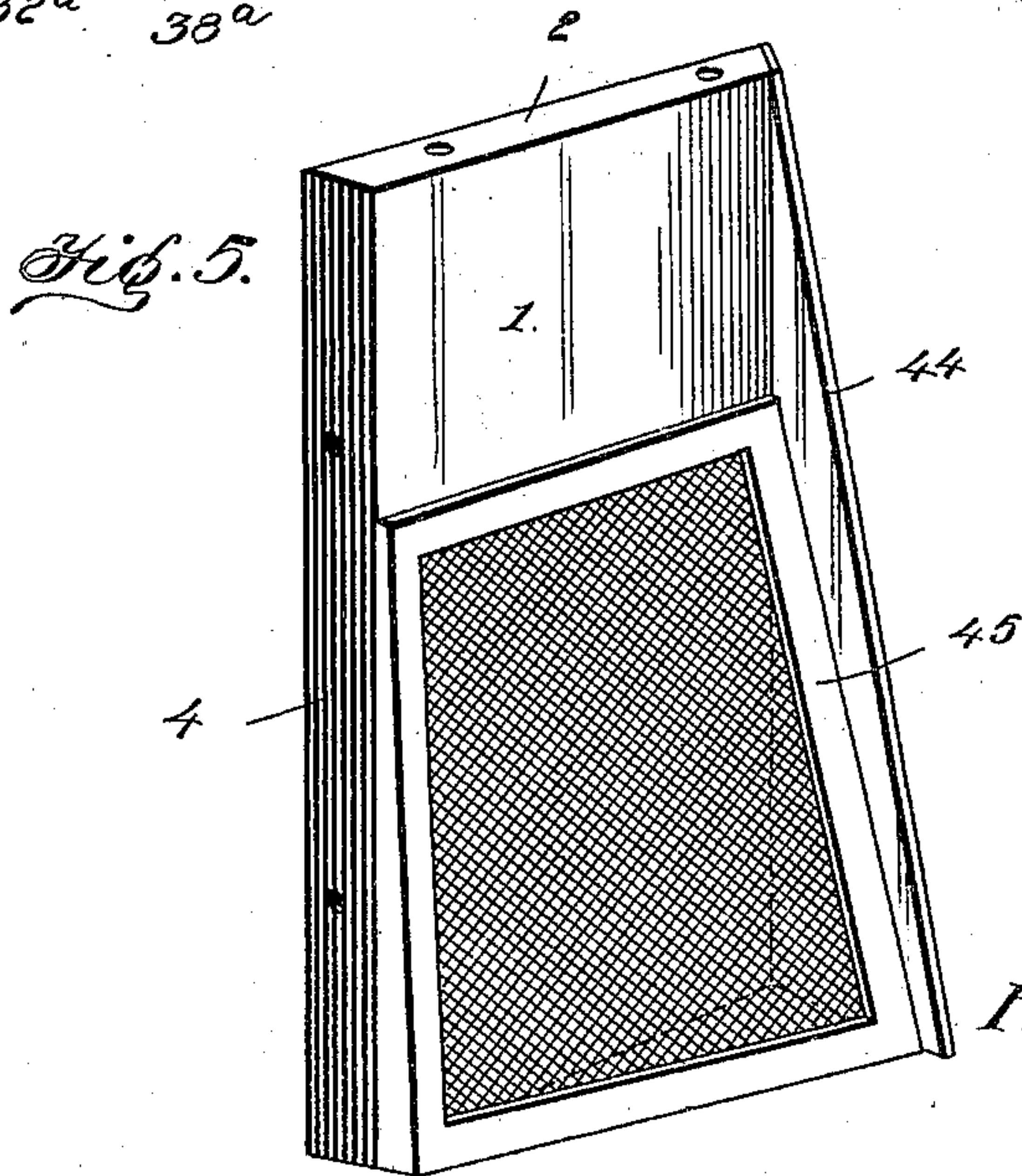
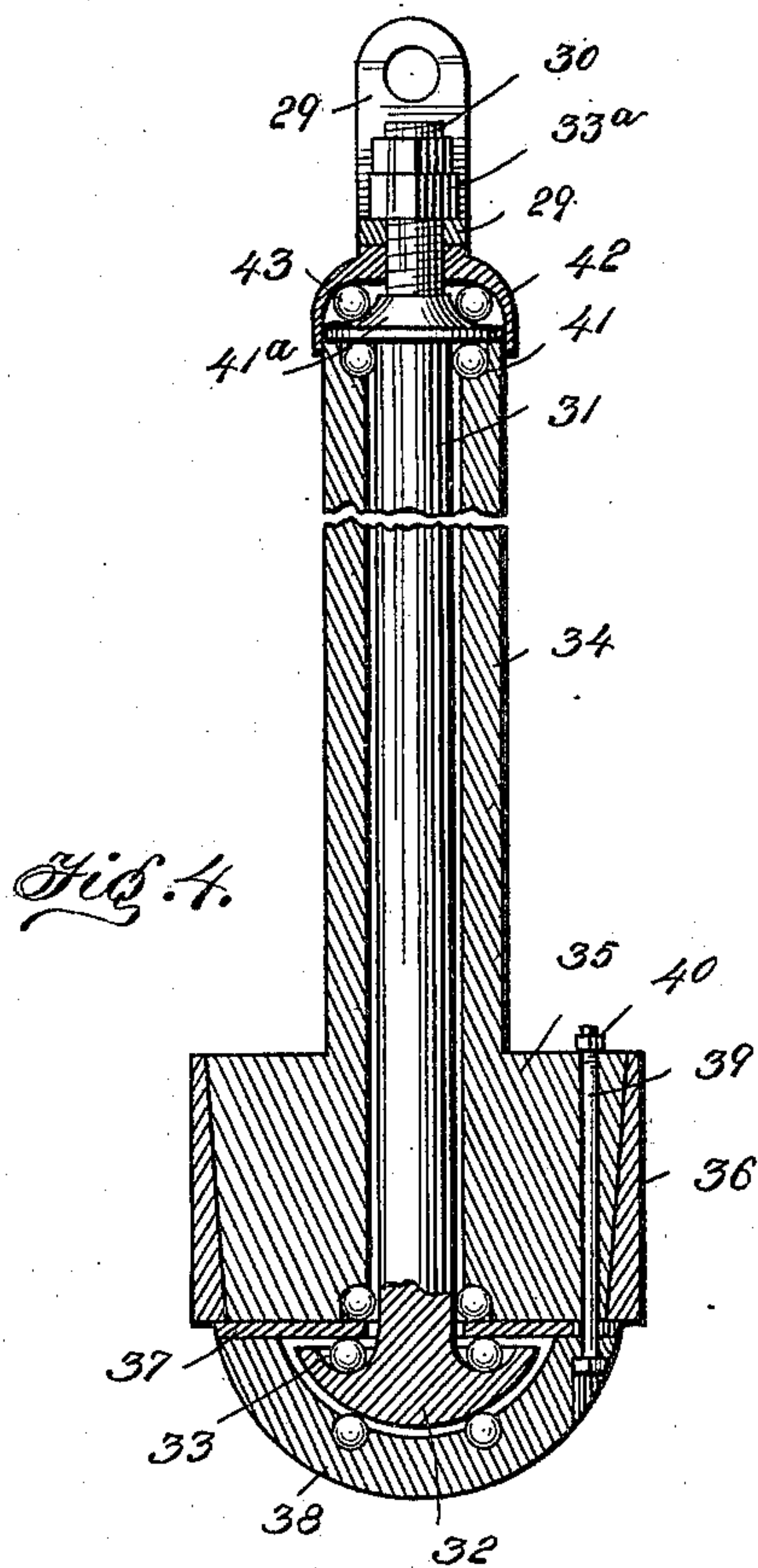
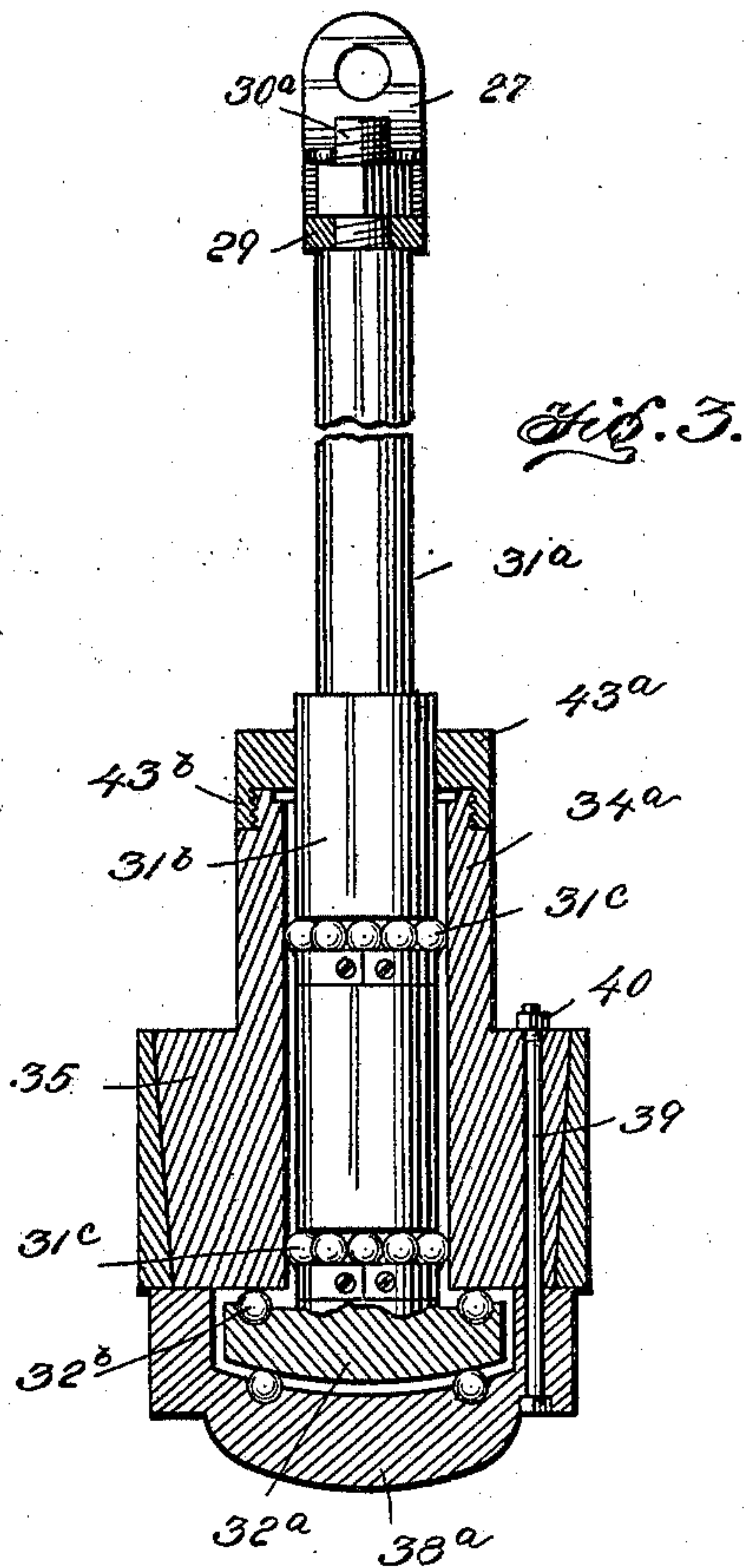
Patented Dec. 3, 1901.

P. RICHARDS.
PULVERIZING MACHINE.

(Application filed June 27, 1900.)

(No Model.)

3 Sheets—Sheet 3.



Witnesses
J. W. Riley,

Hubert D. Landon,

Inventor
Philip Richards,

By Victor J. Evans Attorney

UNITED STATES PATENT OFFICE.

PHILIP RICHARDS, OF CATASAUQUA, PENNSYLVANIA.

PULVERIZING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 687,787, dated December 3, 1901.

Application filed June 27, 1900. Serial No. 21,836. (No model.)

To all whom it may concern:

Be it known that I, PHILIP RICHARDS, a citizen of the United States, residing at Catasauqua, in the county of Lehigh and State of Pennsylvania, have invented new and useful Improvements in Pulverizing-Machines, of which the following is a specification,

My invention relates to roller pulverizing-mills of the class which employ rollers suspended from a rotating frame and coöperating with a stationary circular grinding-surface by being thrown in contact therewith by centrifugal force.

An important characteristic of the invention is that the friction incident to the revolution of the rotating frame and its axial support and of the suspended rollers is taken up or compensated for to the maximum extent by the employment of antifriction-balls, thus entirely avoiding the necessity for lubricating the mill.

A further feature of the invention is the employment of screens arranged at an angle to the orbit of rotation of the grinding-rollers and partitions separating said screens, whereby the currents of air established by the rotation of the rollers will be interrupted and deflected to provide the maximum centrifugal agitation of the material being operated upon.

The construction of the improvement will be fully described hereinafter in connection with the accompanying drawings, which form part of this specification, and its novel features will be defined in the appended claims.

In the drawings, Figure 1 is a vertical section of a roller-mill embodying the invention. Fig. 2 is a horizontal section on the line 2 2 of Fig. 1. Figs. 3 and 4 are vertical sections of two different forms of grinding-roller, and Fig. 5 is a detail perspective view of one section of the casing with its screen and partition.

The body or wall of the casing of the mill comprises a plurality of plates or sections 1 (eight being shown in the drawings) each formed with top flanges 2, bottom flanges 3, and side flanges 4 projecting outward. The abutting side flanges of the several sections 1 are securely bolted together, and the top and bottom flanges thereof are bolted respectively to the under side of the top or cover 5 and the upper surface of a flange 6, projecting from the bottom plate or base.

The top 5 is formed with an integral hub 7, having a central bore for the passage of the main shaft 8, which is provided with a disk 9, having an annular depending flange 10, fitting over the upwardly-projecting portion of the hub.

The hub 7 depends below the top of the casing, and it is formed with internal ball-races 11 and 12 and on its upper surface with a ball-race 13. Antifriction-balls are located in the races 11 and 12, against which the shaft 8 bears, and in the race 13, upon which the disk 9 of the shaft is supported. Upon the shaft 8, above the disk 9, is fixed a belt-pulley 14.

The upper end of the shaft 8 is mounted in a bearing 15, formed in a spider 16, secured upon radial arms 17, fixed upon the top 5 and having their outer ends 18 projected upwardly.

The base 19 of the casing is formed with an upwardly-projecting vertical flange 20, from which the horizontal flange 6 extends, and fixed to the inner surface of the flange 20 is a grinding-ring 21.

22 designates a triangular frame secured by a set-screw 23, a nut 24, and key 25 on the depending end of the shaft 8, said shaft having an annular shoulder, against which the central boss 26 of the frame bears.

At each of the angles of the frame 22 is secured a depending U-shaped hanger 27, pivotally secured upon a pin 28, extending through bolt-holes formed in the frame. The horizontal portion 29 of each of these hangers is formed with an opening through which extends the upper reduced threaded end 30 of a shaft 31, Fig. 4, formed at its lower end with a flange 32, the upper surface of which is formed with an annular groove 33 to receive antifriction-rollers. The upper end of the shaft is secured by nuts 33^a.

34 designates a sleeve fitting over the shaft 31 and having its lower end circumferentially enlarged to form a disk or collar 35, having its periphery beveled to receive a grinding-ring 36, which is beveled in its inner surface in a direction opposed to that of the bevel on the periphery of the collar and which, in conjunction with the collar, constitutes a grinding-roller. The ring 36 is held in place by a washer or disk 37, interposed between the

ring and a cup-shaped retaining-plate 38, secured below the washer 37 by bolts 39, extending through the plate 38 and up through the roller and held by nuts 40.

5 The upper end of the sleeve 34 is formed with a groove 41, constituting a race to contain antifriction-balls, upon which rests the flat under surface of a cone 41^a, secured upon the shaft 31. Between the cone-bearing 41^a and the horizontal portion 29 of the hanger
10 is arranged a concavo-convex cap 42, between which and the cone-bearing is located a row of antifriction-balls 43.

As illustrated in Fig. 1, the sections 1 are
15 inclined outward from top to bottom, the top 5 of the casing being of less diameter than the base or bottom. Projecting inward from the junctures of the sections 1 are a series of vertical radially-disposed partitions 44 of the
20 triangular shape shown in Fig. 2, and between each pair of adjacent partitions is arranged a screen 45. These screens do not extend the full height of the partitions 44 and are arranged at an angle to the circular flange 20
25 of the base of the casing. Adjacent to each of the screens 45, on the outer side thereof, the flange 6 of the base is formed with a discharge-opening 46, through which the pulverized material escapes after passing through
30 the screens, falling into a suitable receptacle below. The screens are formed at their side edges with flanges 47 to facilitate their attachment to the partitions 44.

Fig. 3 illustrates a modification of the grinding-shaft and its attachment, in which the
35 shaft 31^a is provided at its lower end with a disk 32^a, grooved on its upper side to form a race for balls 32^b. The shaft is circumferentially enlarged at its lower portion 31^b and
40 is grooved to receive balls 31^c. The sleeve 34^a, corresponding to the sleeve 34, (shown in Fig. 4,) is shorter than the sleeve 34 and is formed with a disk 35, around which fits a grinding-ring 36. A plate 38^a is secured by
45 bolts 39 to the disk 35. The upper end of the sleeve 34 is externally threaded to receive a cap 43^a, having a depending threaded flange

43^b, having an opening through which the portion 31^b extends.

The operation of the machine is as follows: 50
The material to be operated upon is fed through a chute 48, communicating with an opening 49, formed in one of the sections 1, and when the shaft 8 is revolved the frame 22 and grinder-shafts are rotated, causing the
55 grinding-ring 36 to contact with the stationary grinding-surface 21, thus grinding and pulverizing the material and directing it through the inclined screens 45 and thence through the discharge-openings 46 into a suitable
60 receptacle placed below the machine.

One of the side or wall sections of the casing is hinged or made removable to serve as a door and is provided with a handle 50, as shown in dotted lines in Fig. 2. 65

I claim—

1. A pulverizing-machine comprising a casing consisting of side or wall sections, a top or cover, and a base or bottom having an annular flange formed with discharge-openings, 70
a circular grinding-surface within the casing, radially-arranged vertical partitions within the casing, tangentially-arranged screens within the said casing secured to said partitions, a rotary shaft supported in a bearing of
75 the cover, a frame secured to said shaft, and rotary grinders suspended from said frame.

2. In a pulverizing-machine, the combination with a casing; of a revoluble shaft supported in a bearing in the top of the casing, 80
an annular grinding-surface within the casing, a frame secured to said shaft, shafts depending from said frame, rollers mounted on said shafts, radially-arranged vertical partitions within the casing and a series of vertical
85 screens secured to said partitions at an angle to the side walls thereof.

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

PHILIP RICHARDS.

Witnesses:

JOHN E. WALTERS,
ALEX. N. ULRICH.