Feb. 28, 1939. E. L. BATTEE 2,149,156

GRAIN PUFFING MACHINE

Filed Oct. 27, 1936 3 Sheets-Sheet 1

Fig. 1

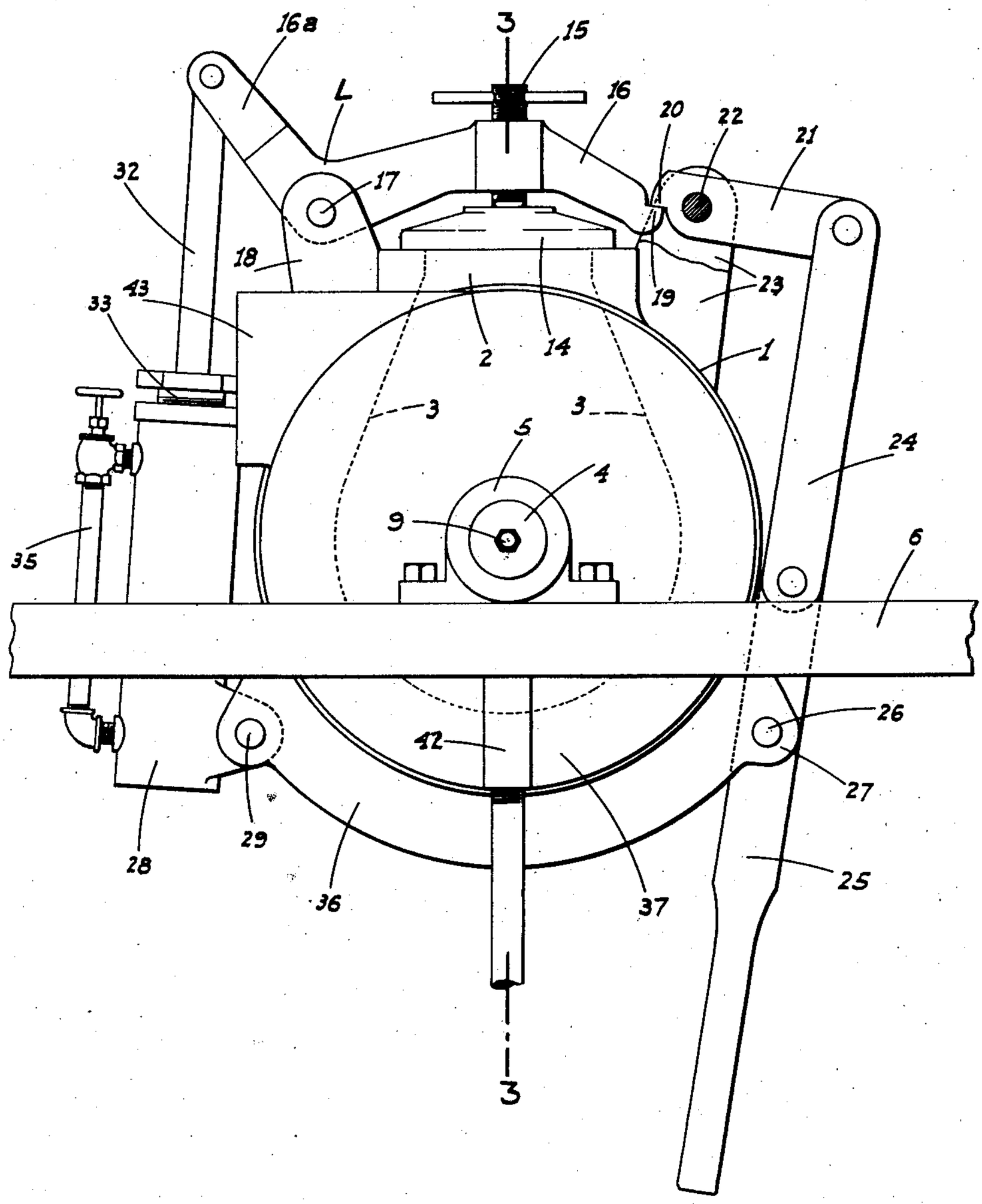

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Fig. 2

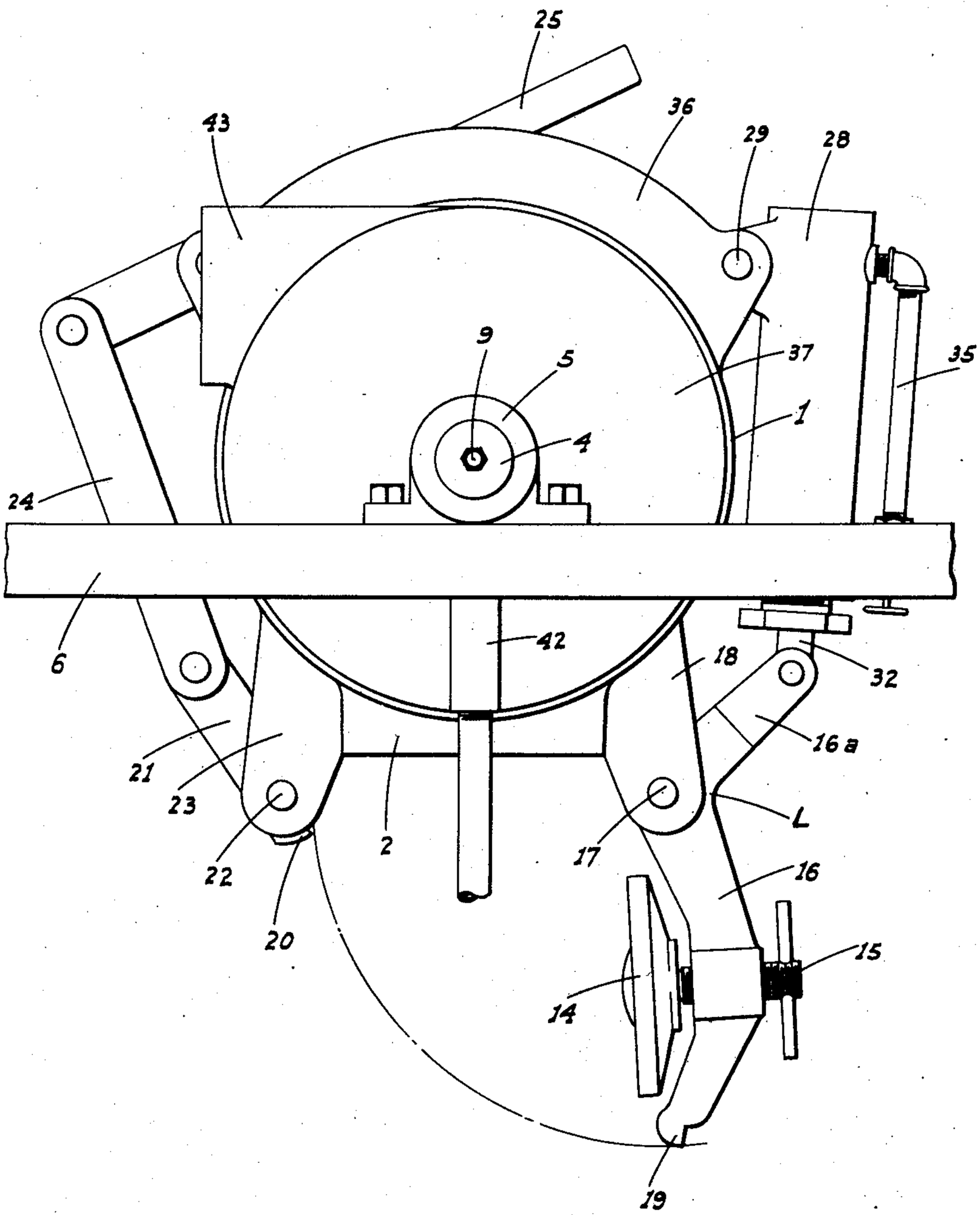

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Fig. 3

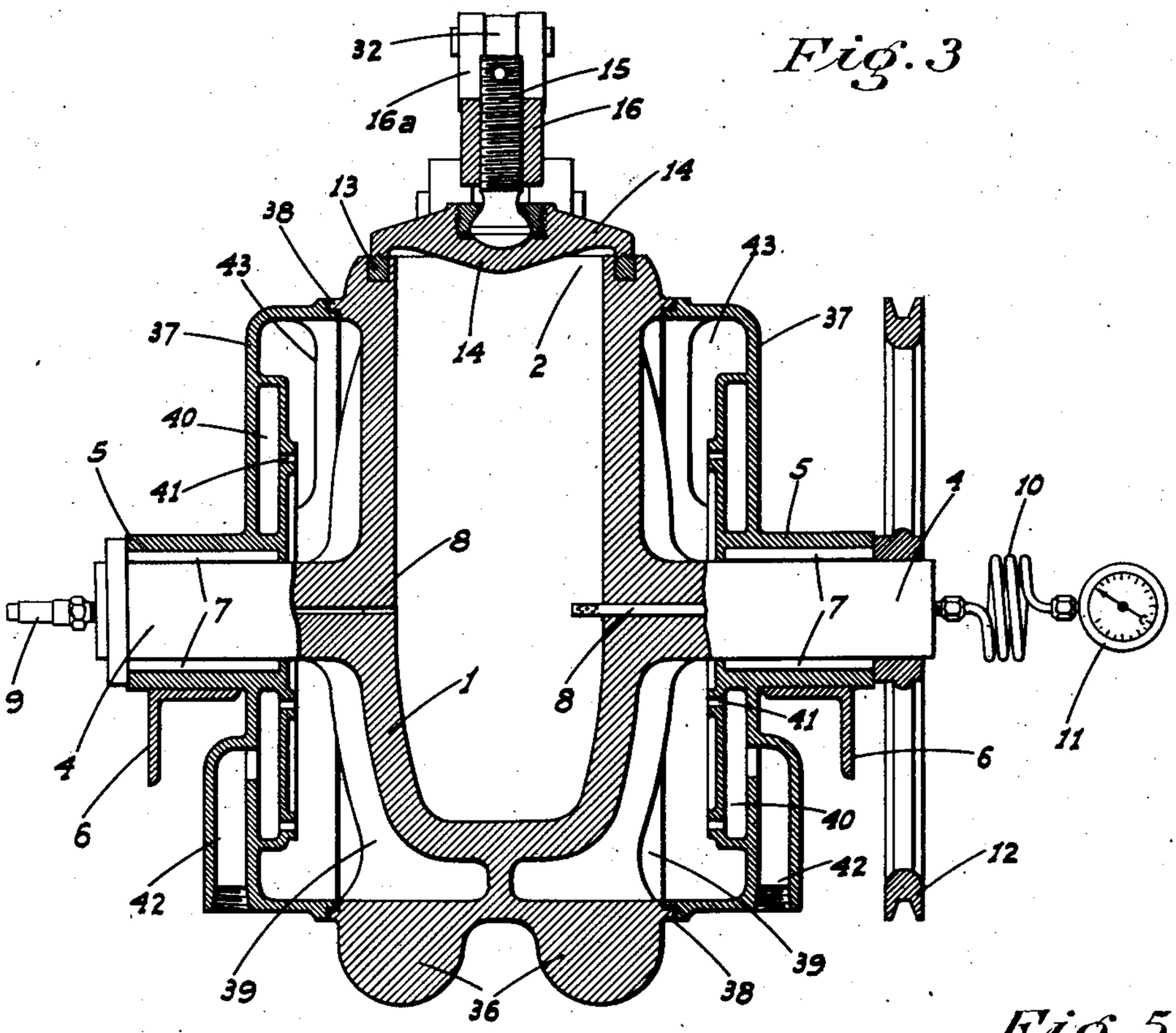


Fig. 4

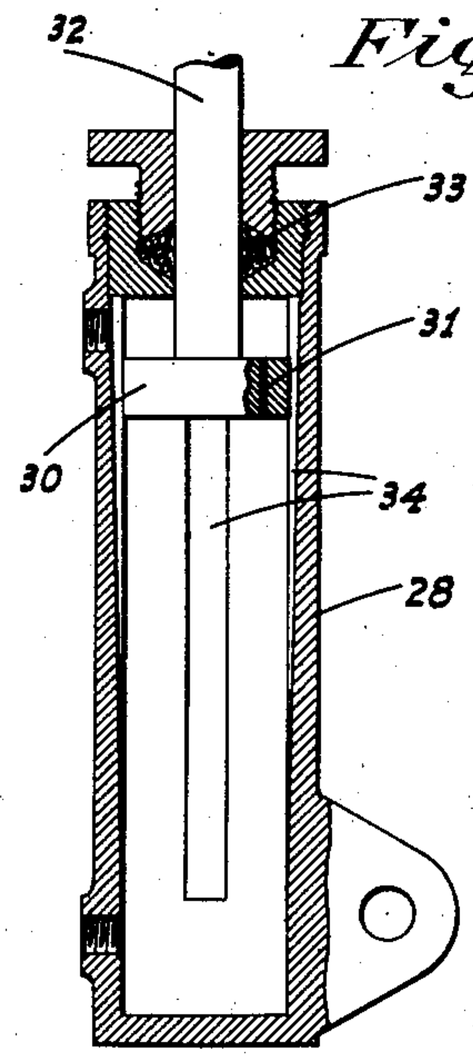
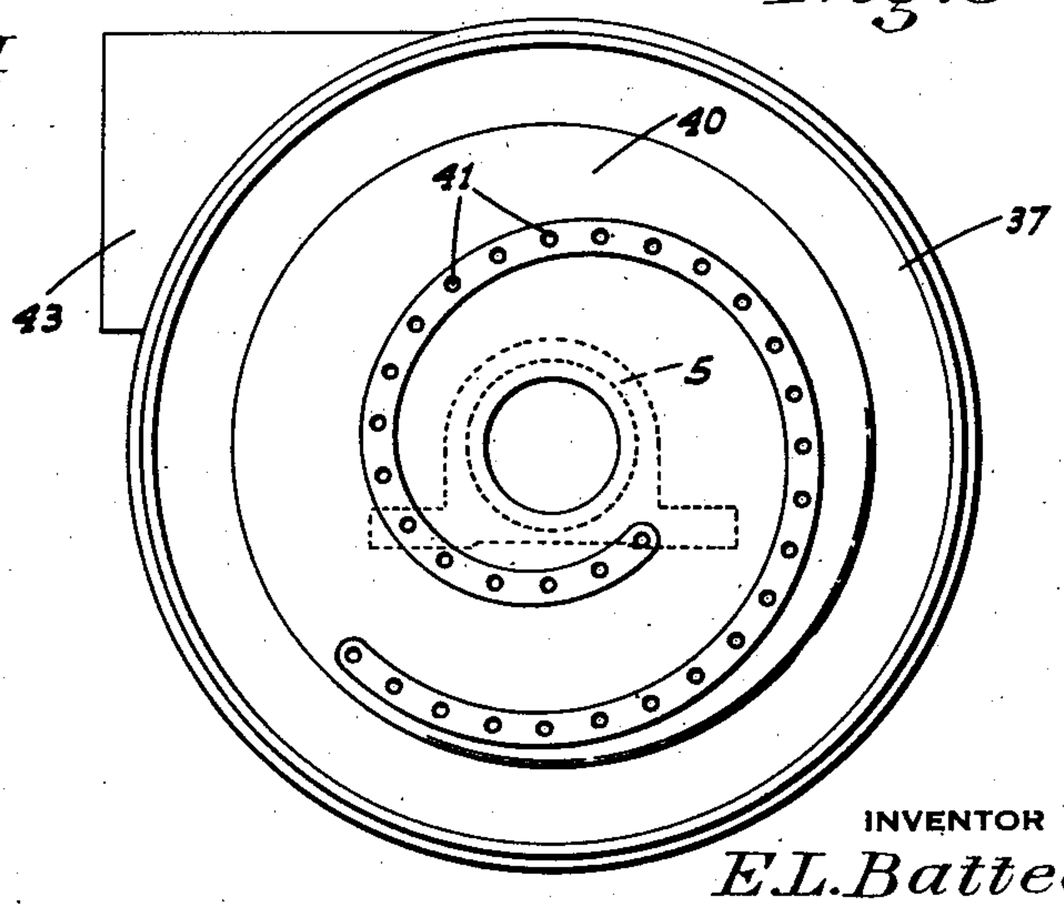


Fig. 5



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Patented Feb. 28, 1939 2,149,156

UNITED STATES PATENT OFFICE

2,149,156

GRAIN PUFFING MACHINE

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Application October 27, 1936, Serial No. 107,818

8 Claims. (Cl. 99—238)

This invention relates to grain puffing machines or ovens, my main objects being to provide a machine which will puff grains quicker and more evenly than is possible with the ordinary machines so that it is capable of a greater output in a given period of time; one in which the oven door is quickly and easily opened and closed and which is provided with a shock absorbing device to prevent possible damage to the door and machine when suddenly released; one in which the oven will entirely and quickly discharge the puffed grains; and one which is compact and sturdy, and has no parts liable to give trouble or get out of order.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a side elevation of the machine, showing the oven in an upright or loading position but with the door closed and locked.

Figure 2 is a similar view showing the oven inverted or in discharge position and with the door open.

Figure 3 is a transverse section on line 3—3 of Fig. 1.

Figure 4 is a sectional elevation of the shock absorbing device for the door.

Figure 5 is an inner face view of one of the burner and bearing units detached.

Referring now more particularly to the characters of reference on the drawings, the machine comprises an oven 1 of substantially cylindrical interior form and relatively narrow from side to side, the sides rounding into the circumferential surface of the oven so as to avoid the formation of any sharp corners. The oven has a circular mouth 2 disposed radially thereof; the diameter of the mouth being substantially the same as the width of the oven so as to merge into the adjacent walls thereof as shown in Fig. 3; the circular interior wall of the oven on opposite sides terminating in substantially tangential surfaces converging to the corresponding sides of the mouth as indicated at 3 in Fig. 1. By reason of this form of oven, it will be evident that an entirely unobstructed discharge from the same will be had when the mouth is inverted, insuring a rapid and complete discharge of the contents and preventing any grain being left in the oven to mingle with a subsequent charge.

Projecting from the opposite sides of the oven are trunnions 4, concentric with the circular portion of the oven. The trunnions project through bearing boxes 5 mounted on longitudinal supporting frames 6; the boxes having roller bearings 7 engaging the trunnions. Both trunnions are bored as at 8 to communicate with the interior of the oven; the bore of one trunnion leading to a safety valve 9 and the bore of the other trunnion leading to a spring passage coil 10 secured at one end on the outer end of the trunnion and at its other end being connected to a pressure gauge 11. This spring or flexible mounting of the gauge is an important feature since it absorbs the shocks which would otherwise be imparted to the gauge with the sudden release of the pressure from the oven as the door (later described) is thrown open, and which would damage the sensitive gauge mechanism.

A belt pulley 12 is mounted on one trunnion, which is adapted to be connected to any suitable source of power so that the oven may be rotated at a desired speed.

The oven mouth 2 is provided about the top with a depressed band 13 of lead or the like, which forms a sealing seat or gasket for the rim flange of a circular lid or door 14. This door is centrally and swivelly suspended from a screw stem 15. This stem projects through and is axially adjustable in one arm 16 of a bell crank lever L. This arm extends over the lid in a plane at right angles to the axis of the trunnions, and the stem engages the arm intermediate its ends. At one end, the arm is pivoted as at 17 between ears 18 integral with the oven at the top and beyond mouth 2, and at its opposite end is formed with a catch tongue 19.

The tongue is adapted to be engaged on the face thereof opposite the oven by a cooperating catch element 20 formed on the adjacent end of an arm 21. This arm is pivoted as at 22 intermediate its ends but relatively close to the catch element between ears 23 integral with the oven on the opposite side of the mouth from ears 18. At its outer end, the arm is pivotally connected to one end of links 24, normally disposed substantially at right angles to the arm. At their opposite end, the links are connected to the adjacent end of an operaing lever 25, which is pivoted intermediate its ends as at 26 between ears 27 integral with the oven adjacent the bottom.

The catch arm, links and lever are arranged so that when the catch arm is engaged with the

tongue 20, the links and lever are in longitudinal dead center alinement and the links are of course under compression. Upon moving the outer end of lever 25 in the direction of the bottom of the oven, the dead center alinement of the lever and links is of course broken. This movement of the lever, if carried out to the extent shown in Fig. 2, swings the catch arm 21 so that the catch element 20 thereon is moved clear of the tongue 19, allowing the latter to swing away from the oven and the lid to open. In actual operation, due to the pressure generated within the oven by the puffing and expansion of the grains, it is only necessary for the operator to merely move the lever sufficient to break its dead center alinement with the links. The oven pressure, acting on the arm 16 through the lid to swing said arm outwardly, is sufficient to then further turn the catch arm 21 to a release position.

The door when thus suddenly released and opened then of course tends to rebound violently. I have therefore provided means to absorb this shock. Such means is in the form of a hydraulic cylinder 28 pivoted adjacent the bottom as at 29 on the oven adjacent the bottom thereof in opposed relation to the operating lever.

A piston 30 having a bleed passage 31 therethrough (see Fig. 4) is connected to a piston rod 32 which projects from the opposite or top end of the cylinder through a packing gland 33 to a connection with the outer end of the other arm 16a of the bell crank lever L. Grooves 34 are provided along the interior walls of the cylinder which decrease in depth from the upper or packing gland end down, to a termination some distance from the bottom of the cylinder as shown in Fig. 4. This unit is arranged so that when the oven lid is closed, the piston is adjacent the top of the cylinder, where the grooves are deepest; the cylinder being filled with oil or similar liquid. When the lid opens and the bell crank lever turns, the piston rod is moved toward the bottom of the cylinder without much resistance at first, since the oil can freely by-pass the piston through the grooves. By the time the lid reaches the fully open position where it is entirely clear of the path of matter discharging from the oven mouth, and as shown in Fig. 2, the piston is adjacent the bottom of the cylinder beyond the grooves 34. Return movement of the lid is thus retarded, since the oil can then only by-pass through the bleed passage 31, and as a result the lid tends to remain in its fully open position.

In order to enable the lid to be closed when desired without having to force the oil through the relatively small bleed passage and grooves, I provide a relatively large valve controlled by-pass conduit 35, connected to the cylinder adjacent the top and bottom and located on the outside of the same.

In order to substantially balance the weight of the lid and associated parts, counterbalance weights 36 are provided about the bottom of the oven; these weights being transversely spaced as shown in Fig. 3 in order to allow the operating lever 25 to project therebetween when the door is fully open.

To insure even heating of all the grains in the oven as the latter rotates, I mount gas burners on both sides of the same. Each burner includes a cylindrical hood 37 formed with the adjacent bearing box 5, the inner open edge of the hood flange cooperating with a circular flange 38 on the oven to form a substantially gastight burner chamber 39. The flange 38, except at and adjacent the mouth 2, is spaced outwardly of the cylindrical wall of the oven, as shown in Fig. 3, so that the burner chamber extends about such wall as well as the outer vertical side wall of the oven.

Formed within the hood is the burner 40, having a row of spirally arranged burner openings 41 facing the oven. A gas and air mixture intake passage 42 leads to the burner, while an outlet vent 43 leads from the hood adjacent the top. It may here be noted that I contemplate using the heat from the spent gases issuing from the vent as a means for preheating the grains to be puffed, thereby cutting down the time the grains must be left in the oven.

In operation, when it is desired to fill the oven, it is disposed in an upright position, the lid is opened and the grain to the requisite amount is poured in. The lid is then closed and locked, and the oven is rotated. This rotation of course continuously tumbles the grain about, and as it tumbles, it is subjected to the heat applied by the burners to the oven on both sides thereof and over substantially its entire area. Due to this heating of practically the entire oven area and to the relative narrowness of the oven, all the grain is quickly and thoroughly heated and puffed. As a result, not only is the grain more rapidly puffed than is ordinarily the case, giving my machine a large potential output in a given time, but all the grains are subjected to practically the same degree of heat, giving a product of very uniform quality.

When the puffing operation is completed, the oven is halted in an inverted position. This places the operating lever in an upwardly projecting position, where it is convenient for the operator to impart the initial lock-releasing movement thereto in the direction of the oven. The door then suddenly flies open due to the pressure within the oven as previously described, and is held in an open position by the shock absorber unit.

The grain then completely discharges from the oven, due to the absence of any sharp corners or obstructing ledges therein as previously explained. The oven is then turned to an upright position with the door still open, ready for reloading.

The pressure gauge 11, by means of which the operator can determine the conditions within the oven, being mounted axially of the oven and entirely clear of the same and its working parts, is always exposed where it may be readily observed.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A grain puffing machine comprising an enclosed oven forming a pressure-tight puffing chamber, trunnions rigid with and projecting from opposed walls of the oven, bearings in which said trunnions are turnably supported, means applied to one trunnion to rotate the same, and heating

means mounted in fixed relation with the bearings concentric with the trunnions and applied to said opposed walls.

2. A grain puffing machine comprising an enclosed oven forming a pressure-tight puffing chamber, trunnions rigid with and projecting from opposed walls of the oven, bearings in which said trunnions are turnably supported, means applied to one trunnion to rotate the same, circular fixed hoods concentric with the trunnions disposed on opposite sides of the oven, circular flanges projecting from the opposed walls of the oven and cooperating with the adjacent edge of the hoods to form, with said oven walls and hoods, enclosed heating chambers, and heating means disposed in said chambers.

3. A structure as in claim 2, in which said heating means comprises gas burners provided with a plurality of jet openings disposed in facing relation to the enclosed oven walls and surrounding the trunnions.

4. A structure as in claim 2, in which the peripheral wall of the oven is mainly concentric with the oven and the flanges are disposed outwardly of said concentric wall portion whereby to include said peripheral wall as a part of the heating chamber.

5. Holding means for the pivoted lid of a grain puffing oven comprising an arm extending over the lid and from which the latter depends, means pivoting the arm at one end on the oven to one side of the mouth, a catch arm pivoted intermediate its ends on the oven on the opposite side of the mouth; the adjacent ends of the arms forming catch elements adapted to overlap in cooperating relationship when the lid is closed and the catch element on the last named arm being then outwardly of the other catch element, and manually operable means to turn the catch arm sufficiently to move the catch element thereon clear of the path of rotation of the catch element on the first named arm and normally functioning to prevent pressure in the oven acting on the lid and first named arm and tending to swing the latter outwardly, from turning the catch arm to such clear position.

6. A structure as in claim 5, in which said manually operable means comprises a link pivoted at one end on the outer end of the catch arm, and a hand lever pivoted intermediate its ends on the opposite end of the link and pivoted intermediate its ends on the oven; said lever and link being longitudinally alined when the catch elements are engaged.

7. A grain puffing machine comprising an enclosed puffing oven having opposed end walls, means mounting the oven for rotation about its axis, and gas burners mounted in fixed position beyond said end walls and disposed concentric with the oven, said burners being provided with a plurality of jet openings disposed in facing relation to said walls.

8. In a grain puffing oven having a mouth, a hinged lid for the mouth and releasable catch means to hold the lid closed, shock absorbing means applied to the lid and including a hydraulic cylinder mounted on the oven and a piston therein connected to the lid, there being a fluid bleed passage bypassing the piston, a relatively large conduit tapping the cylinder adjacent its ends, and a manual control valve in said conduit.

ELVIN L. BATTEE.