

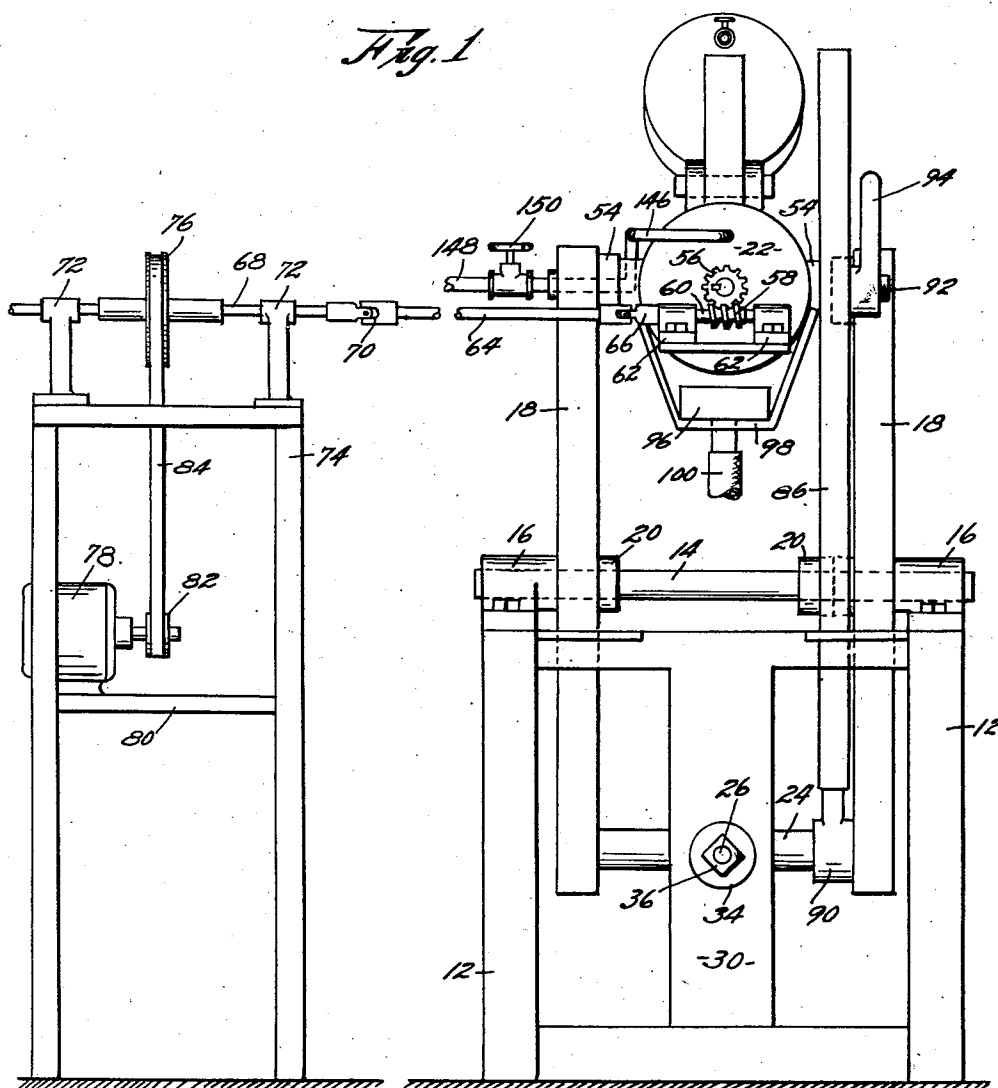
Oct. 11, 1938.

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GRAIN PUFFING APPARATUS

2,132,987

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4 Sheets-Sheet 1



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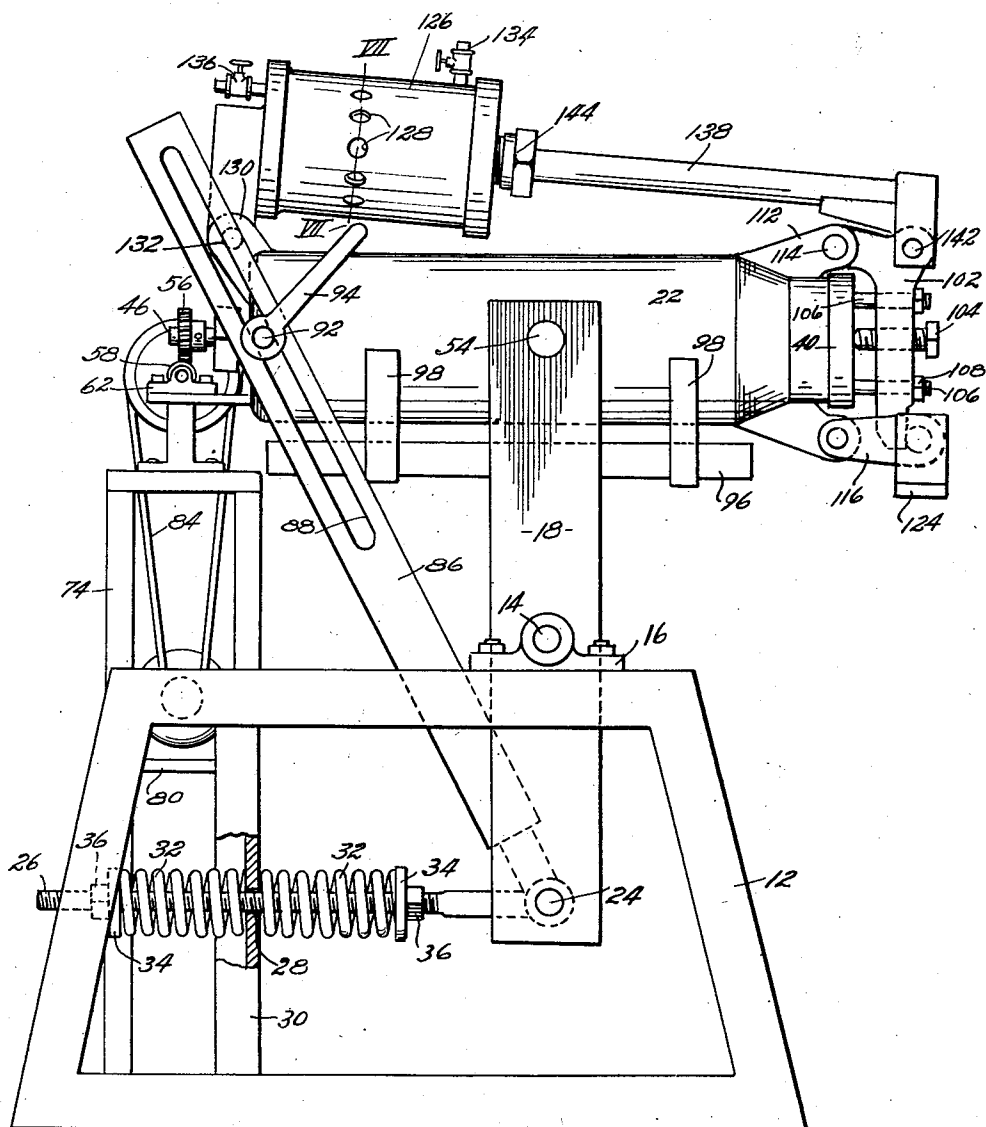
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Fig. 2



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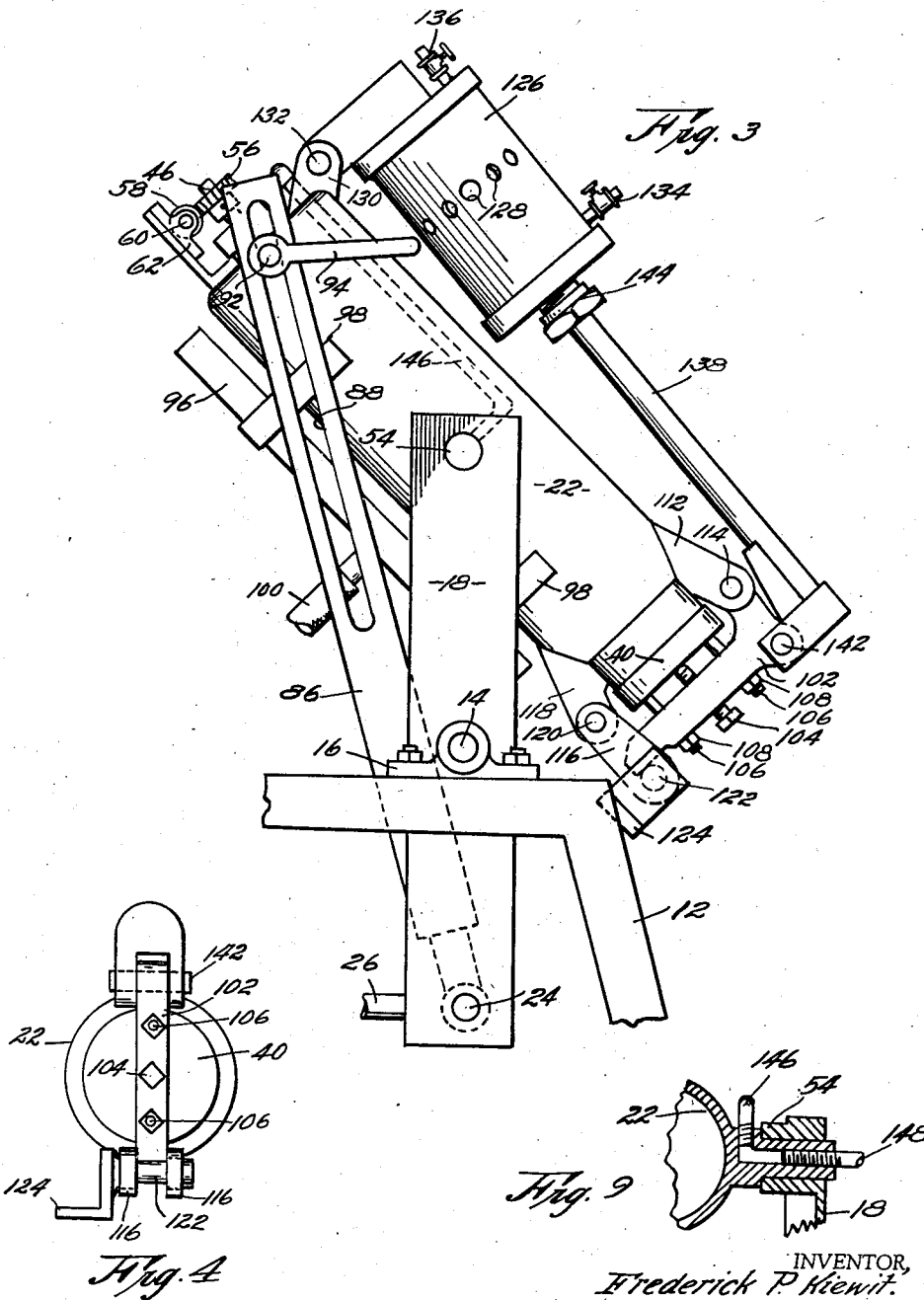
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GRAIN PUFFING APPARATUS

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Fig. 5

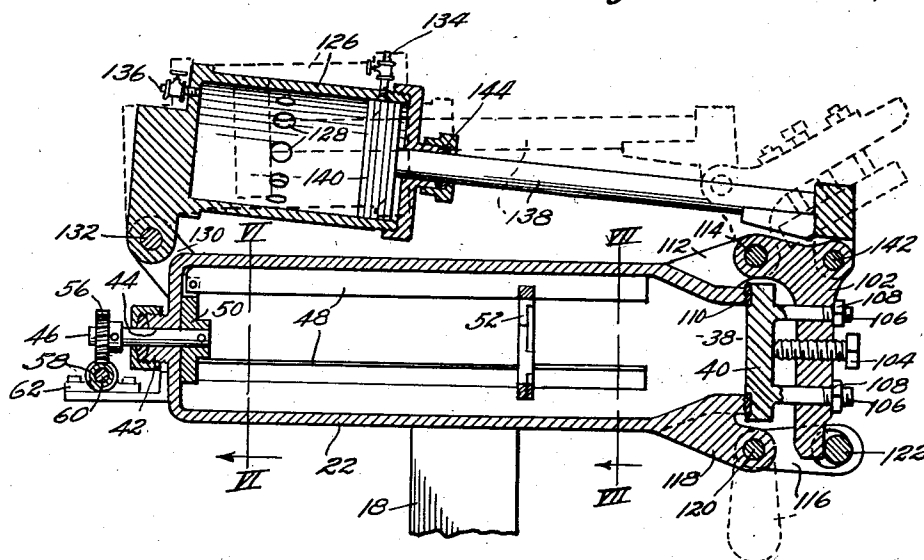
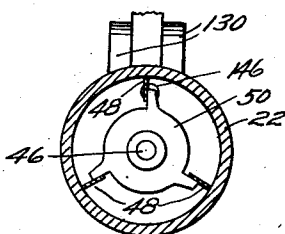


Fig. 6

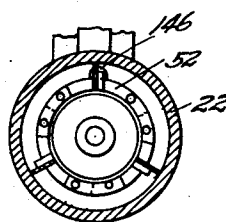


Fig. 7

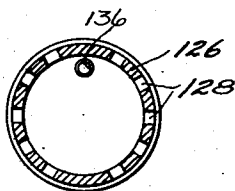


Fig. 8

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UNITED STATES PATENT OFFICE

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GRAIN PUFFING APPARATUS

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Application December 16, 1935, Serial No. 54,581

13 Claims. (Cl. 99—238)

This invention relates to grain puffing apparatus and has for a primary object, the provision of novel, efficient and unique structure in such apparatus as will render the same strong, effective, easy to operate and capable of producing a quality product.

One important object of this invention is to provide grain puffing apparatus having means for damping the movement of the lid of the gun of the apparatus in a fashion that will obviate impacts, strains and destructive racking of the entire assembly.

A yet further aim of the present invention is the provision of effective mounting means for a tiltable gun forming a part of grain puffing apparatus, which mounting means will be effective in absorbing shocks and will serve as means for yieldably maintaining the gun in a predetermined operative position.

Another object of this invention is to provide a tiltable gun for grain puffing apparatus which has an agitator for the grain being treated therein, which agitator is provided with means independent of the gun for rotating the agitator, that is continuously in engagement with the agitator as the gun of the apparatus is tilted.

A still further object of the present invention is the provision of grain puffing apparatus that comprises a combination of parts which contribute to the end of economically and efficiently producing puffed grain of high and desirable quality.

A large number of minor objects of the invention will appear during the course of the following specification, referring to the accompanying drawings, wherein:

Figure 1 is a rear elevation of grain puffing apparatus made in accordance with the present invention.

Fig. 2 is a side elevation of the apparatus shown in Fig. 1.

Fig. 3 is a similar elevation, with parts being broken away for the purpose of clearly illustrating the gun of the apparatus in a tilted position.

Fig. 4 is a front, end elevation of the gun per se.

Fig. 5 is a vertical, longitudinal, central, sectional view through the gun and dashpot structure of the apparatus.

Fig. 6 is a cross sectional view, taken on line VI—VI of Fig. 5.

Fig. 7 is a similar sectional view, taken on line VII—VII of Fig. 5.

Fig. 8 is a vertical cross section, taken along line VIII—VIII of Fig. 2, and

Fig. 9 is a fragmentary, detailed, sectional view through one trunnion which supports the gun and showing the manner of introducing steam therethrough.

It is well known that apparatus which has heretofore been employed in puffing starch-containing grains or materials has subjected itself to self-destruction because of impacts and recoils created when the lid of the gun is opened so as to quickly reduce the pressure in the gun. Grain puffing apparatus contemplated by this invention may be embodied in such structure as illustrated in the accompanying drawings, and while the parts constituting the entire assembly should be strongly constructed, it is to be remembered that certain groups of elements shown in the preferred type of apparatus might well be incorporated in grain puffing machines having characteristics other than those shown.

Suitable strong and rigid framework must be provided and this framework might well consist of a base 12, having a shaft 14 mounted thereon and journaled in bearings 16, disposed on top of base 12. A pair of opposed rocker beams 18 are mounted upon shaft 14 so as to extend above and below the shaft and tilt about the axis thereof. Both beams 18 may have bearings 20 integral therewith and shaft 14 should be journaled in these bearings. The upper ends of beams 18 tiltably support gun 22 in a manner more fully hereinafter set down, and the lower ends of these beams 18 are connected by a tie rod 24 which join the same and which, in turn, has connection with one end of a threaded bar 26. This bar 26 passes loosely through an opening 28 formed in cross head 30 that is rigid with base 12.

A pair of springs 32 in the nature of coil or helical springs are threaded upon bar 26, one on each side of cross head 30. The proximal ends of springs 32 engage each side respectively of cross head 30 and the outer or remote ends of these springs 32 are in engagement with a washer 34, behind which is positioned a nut 36 which is in screw-threaded engagement with bar 26 for the purpose of varying the tension of springs 32. Obviously, as beams 18 rock about the axis of shaft 14, tie rod 24 will oscillate to alternately compress springs 32.

The gun per se is indicated by the numeral 22, and the same should be formed of a single piece of metal, reduced at one end to form an open mouth 38 that is closed by a lid 40. The other end of gun 22 has a boss 42 formed thereon, through which a bore 44 is created to receive shaft 46 that engages the agitator carried with-

in gun 22. This agitator comprises a series of radially extending blades 48, all mounted upon an end casting 50, which is secured to shaft 46, and an expandable ring 52 located intermediate the ends of blades 48 so as to hold the same in spaced relation and against the inner annular surface of gun 22.

Gun 22 is provided with a pair of diametrically opposed trunnions 54 that are journaled in the upper ends respectively of rocker beams 18. These trunnions are disposed intermediate the ends of gun 22 and their axis substantially intersects the longitudinal central axis of gun 22. Tilting of gun 22 about the axis of trunnions 54 permits discharging and loading in a manner well known in the art.

It is desired to continuously rotate the agitator during the operation of the gun in the production of puffed grains, and novel means are herein provided for such continuous operation. Shaft 46 has a gear 56 mounted thereon that is in engagement with worm gear 58 which is carried by a shaft 60, journaled in bearings 62 that are mounted upon the end of gun 22. This shaft 60 is in connection with an intermediate shaft 64 through the medium of a universal joint 66, and shaft 64 in turn is connected with a shaft 68 through the medium of another universal joint 70. Shaft 68 is journaled in bearings 72 that are mounted upon a framework 74 and a pulley 76 is keyed to shaft 68, as illustrated in Fig. 1. A motor 78 which sits upon a shelf 80, carried by framework 74, is in connection with pulley wheel 76 through the medium of the motor pulley 82 and belt 84. When gun 22 is tilted about the axis of trunnions 54, the driving force exerted through the parts just mentioned from motor to agitator will continue to be transmitted to the agitator within the gun. When the gun is tilted to the maximum degree, as illustrated in Fig. 3, universal joints 66 and 70 will compensate for the angularity and shaft 68 will slide longitudinally in bearings 72 so as to lend the required length to the shaft assembly.

When gun 22 is tilted to the desired angle, or when it is to be held horizontally, arm 86, having a longitudinal slot 88 formed therein, will contribute toward rigidly maintaining the gun in place. Arm 86 has a bearing 90 at one end thereof that engages the rod 24 and arm 86 is free to move about the axis of rod 24. A threaded stub shaft 92, rigidly mounted upon gun 22 near one end, rides along slot 88 and clamp 94, in threaded engagement with stub shaft 92, is manipulated to frictionally engage arm 86.

A gas burner 96, mounted upon gun 22 by brackets 98, furnishes means for heating the gun casing and suitable hose or pipe connection 100, with a source of fuel supply, is shown in fragmentary manner.

Lid 40 is hingedly mounted upon one end of gun 22 by lever 102. This lever bears the general form of a bell crank lever, one arm of which supports lid 40 through the medium of a plurality of bolts. Central bolt 104 is in screw-threaded engagement with one arm of lever 102 and bears against the outer face of lid 40. Two other bolts 106 are integral with lid 40 and extend through openings formed in the same arm of lever 102 so that nuts 108 thereon may be manipulated in combination with bolt 104 to hold lid 40 a predetermined desired distance away from lever 102. Lid 40 carries a ring-shaped seat 110 that is made of lead or similar soft metal for the purpose of tightly sealing the joint between lid and

gun. Lever 102 is pivotally secured to ears 112 by pin 114 and ears 112 are rigid to gun 22. While one end of bell crank lever 102 is so mounted, the other end is releasably engaged by a latch.

This latch comprises a pair of links 116, pivotally mounted upon an ear 118 by pin 120, and carrying an eccentrically mounted shaft 122 which directly engages the end of lever 102. A bracket 124 is integral with shaft 122 and moving said bracket about the axis of that portion of shaft 122 which is journaled in links 116 will tighten or release the lid.

Exceptionally great force is exerted upon lid 40 when it swings open about the axis of pin 114 and to dampen the opening movement and, subsequently, the rebounding movement, a unique buffering structure is provided. A cylinder 126, provided with a plurality of ports 128, is mounted upon gun 22. The mounting of this cylinder should be such as to permit swinging and ears 130 are in this instance employed to support a pin 132 which pivotally engages cylinder 126. This cylinder has a pet cock 134 adjacent its forward end and a pet cock 136 adjacent its opposite end. Piston rod 138 is in connection with a piston 140 which is reciprocally mounted within cylinder 126 and connects piston 140 with lever 102. The point of connection is a pivotal one and pin 142 serves as the medium of joining lever 102 to piston rod 138.

A stuffing box 144 insures that piston rod 138 will move within cylinder 126 without leakage. The width of piston 140 is substantially less than the distance between ports 128 and the ends of cylinder 126 so that as lid 40 is driven open, piston 140, traveling in cylinder 126, will serve to dampen the opening movement. Obviously, pet cock 134 is closed and a partial vacuum is created behind piston 140. With pet cock 136 partially closed, the air will be compressed in that end of cylinder 126 and as lid 40 rebounds toward the closed position, piston 140 will serve to dampen that movement in a similar manner.

It is notable that as the movement of lid 40 occurs, cylinder 126 will move about the axis of pin 132 and a complete damping action will take place to effectively and safely bring to rest lid 40.

The introduction of superheated steam into gun 22 takes place through the employment of pipe 146 which enters one end of gun 22 and which is connected to the main steam line 148 through one trunnion 54, as detailed in Fig. 9. A valve 150 is interposed in line 148 to cut off the steam during the loading of gun 22.

The operation of this grain puffing apparatus has been made clear during the course of the foregoing specification and since the art has been highly developed with respect to the action which takes place when puffing starch-containing grains, it will be obvious to one skilled in the art that the puffing apparatus herein illustrated and described is capable of highly efficient operation.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In grain puffing apparatus of the character described, a gun; a lid for one end of the gun; a dashpot having its axis substantially parallel to the axis of the gun, mounted on the gun for damping the movement of the lid; and connections between the dashpot and lid.

2. In a grain puffing apparatus of the charac-

ter described, a gun; a lid hingedly mounted on the gun for closing one end thereof; a dashpot pivotally mounted on the gun for damping the movement of the lid; and connections between the dashpot and lid.

3. In a grain puffing apparatus of the character described, a gun; a lid hingedly mounted on the gun for closing one end thereof; a dashpot pivotally mounted on the gun for damping the movement of the lid; and connections between the dashpot and lid, said dashpot being constructed to dampen the movement of the lid during its movement both from and toward the closed position respectively.

4. In a grain puffing apparatus of the character described, a gun; a lid hingedly mounted on the gun for closing one end thereof; a dashpot pivotally mounted on the gun for damping the movement of the lid; connections between the dashpot and lid; and a latch to hold the lid closed, said dashpot being constructed to dampen the movement of the lid during its movement from the closed position and to also dampen the movement of the lid through the path thereof during rebounding.

5. In grain puffing apparatus of the character described, a gun; a lid for closing one end of the gun; a cylinder having ports formed through the side wall intermediate the ends thereof; a piston reciprocably mounted in the cylinder; a piston rod extending longitudinally from the piston and cylinder; and a link in the form of a bell crank lever interconnecting said lid, gun and piston rod to hingedly mount the lid and cause damping of the opening and rebounding movements of the lid by the said piston and cylinder.

6. In grain puffing apparatus of the character described, a gun; a lid for closing one end of the gun; a cylinder having ports formed through its side wall intermediate the ends thereof; a piston reciprocably mounted in the cylinder having a width appreciably less than the distance from the said ports to the respective ends of the cylinder; a piston rod extending from the piston to a point adjacent the lid; and a link in the form of a bell crank lever interconnecting said lid, gun and piston rod, said lid being rigid with one arm of said lever, the other arm of the lever having pivotal connection with the gun, said piston rod being pivotally connected to the said link at the zone of convergence of said arms.

7. In grain puffing apparatus of the character described, a gun; a lid for closing one end of the gun; a cylinder having ports formed through its side wall intermediate the ends thereof; a piston reciprocably mounted in the cylinder having a width appreciably less than the distance from the said ports to the respective ends of the cylinder; a piston rod extending from the piston to a point adjacent the lid; and a link in the form of a bell crank lever interconnecting said lid, gun and piston rod, said lid being rigid with one arm of said lever, the other arm of the lever having pivotal connection with the gun, said piston rod being pivotally connected to the said link at the zone of convergence of said arms, said gun having a latch structure mounted thereon for releasably engaging the lid-supporting arm of the link.

8. In grain puffing apparatus of the character

described, a gun; a lid hingedly mounted on the gun for closing one end thereof; a cylinder having its longitudinal axis substantially parallel to the longitudinal axis of the gun, pivotally mounted on the side of the gun in spaced relation to the said lid; a piston reciprocably mounted in the cylinder; a piston rod extending longitudinally from the cylinder to a point adjacent the said lid; and a link joining said lid and piston rod.

9. In grain puffing apparatus of the character described, a gun; a lid hingedly mounted on the gun for closing one end thereof; a cylinder having its longitudinal axis substantially parallel to the longitudinal axis of the gun, pivotally mounted on the side of the gun in spaced relation to the said lid; a piston reciprocably mounted in the cylinder; a piston rod extending longitudinally from the cylinder to a point adjacent the said lid; and a link joining said lid and piston rod, said link serving also as means for hingedly mounting the lid on the gun.

10. Grain puffing apparatus of the character described comprising a supporting framework; a gun tiltably mounted on the framework; an agitator rotatably mounted within the gun; and means, independent of the gun, continuously in engagement with, and for rotating said agitator.

11. Grain puffing apparatus of the character described comprising a supporting framework; a gun tiltably mounted on the framework intermediate its ends for movement about an axis transverse to the longitudinal axis of the gun; an agitator rotatably mounted within the gun; a motor remote from the gun; and means, comprising a shaft entering one end of the gun, continuously interconnecting the motor and agitator for rotating the same as the gun is being tilted.

12. Grain puffing apparatus of the character described comprising a supporting framework; a gun tiltably mounted on the framework intermediate the ends of the gun for movement about an axis extending transversely to the longitudinal axis of the gun; means for securing the gun in a stationary position; heating means for the gun; an agitator rotatably mounted within the gun; means independent of the gun, continuously in engagement with, and for rotating said agitator as the gun is being tilted; and means for injecting steam into the said gun while being heated by the heating means and as the gun is being tilted.

13. Grain puffing apparatus of a unitary nature comprising a gun, a lid for one end of the gun, an agitator rotatably mounted within the gun, and buffing structure to dampen the movement of the door during its opening and rebounding movements all mounted for tilting movement about a common axis; means for securing the said aforementioned unitary structure against movement about the said common axis; means independent of the gun, continuously in engagement with, and for rotating the said agitator; means for heating the exterior surface of the gun as it is tilted; and means for injecting superheated steam into the gun to heat the interior thereof and act upon the grain during treatment thereof as the gun is being tilted and as the grain is being agitated when the gun is held stationary by the means for securing the unitary structure against movement.

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