Feb. 3, 1953 F. B. DOYLE 2,627,221

PUFFING GUN

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Fig. 1.

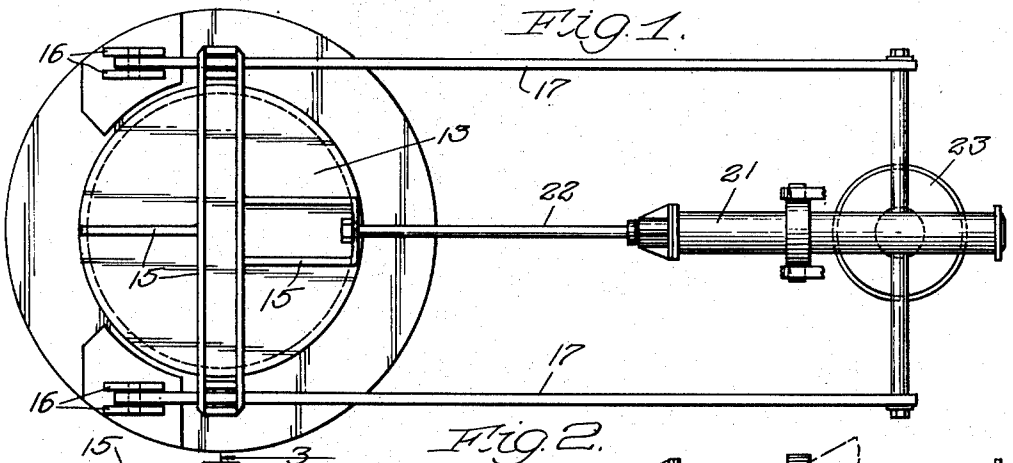
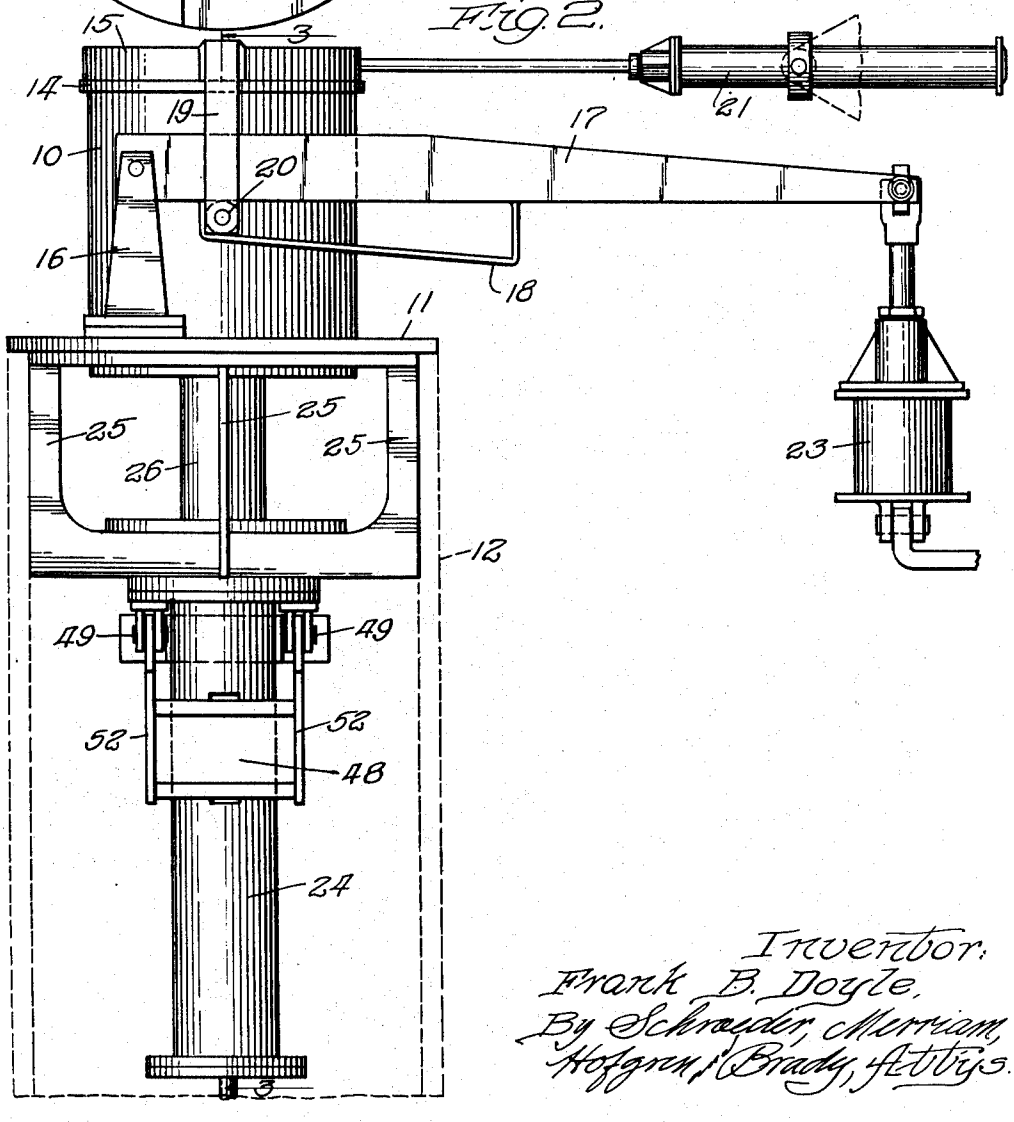


Fig. 2.



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Fig. 3.

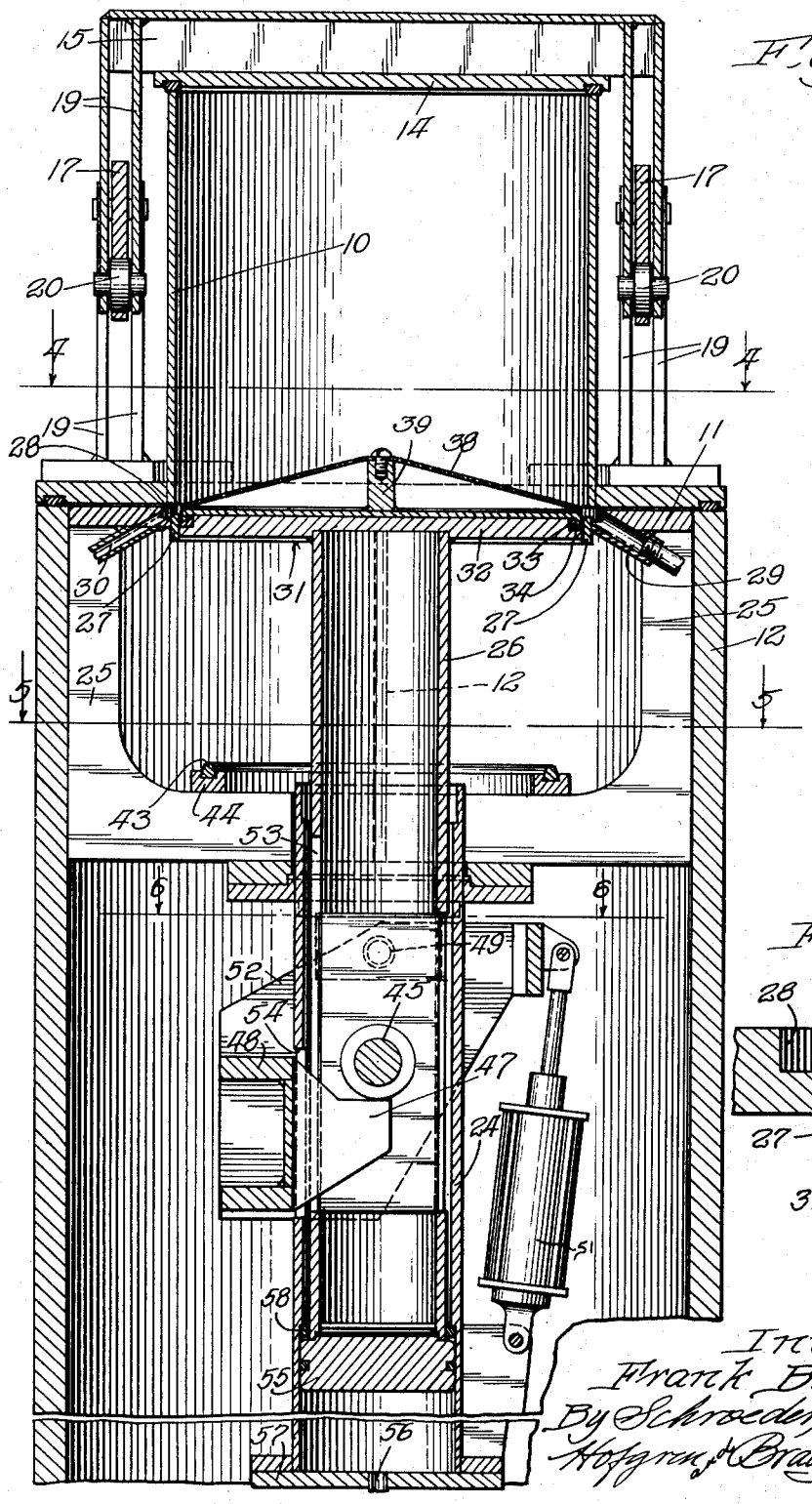
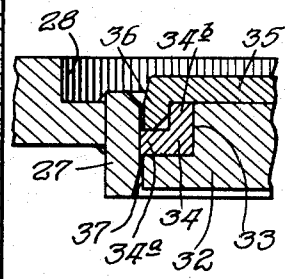


Fig. 3A.



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Fig. 4.

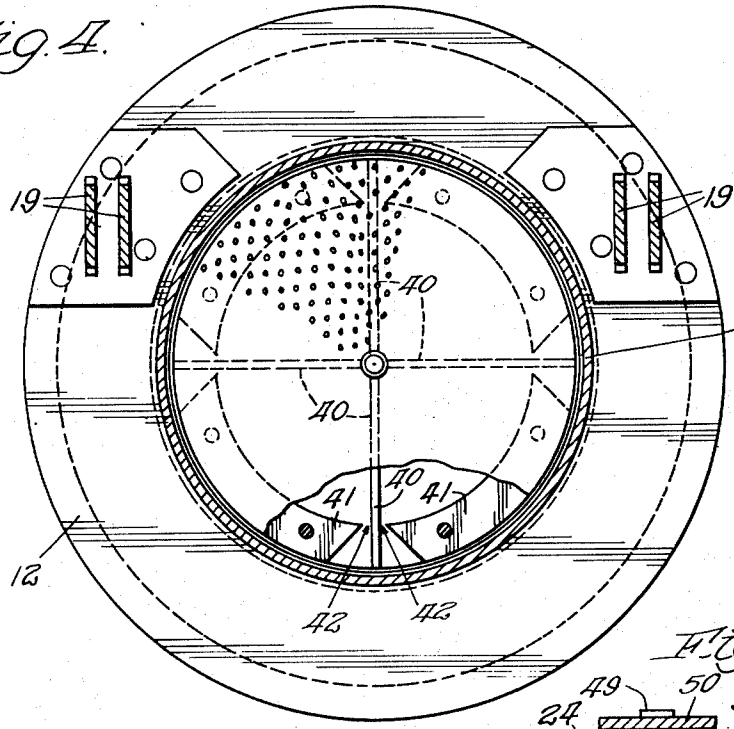


Fig. 6.

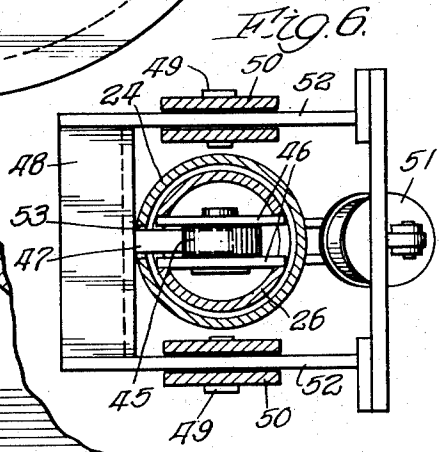
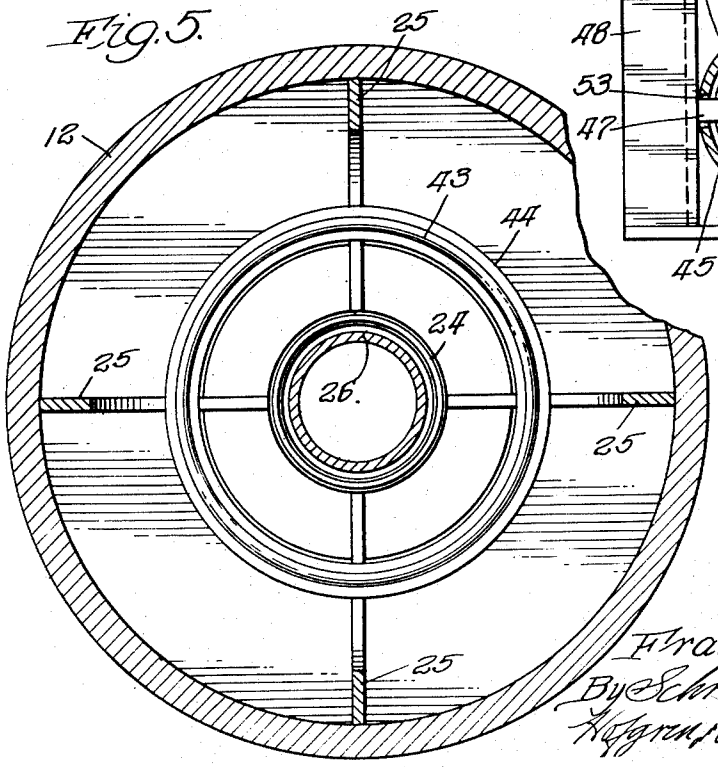


Fig. 5.



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UNITED STATES PATENT OFFICE

2,627,221

PUFFING GUN

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Application November 5, 1949, Serial No. 125,668

14 Claims. (Cl. 99—238)

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This invention relates to a puffing gun or apparatus for use in puffing cereal grains, tobacco and the like, and more particularly relates to such an apparatus in which a charging chamber is positioned adjacent an expansion chamber with a reciprocal closure adapted to open and close an opening between the chambers.

In a puffing apparatus it is desirable that a material receiving chamber be adapted to be placed under pressure and a door or the like be provided in a wall of the chamber for quickly opening the chamber to the atmosphere or an expansion chamber to obtain the requisite puffing of the material. In providing such a material receiving chamber, it is necessary that the door or other closure be provided with a suitable seal for retaining pressure built up within said chamber.

Applicant has invented a puffing gun having a reciprocal gate and supporting plunger for closing an opening between a charging chamber and an expansion chamber, said gate and plunger being provided with novel means for quickly moving the closure to a position allowing communication between the chambers. Said gun is also provided with novel means for returning the closure to a position wherein the opening between the chambers is closed by the gate and a sealing member carried by the gate effectively seals said opening.

Applicant's invention will be described with reference to an embodiment thereof illustrated in the accompanying drawings, in which:

Fig. 1 is a top view of the apparatus with the expansion chamber removed;

Fig. 2 is a side elevation of the apparatus, partly in section;

Fig. 3 is a sectioned elevation of the apparatus taken substantially along the line 3—3 in Fig. 2;

Fig. 3A is an enlarged sectional view of the peripheral edge of the gate in contact with the periphery of the opening between the chambers;

Fig. 4 is a horizontal sectional view taken substantially along the line 4—4 in Fig. 3;

Fig. 5 is a view similar to Fig. 4 taken along line 5—5 in Fig. 3; and

Fig. 6 is a view similar to Figs. 4 and 5 taken substantially along line 6—6 in Fig. 3.

The puffing apparatus illustrated in the drawings has a charging chamber 10 mounted on the upper wall 11 of an expansion chamber 12, which is supported at its lower end on a suitable foundation (not shown). The upper end of the charging chamber 10 is provided with a heavy closure 13 comprising a flat base plate 14 suitably reinforced by braces 15. The closure is removed and replaced over the top of the charging chamber 10 by a framework and associated power operated cylinders. A pair of standards 16 are mounted on either side of the expansion chamber. Arms 17 are pivotally connected to the standards 16 and extend outwardly to one side of the chamber 10. Each arm 17 is provided with an inclined bracket 18 mounted on the under side of the arm. A pair of upstanding legs 19 are affixed to the cross braces 15 and each mounts a roller 20 at its lower end, said roller engaging the bracket 18 and the lower edge of the arm 17. The weight of the closure 13 is carried on the rollers 20 resting on the brackets 18 when the closure is removed or replaced on the chamber. Power means such as an air cylinder 21 having a longitudinally movable rod 22 is connected to a portion of the braces 15 for moving the closure 13 on and off the top of the charging chamber. Power means, such as an air cylinder 23, is operatively attached to the free ends of the arms 17 for lifting the closure 13 from the charging chamber and locking the closure in sealing engagement therewith when desired.

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The expansion chamber 12 has depending therein a cylindrical housing 24 supported from the top of the chamber on web members 25 spaced ninety degrees from each other around the chamber. The housing 24, as best seen in Fig. 3, provides a guideway for a gate supporting plunger 26 for a purpose hereinafter described.

As best seen in Fig. 3, the charging chamber 10 is mounted on the top wall 11 of the expansion chamber 12. A stainless steel ring 27 is secured in the opening between the chambers and an annulus 28 is provided partly behind the stainless steel ring 27 and at the lower peripheral edge of the charging chamber 10. A suitable nozzle 29 communicates with the annulus 28 for admitting steam or other fluid to the charging chamber. Another nozzle 30 also communicates with the annulus 28 for carrying away condensates, non-condensables, purging steam and the like. The nozzles 29 and 30 are connected to appropriate vessels (not shown) outside the puffing apparatus.

The upper end of the shaft or plunger 26 mounts a gate 31 adapted to close the opening defined by the annular stainless steel ring 27 when in its upper position, as shown in Fig. 3. The gate 31 has a base plate 32 which is affixed as by welding to the plunger 26. A seat 33 is provided in the upper peripheral edge of the base plate 32.

An annular L-shaped sealing ring 34 of rubber like material is placed in the annular seat 33 with one leg 34a of the ring projecting radially outward from the base plate 32 and the other leg 34b projecting upwardly to a plane flush with the top of the base plate 32. A flat circular plate 35 having a peripheral edge 36 turned downwardly is affixed to the upper side of the base plate 32 with the down-turned peripheral edge encompassing the upwardly projecting leg 34b of the sealing ring 34. The plate 35 thus holds the sealing ring 34 in its proper position relative to the base plate 32 of the gate 31 and the radially extending leg of the sealing ring 34 projects sufficiently beyond the peripheral edge 37 of the base plate to contact the stainless steel ring 27. The sealing ring is firmly held in its proper position on the gate by the plate 35 and fluid pressure which may be trapped behind the ring will not blow the ring off the gate when the gate is quickly lowered from sealing engagement with the stainless steel ring 27. When pressure is admitted to the charging chamber, the radial leg 34b is pressed downwardly and expands against the ring 27. Thus the bearing pressure of the sealing ring against the annular ring 27 increases proportionately with the pressure in the chamber.

A perforated cone 38 is affixed to the upper end of the gate 31 and is supported in its conical shape by a center post 39 and four radial triangular shaped ribs 40 secured on the top of the plate 35. Plates 41 secured to the circular plate 35 provide restricted openings 42 between the ends of the plates 41 and the triangular webs 40 communicating the space below the perforated cone 38 with the annulus 28.

The gate 31 and the plunger 26 are movable from the position shown in Fig. 3 to a lower position with the gate 31 resting against a rubber bumper stop 43 mounted in the upper surface of an annular ring 44 mounted on the webs 25.

Means are provided for releasably retaining the gate and plunger in their upper position with the gate in contact with the stainless steel ring 27 which comprises a roller 45 mounted on plates 46 supported within the plunger 26 and a hook 47 movable into and out of contact with the lower edge of the roller 45. The hook 47 is carried by a frame 48 supported on a pair of rocker arms 52 respectively mounted on pivots 49 supported on plates 50 depending from the webs 25. Power means such as an air cylinder 51 is operatively connected to the end of the frame opposite said hook for moving the hook into and out of contact with the roller 45. The pivots 49 have their axes parallel to the axis of the roller 45 and are positioned vertically above the roller so that the hook 47 may engage the roller tangentially at a point vertically aligned with the roller and pivot axes. When the hook is thus positioned in contact with the roller 45, pressure in the charging chamber applies forces to the gate 31, the summation of which is directed in a line centered within the shaft or plunger 26 and extending through the axis of the pivots 49, the axis of the roller 45 and the line of contact between the roller and the hook 47. Thus no moment is created to produce a lateral force on the hook, so that the hook will remain at rest in contact with the roller regardless of the amount of pressure exerted on the gate. A slot 53 is provided in the side of the plunger 26 for admitting the hook 47 and a smaller slot 54 is likewise provided in the housing 24.

A small piston head 55 is slidably mounted in the lower end of the housing 24 and is attached to the lower end of the plunger 26 for raising the plunger and gate from its lower position to its upper position. An orifice 56 is provided in the bottom plate 57 for admitting fluid under pressure to the lower side of the piston head 55. A ring 58 is positioned in the housing 24 to limit the upward movement of the piston head 55.

In operating my puffing apparatus fluid under pressure is admitted through the orifice 56 to move the piston head 55 upwardly against the ring 58. The roller 45 carried in the plunger 26 is now positioned so that the air cylinder 51 may rock the hook 47 into contact with the lower edge thereof. In this position the gate 31 closes the opening defined by the stainless steel ring 27 between the chambers. Atmospheric air is admitted to the charging chamber and the charging closure 13 is removed from the upper end of the charging chamber 10. The material to be puffed is then placed into the charging chamber and the closure 13 replaced and securely locked in sealing engagement with the upper end of the chamber. The materials in the charging chamber are treated as desired, the perforated cone 38 allowing good drainage from the center of the chamber with the condensates, etc. running across the head of the gate 31 and into the annulus 28 where they are drawn off through the nozzles 30. When the material in the chamber 10 is ready to be puffed, the air cylinder 51 is actuated to rock the hook 47 out of contact with the roller 45 allowing the gate and plunger to fall quickly with the gate coming to rest against the rubber bumper stop 43. The material discharges through the annulus formed between the gate and the steel ring 27 into the expansion chamber. The cycle may now be repeated by admitting fluid into the housing below the piston head 55 to return the gate to its upper position and following the steps outlined above.

The foregoing detailed description is given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, for some modifications will be obvious to those skilled in the art.

I claim:

1. In a puffing gun, an expansion chamber, a charging chamber having an unconstricted opening communicating with the expansion chamber, and closure means for said opening comprising a plunger, a gate mounted on one end of said plunger, said gate and plunger being instantaneously movable between a first position with the gate closing said opening and a second position allowing free puffing communication between the chambers, means for releasably retaining said gate and plunger in first position and means for moving the gate and plunger from second to first position.

2. Apparatus as set forth in claim 1 in which an annular resilient sealing ring is positioned around the peripheral edge of said gate for contacting the periphery of said opening and said gate is symmetrically movable from said opening to open position.

3. Apparatus as set forth in claim 1 in which the means for releasably retaining the gate and plunger in first position comprises a roller carried by said plunger, and a hook carried on a pivoted rocker arm, said hook being movable into and out of engagement with said roller.

4. Apparatus as set forth in claim 1 in which said means for moving the gate and plunger from second to first positions comprises, a housing about the plunger, a piston head slidable in said housing adjacent the end of the plunger spaced

from said gate and means for admitting fluid to the side of said piston head opposite said plunger.

5. Apparatus as set forth in claim 1 in which an annular resilient L-shaped sealing member is attached to said gate with one leg of the sealing member extending radially outward from said gate for sealing engagement with the periphery of said opening.

6. In a puffing gun, a charging chamber adapted to receive a material to be puffed, an expansion chamber positioned below the charging chamber and having an unconstricted opening communicating directly with said charging chamber, and closure means for said opening comprising, a vertically reciprocal plunger, a housing about said plunger depending within said expansion chamber, a gate mounted on the upper end of said plunger and movable therewith, said plunger and gate being movable instantaneously between an upper position with said gate closing said opening and a lower position allowing free puffing communication between the chambers, means for releasably retaining said gate and plunger in upper position and means for raising the gate and plunger from second to first positions.

7. Apparatus as set forth in claim 6 in which said means for releasably retaining the gate and plunger in upper position comprises, a roller carried by said plunger below said gate, a hook carried on one end of a pivoted frame and power means operatively connected to the other end of said frame for swinging the hook into and out of contact with the lower side of said roller.

8. Apparatus as set forth in claim 6 in which said means for raising the gate and plunger comprises a piston head affixed to the lower end of said plunger and slidable in said housing means for limiting the movement of said piston head and means for admitting fluid to the lower side of said piston head.

9. Apparatus as set forth in claim 6 in which an annular resilient sealing ring is positioned about the peripheral edge of said gate for sealing engagement with said opening when the gate and plunger are in said upper position.

10. In a puffing apparatus, a charging chamber, an expansion chamber positioned below said charging chamber, a cylindrical ring positioned in the upper wall of the expansion chamber defining an opening between the chambers, a housing depending within the expansion chamber, a plunger vertically reciprocal within the housing, a gate mounted on the upper end of said plunger, said gate and plunger being selectively reciprocal between an upper position with the gate closing said opening and a lower position allowing communication through the opening between the chambers, an annular L-shaped sealing ring seated in the upper peripheral edge of said gate, said sealing ring having one leg projecting radially outward from the gate for sealing engagement with said cylindrical ring and the other leg projecting upwardly toward the upper surface of the gate, and a plate secured to the upper surface of the gate and having a downwardly turned peripheral edge encompassing the upwardly projecting leg of the sealing ring to hold the ring in position on the gate.

11. In a puffing gun having a charging chamber and an expansion chamber in unconstricted communication therewith through an opening, a closure for the opening symmetrically and instantaneously movable into open position, a centrally located shaft carrying the closure and means centered within the shaft for releasably holding the closure in closed position, whereby the resultant of pressure forces upon said closure is centrally located within said shaft.

12. A puffing gun as set forth in claim 11 in which a roller is centrally positioned within said shaft with its axis normal to the axis of the shaft and a hook is movable into and out of tangential contact with said roller for releasably holding said closure in closed position.

13. In a puffing gun, a closure for the barrel symmetrically movable into open position, an annular rubber-like L-shaped sealing ring positioned in the upper peripheral edge of said closure, said sealing ring having a first leg extending radially outward from the closure for contact with the barrel and a second leg extending toward the surface of the closure facing the barrel, and a sealing ring retaining plate having its peripheral edge turned normal to the plate to encompass said second leg to secure the ring to said closure.

14. A vessel having an annular opening in a wall of the vessel, a closure, means for releasably holding the closure in the annular opening against a substantial fluid pressure, means for sealing the space between the wall and the closure, said sealing means comprising an L-shaped ring of substantially incompressible resilient plastic material, having one leg of the L abutting the wall and the other leg abutting a sealing plate adapted to press on said ring under the fluid pressure, and backing means for the ring whereby pressure of the plate forces the wall-abutting-leg into sealing engagement with the wall.

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