

April 14, 1942.

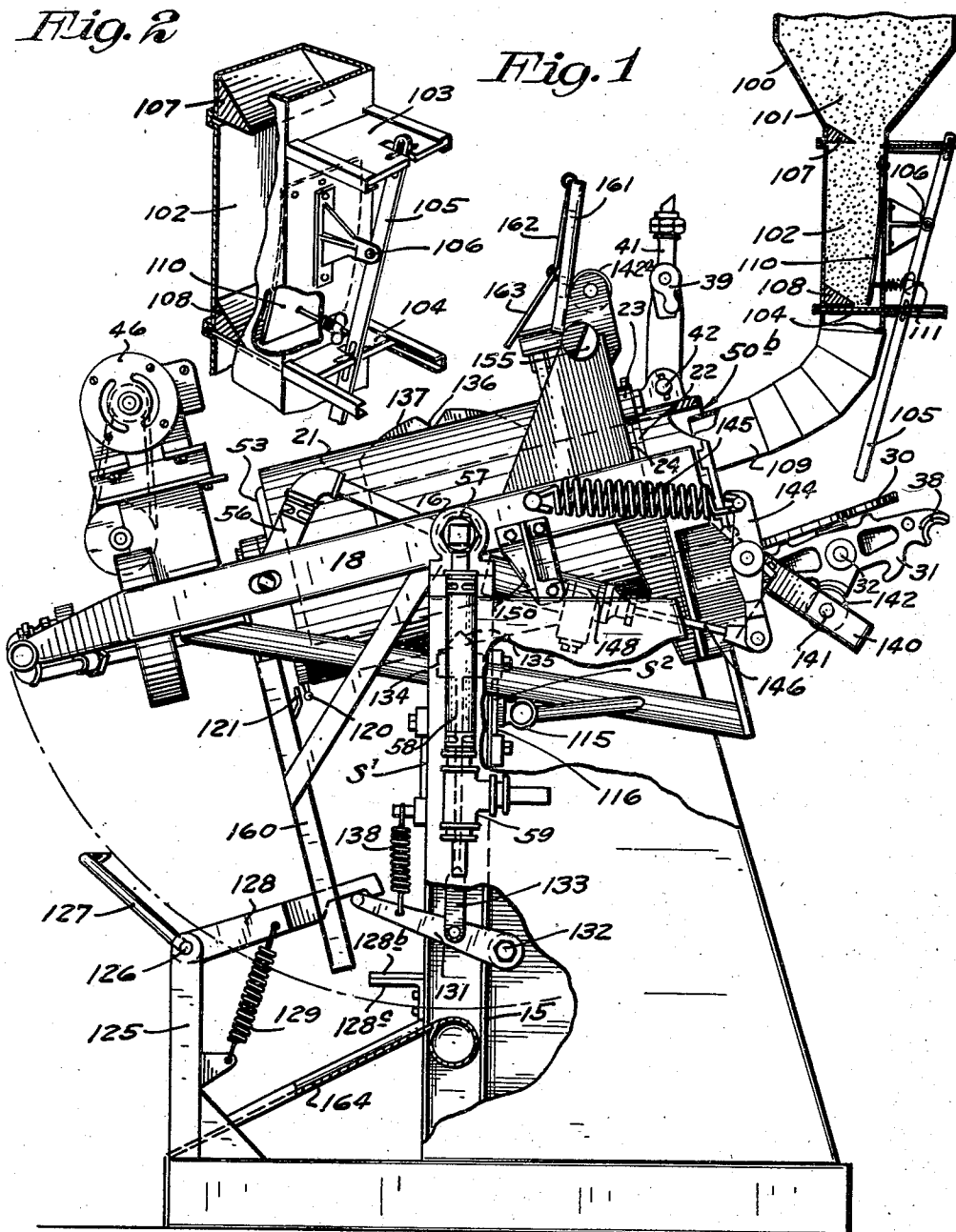
H. L. HAYDEN

2,279,868

PUFFING GUN

Filed July 24, 1940

5 Sheets-Sheet 1



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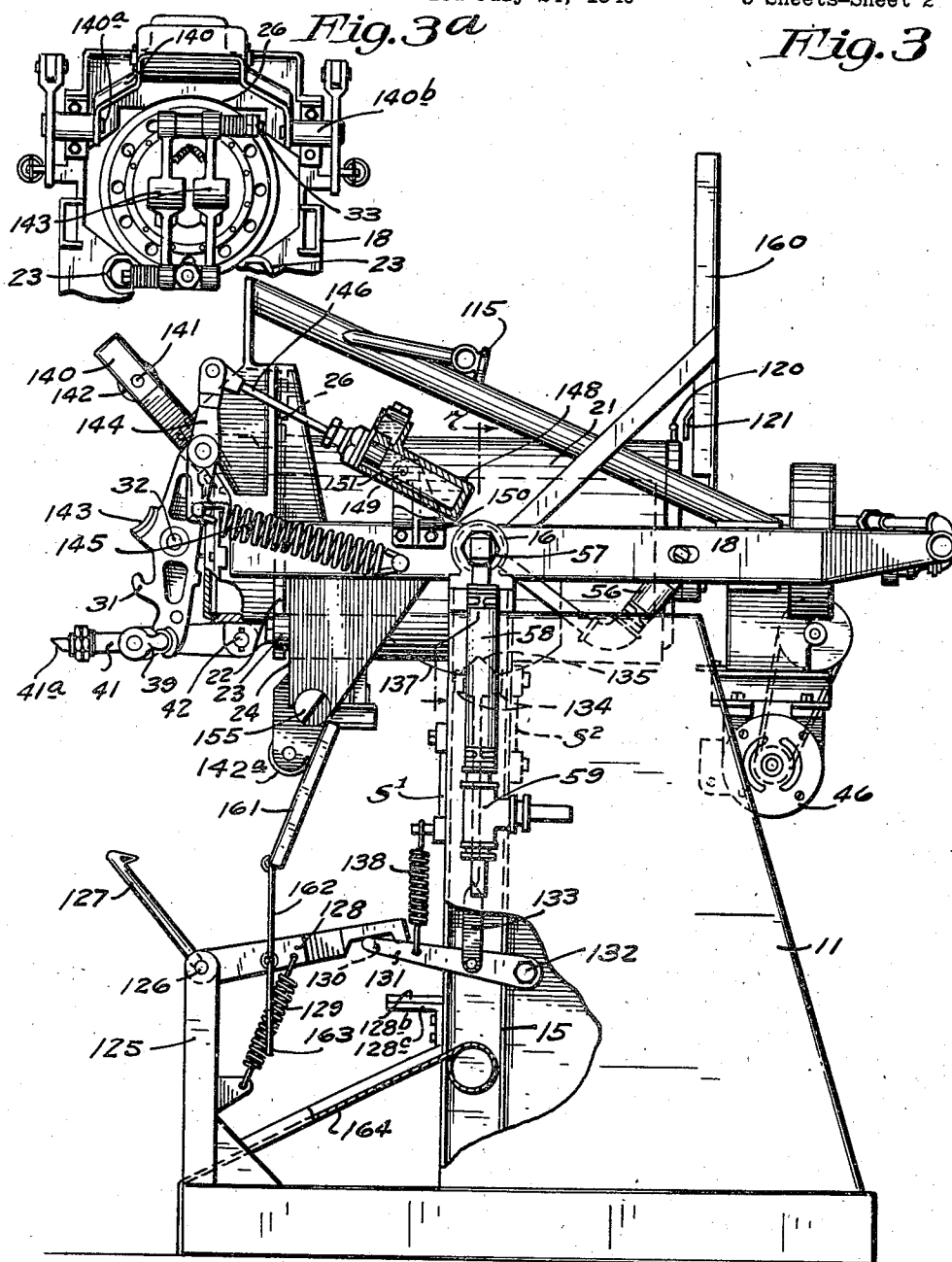
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5 Sheets-Sheet 2



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5 Sheets-Sheet 3

Fig. 5

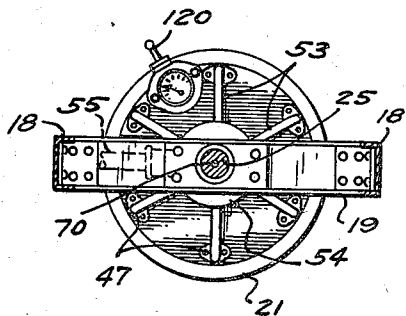
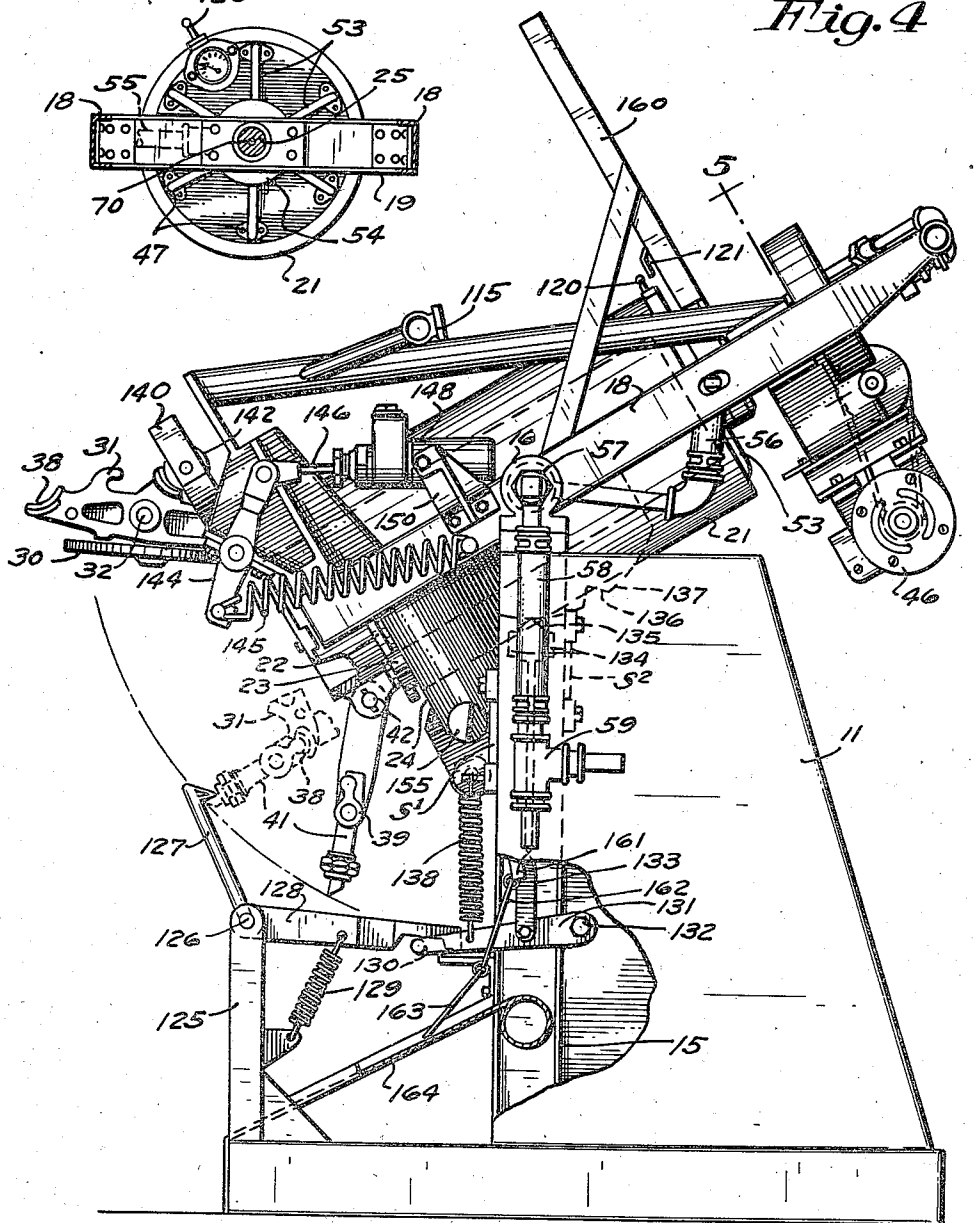


Fig. 4



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Fig. 7

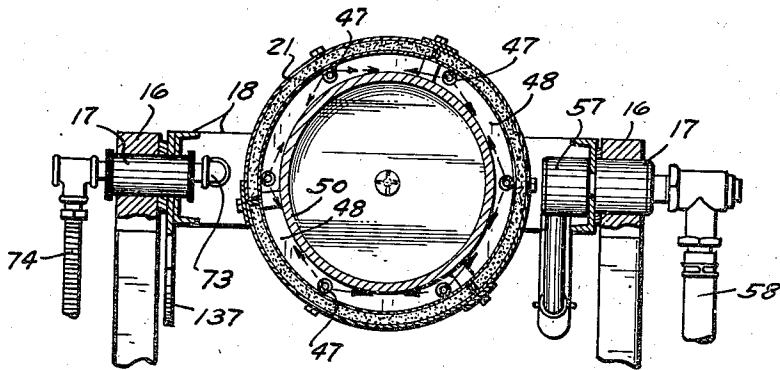


Fig. 6

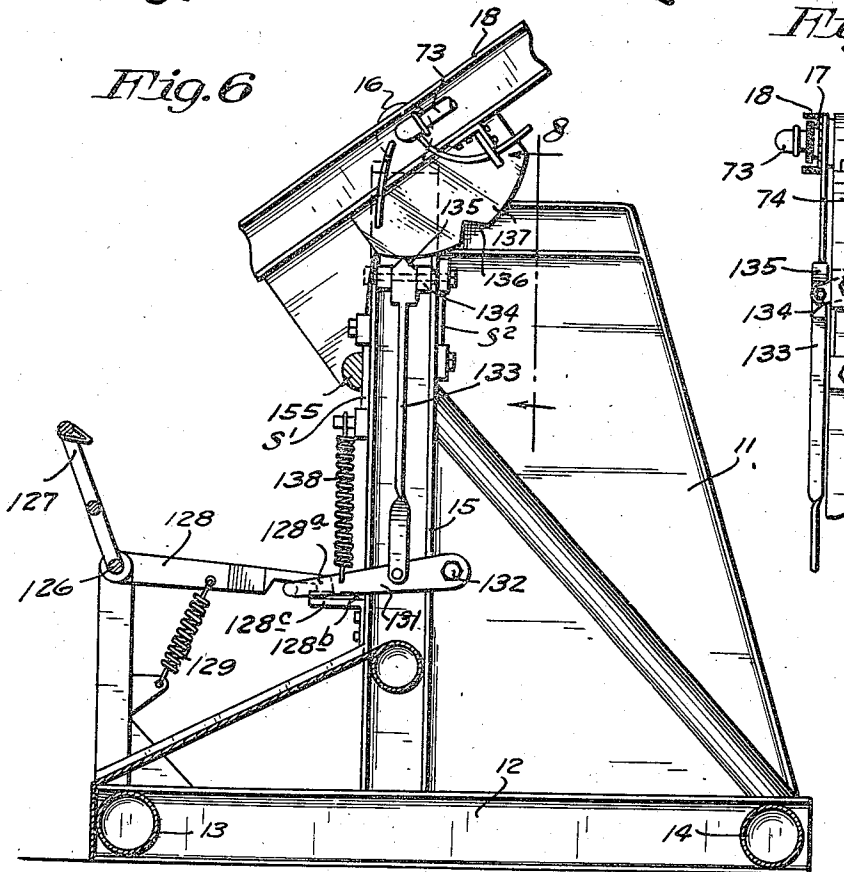
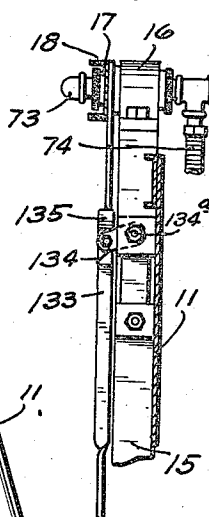


Fig. 8



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Fig. 9

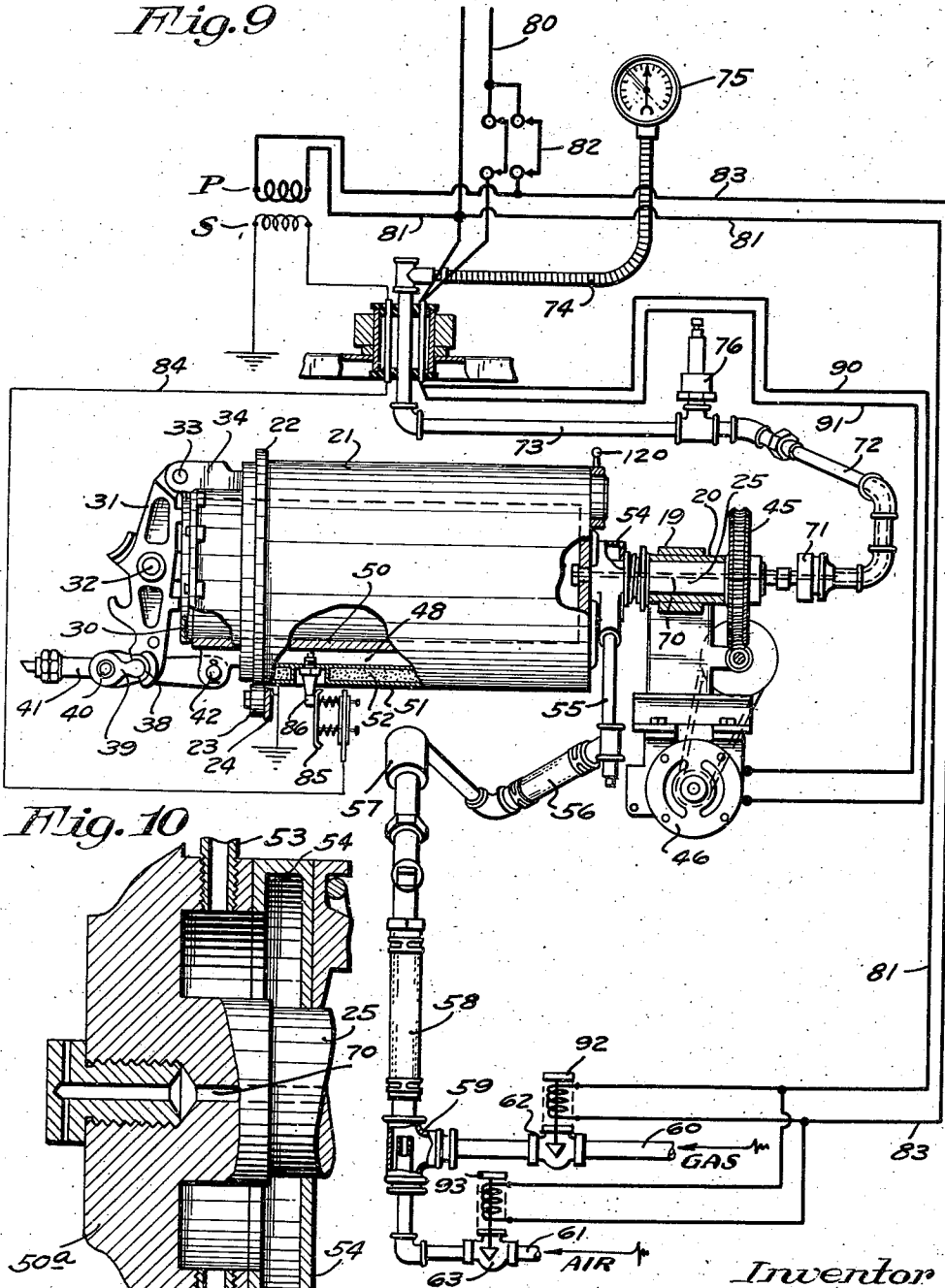
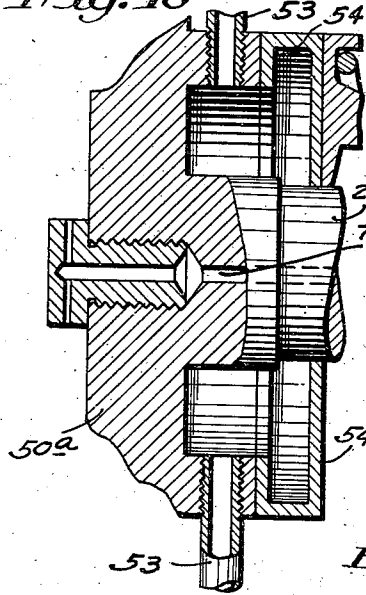


Fig. 10



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UNITED STATES PATENT OFFICE

2,279,868

PUFFING GUN

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6 Claims. (Cl. 99—238)

This invention relates to puffing guns.

An object of the invention is the provision of means for readily charging and discharging puffing guns.

Another object is to simplify and improve the construction and operation of puffing guns generally.

These and other objects as will hereinafter appear are fully described in the following specification and shown in the accompanying drawings in which:

Figure 1 is a side elevation of the puffing gun during charging showing certain of the parts removed or in section;

Fig. 2 is a partial perspective of the charging mechanism;

Fig. 3 is a view similar to Figure 1 showing the puffing gun closed during the heating operation;

Fig. 3^a is a partial reduced end view of the gun;

Fig. 4 is a similar view of the puffing gun at the instant of discharge;

Fig. 5 is a partial section on the line 5—5 of Fig. 4;

Fig. 6 is a vertical section through the frame of the puffing gun showing a portion of the carriage in the position of Fig. 4, but with the gun barrel removed;

Fig. 7 is a partial enlarged section on the line 7 of Fig. 3 showing a cross sectional view of the gun barrel and carriage and the mounting for the same;

Fig. 8 is a detail of the standard taken on the line 8—8 of Fig. 6;

Fig. 9 is a schematic diagram showing means for heating the puffing gun barrel, the electric controls and the like; and

Fig. 10 is a partial enlarged section through the breech of the gun barrel.

The embodiment illustrated comprises a puffing gun having a standard 11 comprising spaced bottom members 12 (Fig. 6) connected by tubular members 13, 14 and having vertical standards 15 to the tops of which are secured bearings 16 in which are journaled trunnions 17 firmly secured to the opposite sides of the carriage 18.

This carriage is open at the discharge end but closed at the opposite end by a member 19 in which is provided a bearing 20 (Fig. 9).

A puffing gun barrel shown generally as 21 is provided at its forward end with a ring 22 which, during the rotation of the gun barrel, rests upon two rollers 23 which are carried by a transverse member 24 forming part of the carriage, the opposite end of the gun barrel being

operably connected to a shaft 25 which is journaled in the bearing 20. Above the ring 22 (Fig. 3) is a member 26 which is arcuate inside to hold the ring 22 in place when the carriage is inverted as shown in Figure 1. It also prevents any upward movement of the gun barrel at the instant of firing. It will be understood, of course, that during this time the gun barrel is not in rotation and that it rotates only when in the horizontal position shown in Fig. 3 at which time it rests upon the rollers 23.

The gun barrel is closed by a lid or cover 30 which is hingedly connected to two spaced beams 31 and pin 32, the beams being hingedly connected by means of a shaft 33 to an extension 34 at the side of the gun barrel. The beams 31 have at their outer ends toggle seats 38 adapted to receive the rounded ends of the spaced toggle arms 39 which are made rotatable about pins 40 extending in opposite directions from a trip lever 41, the latter being pivotably mounted at 42 at the side of the gun barrel. As shown in Fig. 9, the lid is tightly locked in closed position.

The mechanism for rotating the gun barrel in the carriage is also shown in Fig. 9 and comprises a worm wheel 45 keyed to the shaft 25 and driven by suitable reducing gearing from a motor 46.

Forming no part of the present invention, the gun barrel as shown is heated by a series of gas burners 47 (Fig. 5 and 7) which are located in the space 48 (Fig. 9) between the gun barrel proper 50 and the outer housing 51 which also preferably incloses heat insulating material 52. A combustible mixture of gas for these burners is supplied thereto through a series of pipes 53 (Fig. 5) from a centrally located housing 54 which is stationary and which connects through a pipe 55 (Fig. 9), a short hose 56, a rotary joint 57, another short hose 58 with a gas mixing valve 59 which is supplied with a combustible gas through a line 60 and with air through a line 61. The line 60 is controlled by means of a valve 62 and the line 61 by a valve 63. The operation of these valves will later be described.

Referring to Fig. 10, the end of the gun barrel 50a and the shaft 25 are drilled to provide a longitudinal opening 70 which connects through a suitable rotary joint 71 with a pipe 72 and 73, thence through one of the journals 17 and through a flexible tube 74 to a pressure gauge 75. The latter is preferably located where it is readily visible to the operator so that he is informed at all times as to the pressure within the puffing gun. A relief valve 76 is preferably in-

serted in the pipe line 72 so as to prevent the pressure exceeding a predetermined amount.

A source of alternating current 80 connects at one side to a lead 81 and at the other through a switch 82 with a lead 83. These lines connect through primary P of a suitable spark coil while the secondary S is grounded at one side on the machine and at the other connects through a lead 84 to an insulated brush 85. This brush lies in the path of the terminal of a spark plug 86. This spark plug has its points extending into the space 48 where they are surrounded by the combustible mixture to be ignited so that when the machine is in operation the spark plug is energized several times on each revolution of the rotating puffing gun barrel as the terminal of the spark plug comes in contact with the brush, thereby igniting the mixture within the combustion space 48.

The leads 81 and 83 are also suitably connected through leads 90, 91 to the motor 46 and the leads 81, 83 also connect with suitable solenoids 92, 93 which control the action of the valves 62, 63.

Thus it will be seen that on closing the switch 82 the motor 46 becomes energized and causes the gun barrel to be rotated, at the same time the solenoids 92 and 93 become energized thereby opening the gas and air valves 62 and 63 thereby permitting a combustible mixture to be fed into the combustion space 48 and at the same time the spark coil P-S becomes energized thereby energizing the brush 85 and causing the spark plug 86 to emit a succession of sparks at a given point on each revolution to ignite the combustible mixture. This operation continues until the operator sees by the pressure gauge 75 that the pressure within the puffing gun has reached a point at which the gun should be discharged. He thereupon opens the switch 82 at the proper time to bring the gun barrel into the proper position for discharge. This he does as will later be described.

In Figs. 1, 3 and 4 are shown the principal operating positions of the puffing gun. Thus in Figure 1 the machine is in the position for filling in which the muzzle 56^a of the gun barrel is turned toward the operator for filling and is pointed upwardly at an angle of about 15° from the horizontal.

For ease of filling, I have provided a chute 100 containing the material 101 to be puffed and beneath this is a metering chamber 102 having sliding gate valves 103, 104 reversely operative by means of a lever 105 hingedly mounted at 106. Inclined blocks 107 and 108 are located just above these valves. A flexible chute 109 is secured to the bottom of the chamber 102 and is easily movable by the operator into the position shown in Figure 1 in which it directs the material passing through it into the muzzle of the puffing gun.

Thus it will be noted that with the parts in the position shown in Figure 1, the valve 104 closes the opening at the bottom of the metering chamber while the top is open. To discharge the material into the gun, the operator pulls the lever 105 to the right thereby opening the valve at the bottom of the metering chamber and closing the valve at the top. The material within the metering chamber 102 thereby passes through the chute 109 into the puffing gun. The operator promptly pushes the lever 105 to the left, opening the valve at the top of the metering chamber and closing the valve at the bottom, thereby

returning the parts to the position shown in Figures 1 and 2 and filling the metering chamber.

In order to provide a means for varying the charge in the metering chamber, I have provided a false inner wall 110 and an adjusting screw 111 whereby the bottom of this wall may be pushed in to vary the capacity in this chamber.

In order to position the gun barrel for filling I have provided a bar 115 (Figure 1) which in this position strikes a rubber pad 116 which serves as a stop for the movement of the swing of the gun barrel in this direction. Upon filling the gun barrel, the chute 109 is swung back to one side where it normally hangs at the side of the gun. The operator then closes the lid 30 by means of the lid beams 31 and locks them in place by means of the toggle arms 32 and the trip lever 41, the latter being forced into place by means of a suitable operating lever which the operator uses for this purpose and which is not shown as it is not secured to the mechanism. As soon as the lid is properly closed the operator promptly rocks the gun barrel in a counter-clockwise direction from the position shown in Figure 1 to the position in Fig. 3. As soon as it reaches the position of Fig. 3, he closes the switch 82 (Fig. 9) thereby causing the puffing gun to be rotated and passing a combustible mixture to the combustion chamber 48, at the same time providing a spark for the ignition of the mixture. As this mixture burns, the gun barrel is uniformly heated throughout and after a few minutes the pressure therein rapidly rises. Experience soon shows the pressure at which the material to be puffed should be released for best results.

When this point is reached the operator opens the switch 82 thereby stopping the rotation of the puffing gun so that a small indicator 120 (Fig. 3) stops at the uppermost position in front of a stationary sight 121 to insure that the trip lever 41 will be in the proper position for tripping. This tripping mechanism will now be described.

Referring to Figs. 3 and 6, a standard 125 at each side of the base carries a shaft 126 to which is secured a trip finger 127. The shaft 126 carries a lever 128 which is normally pulled down by a spring 129 so that it rests upon an ear 130 on the end of a lever 131, the latter being hingedly mounted at 132 on the frame. The outer end 128^a of the lever is stopped by a rubber pad 128^b on an angle 128^c on the standard 15. The lever 131 carries a link 133 which is movable up and down in suitable supports 134 hingedly mounted on the standard 15 at 134^a and is provided at its top with a pointed end 135 which, in the position shown in Fig. 3, enters a corresponding notch 136 in a cam 137 which is carried by the carriage 18. A spring 138 pulls the lever 131 up so as to force upwardly the link 133. As the carriage 18 is moved so as to move the cam 137 entirely away from the upper end of the link 133, the spring 138 becomes free to move the trip finger 127 back so that it will be out of the way of the left-hand end of the carriage of Figure 1 so that the carriage then can pass the trip finger without engaging it.

In order for the trip lever 41 to engage the trip finger 127 the carriage on being rocked in a counter-clockwise direction, in Fig. 3, will cause the tapered outer end 41^a of the trip lever to engage the inclined upper face of the trip

finger and the latter will yield to permit the trip lever to pass. Having passed, the operator then rocks the carriage back in a clockwise direction at which time the outer end of the trip lever 41 engages the under edge of the trip finger 121, thereby rocking the trip lever about the pin 42 until the toggle arms 39 are rotated somewhat in a counter-clockwise direction, after which the pressure within the gun forces the lid beams 31 outwardly with great force. This force must be absorbed in order to prevent the mechanism from being wrecked. I have accordingly provided a mechanism for absorbing this energy and this mechanism will now be described.

A U-shaped recoil lever 140 has at its ends trunnions 140a journaled in bearings 140b on brackets on the carriage 18. These trunnions are in axial alignment with the shaft 33. This lever carries a pin 141 on which is mounted a rubber sleeve 142 which sleeve is adapted to be engaged by arcuate surfaces 143 on the lid beams 31 so that the lid beams and the recoil lever 140 have a tendency to oscillate together about the axis of the shaft 33. A break lever 144 is keyed to each of the trunnions 140a and has pivotally connected at its lower end a stiff spring 145 and at the other end a plunger rod 146, the opposite end of which is secured to a plunger 147 which is fitted within a cylinder 148, the latter being pivotally mounted at 149 to a bracket 150 on the carriage. The cylinder 148 is filled with oil or the like and has a tapered groove 151 formed at one side, the deep end of the longitudinal groove being at the outer end, as shown, and tapering off to nothing near the inner end of the cylinder so that as the plunger 147 descends it will encounter constantly increasing resistance thereby bringing the plunger 147 gradually to rest. At the same time, the trip lever 41 strikes a rubber sleeve 142.

Thus it will be seen that the pressure of the discharge exerted on the lid 30 is transferred through the lid beams 31 to the recoil lever 140 and thence through the trunnions 140a to the springs 145 and to the plungers 147. As the latter are forced down, the springs 145 are extended and as soon as the force of the discharge is spent on the plunger, these springs tend to return the operatively connected recoil lever to the normal position as shown in Fig. 3. The point to which the gun barrel can be pointed down, as shown in Fig. 4, is limited by the stop bar 155 which strikes the rubber buffer S¹.

A shield 160 is mounted on the carriage in front of the gun barrel which serves to protect the operator who stands at the right of the machine, as shown in Fig. 3, from the heat of the gun as well as protecting him from any flying particles should breakage occur and it also serves to prevent the material puffed from being blown back in his face. At the forward end of the machine is located an apron 161 which extends across the gun and to this is hingedly mounted apron sections 162 and 163. The latter rides up on an inclined plate 164 as shown in Fig. 4 during the instant of discharge. This flexible apron serves to prevent the puffed material from being blown back under the machine and directs it forward toward a chute into which the gun discharges, the chute not being shown.

While I have shown and described but a single embodiment of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, may be made which do not

depart from the spirit and scope of my invention as disclosed in the appended claims.

I claim as my invention:

1. In a puffing gun, a frame, a carriage having trunnions journaled in the main frame, a gun barrel journaled in said carriage to rotate about its longitudinal axis, means for rotating the gun barrel about its longitudinal axis while in a horizontal position, means for heating the gun barrel, means for closing the muzzle of the gun barrel, a trip release for the closing means, and means for yieldably holding the gun barrel in the horizontal position, the carriage and gun barrel being rotatable about the trunnions downwardly to engage the trip release so that the next upward movement of the gun barrel will cause the trip to release the closing means.

2. In a puffing gun, a frame, a carriage having trunnions journaled in the main frame, a gun barrel journaled in said carriage to rotate about its longitudinal axis, means for rotating the gun barrel about its longitudinal axis while in a horizontal position, means for heating the gun barrel, means for closing the muzzle of the gun barrel, a trip release for the closing means, the carriage and gun barrel being rotatable about the trunnions downwardly to discharge, and a filling spout, the gun being then rotatable in the reverse direction to a position where the muzzle of the gun is beneath the filling spout for filling the gun and where the closing means is accessible to an operator.

3. In a puffing gun, a frame, a carriage having trunnions journaled in the frame, a gun barrel journaled in said carriage to rotate about its longitudinal axis, means for rotating the gun barrel about its longitudinal axis while in a horizontal position, means for heating the gun barrel, means for closing the muzzle of the gun barrel, a trip release for the closing means, the carriage and gun barrel being rotatable about the trunnions downwardly to engage the trip release so that the next upward movement of the gun barrel will cause the trip to release the closing means, and a filling spout located substantially opposite the open end of the gun at discharge, the gun being then rotatable through about half a revolution in the opposite direction to a position where the muzzle of the gun is beneath the filling spout for filling the gun and where the closing means is accessible to an operator.

4. In a puffing gun, a frame, a carriage having trunnions journaled in the main frame, a gun barrel journaled in said carriage to rotate about its longitudinal axis, means for rotating the gun barrel about its longitudinal axis while in a horizontal position, means for heating the gun barrel, means for closing the muzzle of the gun barrel, a trip release for the closing means, the carriage and gun barrel being rotatable about the trunnions downwardly to discharge, and a flexible apron carried by the gun barrel and which hangs below the gun when in the firing position to prevent material discharged from the gun from being blown back under the gun barrel.

5. In a puffing gun, a frame, a carriage having trunnions journaled in the main frame, a gun barrel journaled in said carriage to rotate about its longitudinal axis, means for rotating the gun barrel about its longitudinal axis while in a horizontal position, means for heating the gun barrel, means for closing the muzzle of the gun barrel, a trip release for the closing means, the carriage and gun barrel being rotatable about

the trunnions downwardly to discharge, and an apron made up of stiff sheets hingedly secured together and carried by the gun barrel and which hangs below the gun when in the firing position to prevent material discharged from the gun from being blown back under the gun barrel.

6. In a puffing gun, a frame, a carriage having trunnions journaled in the main frame, a gun barrel journaled in said carriage to rotate about

its longitudinal axis, means for rotating the gun barrel about its longitudinal axis while in a horizontal position, means for heating the gun barrel, means for closing the muzzle of the gun barrel, a trip release for the closing means, a cam carried by the carriage and having a notch, and a spring-pressed detent adapted to engage the notch for yieldably holding the gun barrel in horizontal position.

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