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GAS GUN

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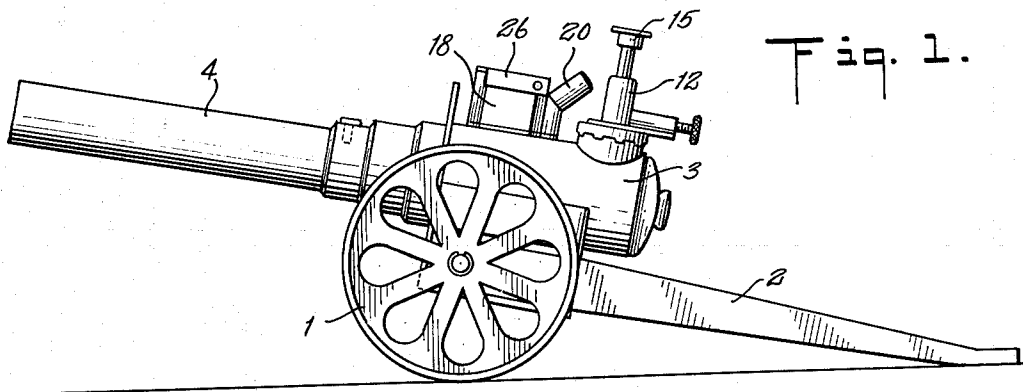


Fig. 1.

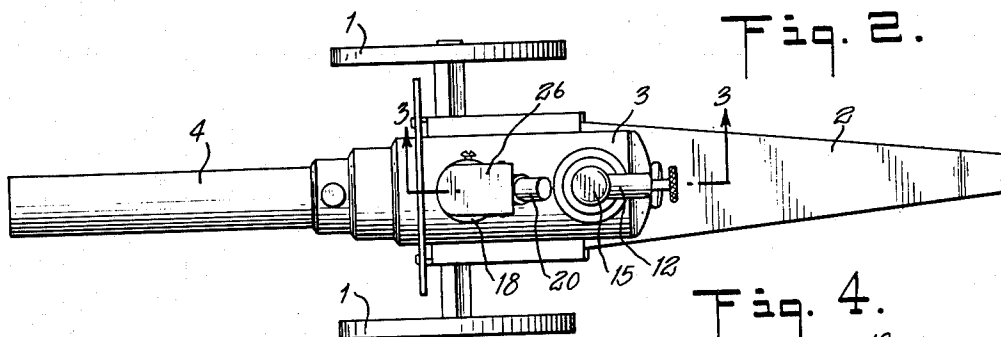


Fig. 2.

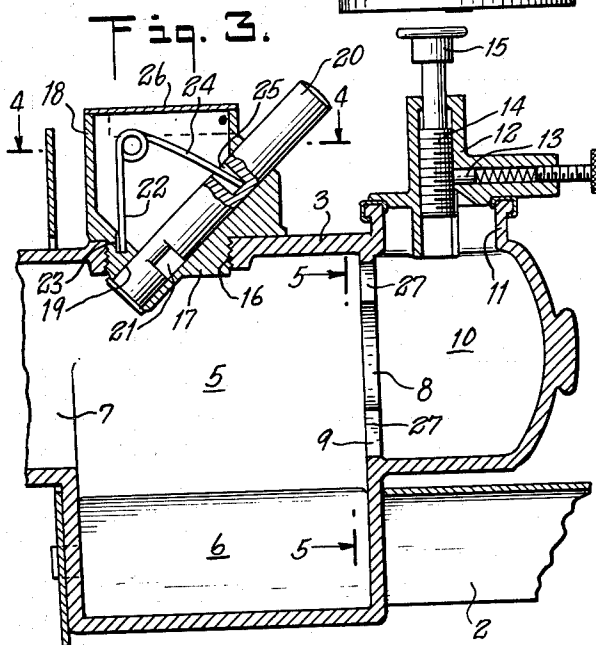


Fig. 3.

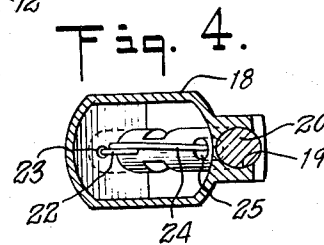


Fig. 4.

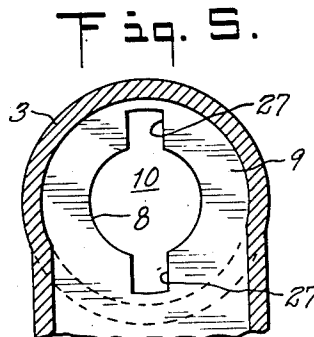


Fig. 5.

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GAS GUN

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3 Claims. (Cl. 42—55)

This invention relates to a gas gun of the type constructed to contain water and provided with a charger whereby calcium carbide is loaded in the water in the gun, the gun having an igniter for the acetylene gas generated within the gun itself. The gun must contain air to support the combustion of the gas and customarily the calcium carbide is proportioned so that the gun fills with a gas and air mixture which ignites and burns inside of the gun itself.

The main purpose of such a gun is to produce a loud concussion accompanied by a spectacular muzzle blast. Usually the device is made in the form of a small cannon which is useful in connection with the starting of sporting races, as a toy, for general celebration purposes and the like.

One of the objects of the present invention is to provide this kind of gun in a form providing for a louder report and a more impressive muzzle blast, and which obtains these effects more reliably and consistently. Another object is to provide such a gun with a repeating loading device providing accurately proportioned charges of calcium carbide. A further object is to generally simplify the operation of this type of gun so as to obtain loud reports and spectacular muzzle blasts without requiring the skill necessary when operating prior art guns of this type.

A specific example of a gas cannon made in accordance with the present invention is illustrated by the accompanying drawings in which:

Fig. 1 is a side view of the cannon;

Fig. 2 is a top view;

Fig. 3 is a vertical section taken on the line 3—3 in Fig. 2;

Fig. 4 is a horizontal cross section taken on the line 4—4 in Fig. 3; and

Fig. 5 is a vertical cross section taken on the line 5—5 in Fig. 3.

The illustrated cannon is intended primarily for use as a toy but as can be seen from Figs. 1 and 2 it has a realistic appearance. Its carriage is formed by wheels 1 and a tailpiece 2, and the gun itself comprises a generally cylindrical breech portion 3 and relatively long barrel 4. The invention is embodied by the breech portion 3 as described below.

This breech portion 3 forms a gas generating chamber 5 having a liquid-containing lower portion or sump 6. This sump is in the form of a rectangular box depending from the generally cylindrical contour of the breech portion 3 and which is adapted to be partly filled with water. This gas generating chamber has an outlet 7 in its front wall and which connects directly with the barrel 4, and it has a port 8 formed in its back wall 9. A pre-ignition chamber 10 connects with the gas generating chamber 5 through the port 8, and this chamber 10 has an inlet 11 provided with a closure 12 in which is mounted a piece of pyrophoric metal 13. This piece of pyrophoric metal is mounted so that it bears against a sliding striker plunger 14 which when sharply depressed by an

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external operator 15 showers igniting sparks into the chamber 10. The closure 12 applies to the top of the chamber 10 by means of a bayonet joint so that the closure may be easily removed and replaced, the inlet 11 functioning to admit air to the chamber 10 when the closure is removed.

A threaded hole 16 is formed in the top of the gas generating chamber 5 so as to receive the correspondingly threaded bottom 17 of a hopper 18. This hopper has a downwardly and forwardly slanting bore 19 formed through its bottom and in which a plunger 20 is reciprocatively fitted. The lower side of this plunger 20 is formed with a recess 21 having the shape of an annular groove so excessively eccentric to the plunger 20 as to be free from the latter's upper side. The plunger is reciprocative in the bore between an up position, shown by Fig. 3, where the recess 21 is inside of the hopper 18, and a down position where the recess 21 is open to the inside of the gas generating chamber 5. The plunger is biased to its up position by a hairpin spring having one leg 22 inserted relatively closely in a hole 23 formed in the bottom of the hopper, and its other leg 24 inserted in a hole 25 formed partly through the upper side of the plunger 20. The bore 19 and plunger 20 are cylindrical so that the latter may turn rotatively to different positions. This turning action is permitted because the hole 25 is relatively larger in diameter than is the spring's leg 24, but at the same time the diameter of the hole 25 is proportioned so that the spring's leg 24 limits the plunger rotation to a range of rotative positions wherein the recess 21 always faces or is open in a generally downward direction. The hairpin spring is laterally braced by the opposite sides of the hopper 18 but the spring may swing in moving from one side to the other, so the hole 25 should be proportioned with this loose action in mind. It is necessary to prevent the recess 21 from ever occupying an up position so that material will not fall freely from this recess.

In operation water is loaded in the sump 6 so that the latter is about half full, and powdered calcium carbide is placed in the hopper 18, the latter having a lifting swing cover 26. The upper end of the plunger 20 projects beyond the outside of the hopper so that a finger may be used to depress this plunger and drop a charge of the calcium carbide into the water. The size of the recess 21 is proportioned so as to assure filling the gun with a relatively rich mixture of acetylene gas and air with the excess of the acetylene possibly being even so great as to prevent ignition.

Due to the fact that the plunger slants downwardly toward the outlet 7 the calcium carbide charge is loaded into the water close to this outlet. The generated gas crowds backwardly and forwardly in the chamber 5, the relatively small size of the outlet 7, as compared to the chamber, choking back free flow in a forward direction, and the even smaller port 8 choking back flow into the pre-ignition chamber 10. If the gun has been fired shortly before, prior to the loading operation the closure 12 is removed and air is blown into the chamber 10 to make certain that it is loaded with air. There is a relatively wide range of mixtures of acetylene gas to air ratios permitting combustion, so pushing down on the actuator 15, causing operation of the igniter, ignites the mixture in the chamber 10 with reasonable certainty.

Since there is no way to control practically the gas to air ratio the rate of combustion in the pre-ignition chamber is more or less unpredictable as it is in the case of the entire gun designed in the prior art manner. However, in the illustrated gun the pre-ignition chamber functions to develop a rush or flow of moving mixture due to the expansion involved, thus forcing its way through the port 8 and driving out the rich mixture in the chamber

5 through the outlet 7 and on through the barrel 4 into the atmosphere. This gas is, of course, burning and in the atmosphere where it has access to plenty of air it burns at its maximum rate so as to produce both a loud report and a large and impressive muzzle blast. The report is, of course, the result of the muzzle blast explosion.

To promote the action described the port 8 is made with a smaller cross sectional area than the outlet 7 and it is positioned diametrically opposite and aligned with the outlet 7. Preferably the port 8 is vertically elongated as by having the upwardly and downwardly extending slot or wing extensions 27. These cause the backwardly expanding gas to mix with the air in the top and bottom of the pre-ignition chamber 10 more readily. Both the main port portion and the outlet 7 are of circular contour so as to promote the driving of the rich gas through the outlet 7 and the barrel 4 to the atmosphere. This is to assure that regardless of the violence of the explosion in the pre-ignition chamber 10, there will positively be a good muzzle blast which will provide the main report.

Due to the ability of the plunger to move to different rotative positions there is little chance for wear to form longitudinal grooves in the plunger so as to cause it to leak when in its normal upward position. Because the recess 21 must always face downwardly each load is fully dumped for each operation of the plunger and each load has the exact volume determined by the volume of the recess 21.

Another advantage of the new gun is that when the closure 12 is removed it is not necessary to completely clear the gun of the products of combustion of a previous firing. If the chamber 10 is blown full of air the pre-ignition effect may be obtained with certainty, the discharged rich gas and air mixture then exploding in the atmosphere beyond the muzzle of the gun barrel.

The dropping of the calcium carbide charge in the front of the sump 6 has the advantage that the gas is generated near the outlet 7 and more remote from the port 8, so that a rich mixture builds up in the gun by the time there is enough gas in the chamber 10 to ignite when the igniter is operated.

The breech portion 3 and sump 6 may be made from cast metal with the front of the sump 6 providing a baffling action for choking back the flow through the outlet 7 during the gas generating phase. The port 8 with its extensions 27 may be formed in an integral web forming the back of the gas generating chamber and providing an even greater baffling effect respecting the flow to the pre-ignition chamber.

I claim:

1. A gas gun including a gas-generating chamber having a liquid-containing lower portion and having an outlet and a port located above said portion, means for loading said lower portion with a charge reacting with liquid therein to generate combustible gas, a pre-ignition chamber connected with the gas-generating chamber through said port and having an air inlet provided with a closure, and an igniter for the pre-ignition chamber, whereby pre-ignition of the portion of the generated gas entering the pre-ignition chamber through said port, with air introduced through said inlet, drives a burning volume of the gas through said outlet for combustion in the atmosphere therebeyond, the gas-generating chamber having an opening in its top and said loading means comprising a hopper positioned over said opening and having a declining bore providing communication between the inside of the hopper and the gas-generating chamber, a plunger reciprocative in said bore and having a recess in its side, the plunger being reciprocative between an up position where its recess is inside of the hopper and a down position where the recess is inside of the gas-generating chamber, and a spring biasing said plunger to its up position, said

plunger being free to turn throughout a range of rotative positions in said bore wherein the plunger's recess is generally downwardly facing.

2. A gas gun including a gas-generating chamber having a liquid-containing lower portion and having an outlet and a port located above said portion, means for loading said lower portion with a charge reacting with liquid therein to generate combustible gas, a pre-ignition chamber connected with the gas-generating chamber through said port and having an air inlet provided with a closure, and an igniter for the pre-ignition chamber, whereby pre-ignition of the portion of the generated gas entering the pre-ignition chamber through said port, with air introduced through said inlet, drives a burning volume of the gas through said outlet for combustion in the atmosphere therebeyond, the gas-generating chamber having an opening in its top and said loading means comprising a hopper positioned over said opening and having a declining bore providing communication between the inside of the hopper and the gas-generating chamber, a plunger reciprocative in said bore and having a recess in its side, the plunger being reciprocative between an up position where its recess is inside of the hopper and a down position where the recess is inside of the gas-generating chamber, and a spring biasing said plunger to its up position, said plunger being free to turn throughout a range of rotative positions in said bore wherein the plunger's recess is generally downwardly facing, said spring comprising a hair-pin spring having one leg connected to the hopper and the plunger having a hole in its side opposite to said recess and located above the latter and substantially larger than the other leg of the spring and in which the other leg is inserted to connect it with the plunger while permitting the plunger to turn throughout said range of rotative positions.

3. A gas gun including a gas-generating chamber having a liquid-containing lower portion and having an outlet and a port located above said portion, means for loading said lower portion with a charge reacting with liquid therein to generate combustible gas, a pre-ignition chamber connected with the gas-generating chamber through said port and having an air inlet provided with a closure, and an igniter for the pre-ignition chamber, whereby pre-ignition of the portion of the generated gas entering the pre-ignition chamber through said port, with air introduced through said inlet, drives a burning volume of the gas through said outlet for combustion in the atmosphere therebeyond, the gas-generating chamber having an opening in its top and said loading means comprising a hopper positioned over said opening and having a declining bore providing communication between the inside of the hopper and the gas-generating chamber, a plunger reciprocative in said bore and having a recess in its side, the plunger being reciprocative between an up position where its recess is inside of the hopper and a down position where the recess is inside of the gas-generating chamber, and a spring biasing said plunger to its up position, said plunger being free to turn throughout a range of rotative positions in said bore wherein the plunger's recess is generally downwardly facing, said outlet and port being oppositely spaced in mutually opposed walls of the gas-generating chamber, and said bore and plunger declining towards said outlet so as to load charges of the material into the liquid adjacent to said outlet.

References Cited in the file of this patent

UNITED STATES PATENTS

1,624,086	Wily	Apr. 12, 1927
1,757,523	Grimm	May 6, 1930
1,863,062	MacDonald	June 14, 1932
2,000,607	Peake	May 7, 1935