Sept. 26, 1967 R. LOHR 3,343,455

GUN

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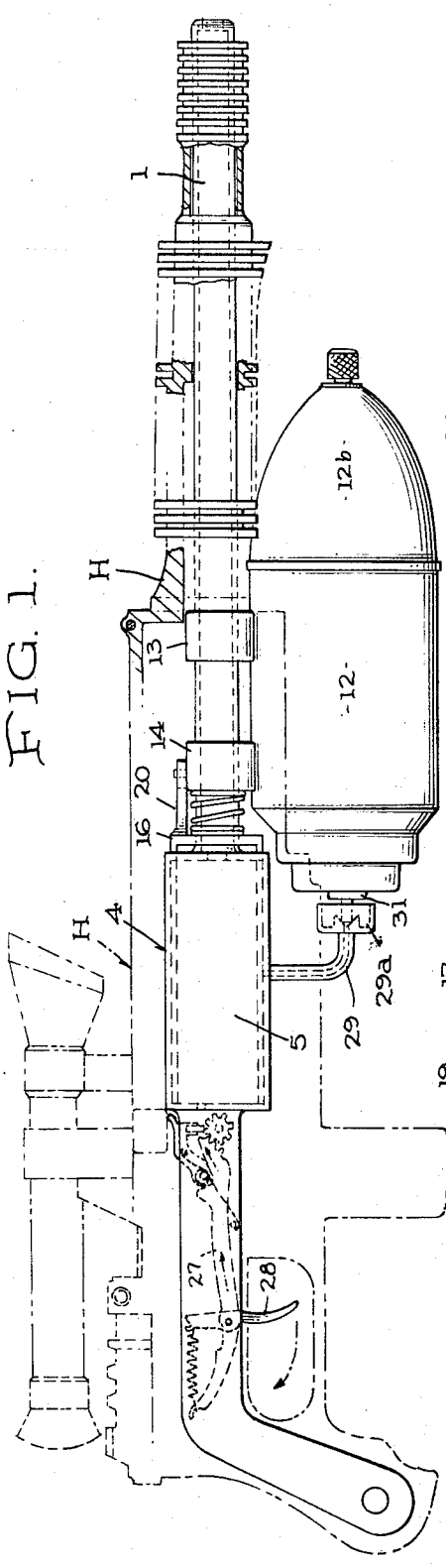


FIG. 1.

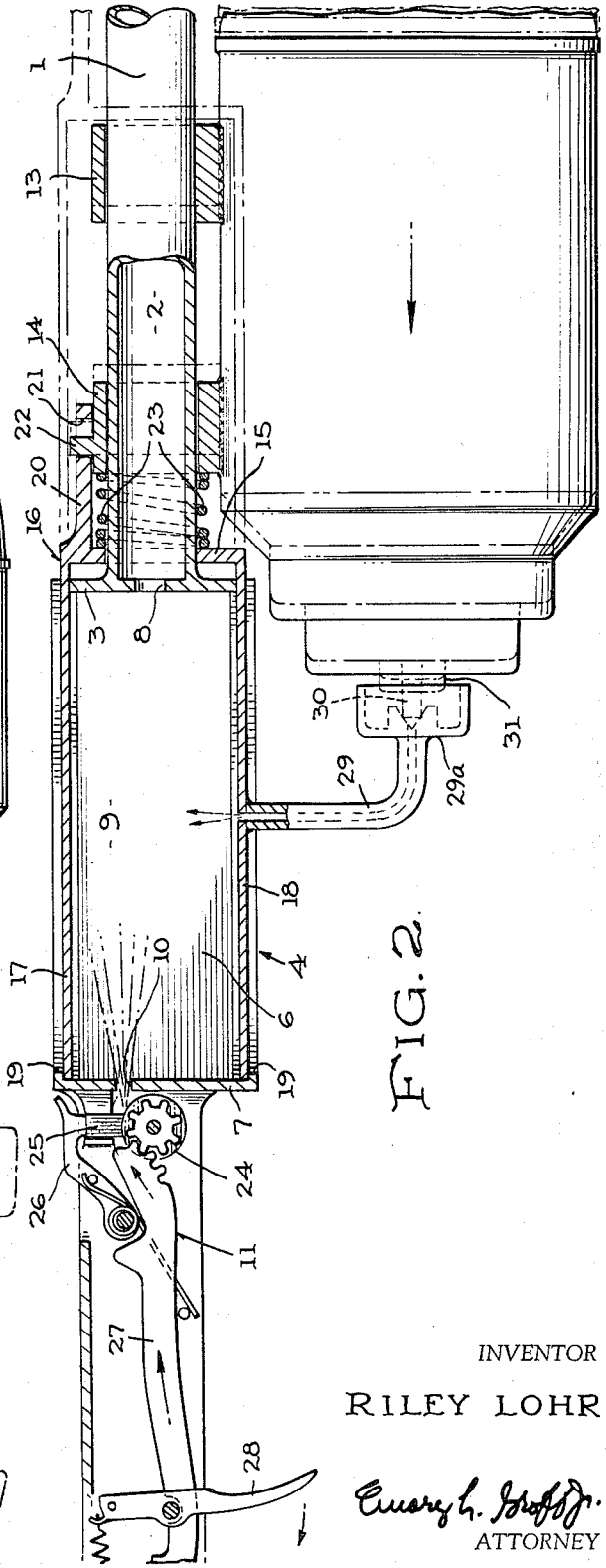


FIG. 2.

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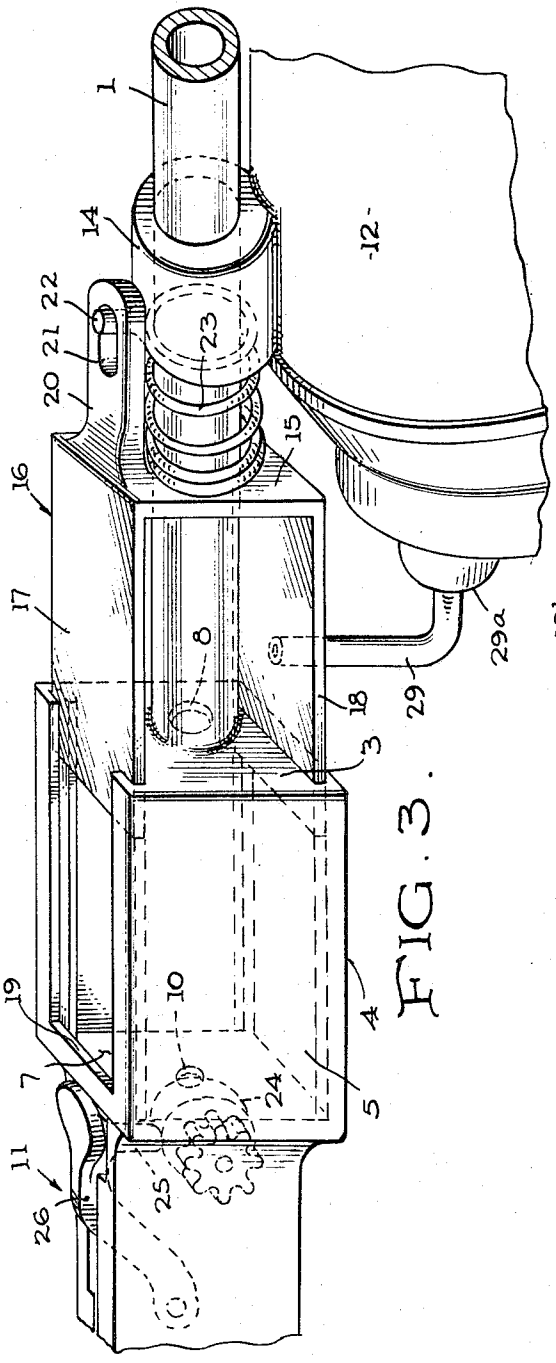


FIG. 3.

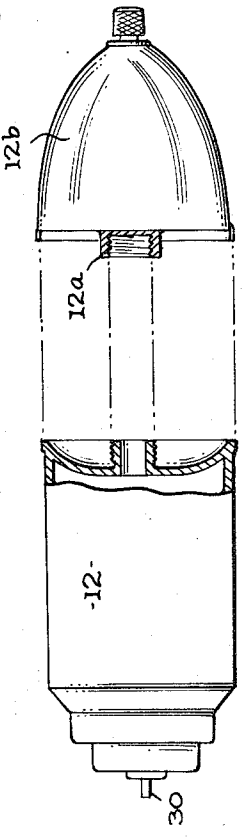


FIG. 4.

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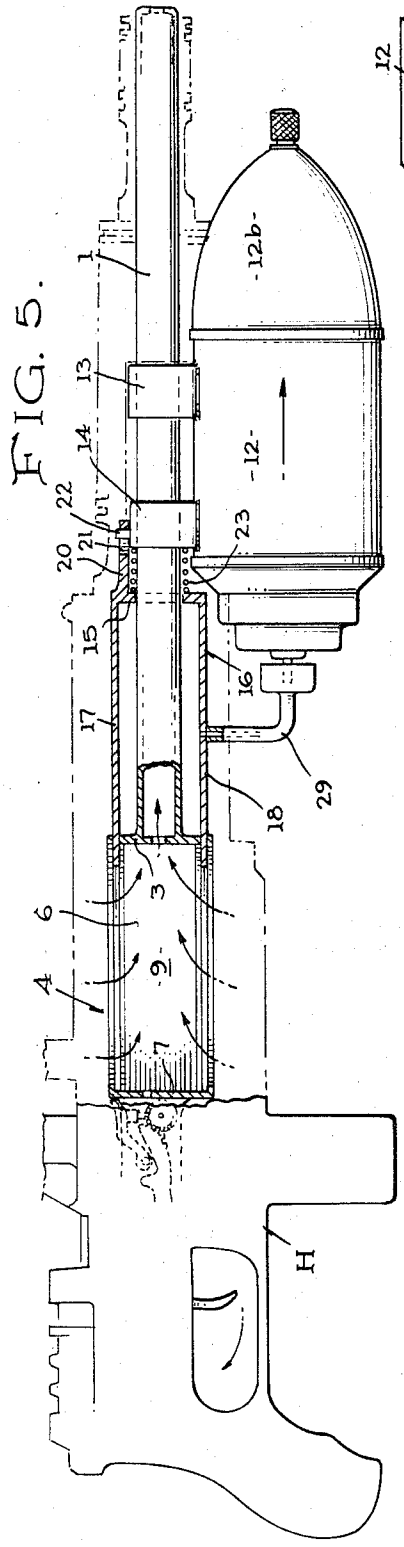


FIG. 5.

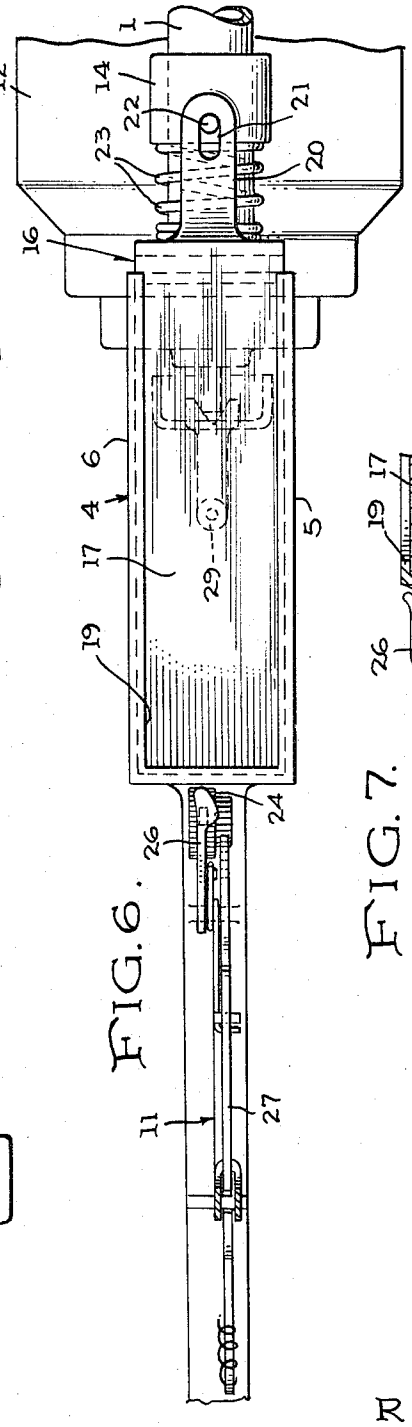


FIG. 6.

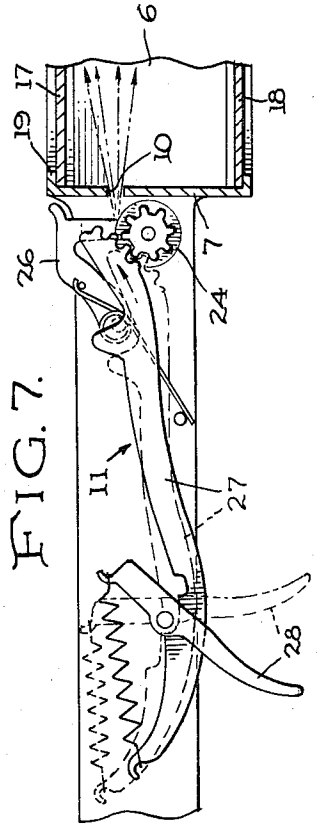


FIG. 7.

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3,343,455

GUN

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6 Claims. (Cl. 89—7)

ABSTRACT OF THE DISCLOSURE

A toy gas gun having a self-contained gas supply mounted for slidable movement and a two-position chamber which when opened purges the chamber and when closed automatically permits charging the chamber with a measure of explosive gas from the gas supply.

This invention relates generally to guns, and more particularly, to gas guns adapted for use as toys. Many of the known forms of gas guns intended for use as toys are provided with a combustion or explosion chamber wherein an explosive gaseous mixture is generated and subsequently ignited.

This process is most commonly achieved by generating acetylene gas and mixing with air, the acetylene usually produced by means of the combining of calcium carbide and water, which gaseous formation is then ignited with considerable violence thus producing a very loud report. In these devices, as heretofore constructed, one of two methods were employed to generate the explosive gas. Either measured amounts of water were dropped onto a supply of calcium carbide, or, on the other hand, measured amounts of, preferably granular, calcium carbide were dropped into a reservoir of water in order to initiate the generation of the highly explosive acetylene gas. A primary problem in the prior known types of gas detonating devices is that of scavenging or purging the combustion chamber subsequent to the detonation of the gaseous charge and prior to the ignition of a subsequent gaseous mixture. It is well known that if the products of combustion are not purged prior to the generation of a new charge of gaseous mixture, then there will not be a sufficient amount of pure air in the gaseous mixture to support a subsequent combustion. The lack of proper purging results in a mixture of air and acetylene that will either not explode at all, or if it does explode, the report will be very muffled. Several attempts have been made in the past to provide scavenging or purging means in gas detonating devices; however, these devices have met with very little success since in most instances, complicated and expensive structure was required, and/or a separate manual step by the operator of the device was necessitated, such as blowing into an open combustion chamber prior to closing same before generating a new charge of explosive gas.

Another disadvantage of the previous devices as referred to hereinabove is the formation of residual deposits within the combustion or generating chamber of the device, which deposits are built up in decreasing amounts upon each successive detonation of the device due to the chemical reaction, not only between the calcium carbide and water, but also when the resultant gaseous mixture is ignited.

Another disadvantage of previous devices is that they are not truly portable, without splashing of the water supply on parts of the mechanism that must be kept dry. As a result, they are usually in the form of a cannon or other relatively stationary gun that is not intended to be carried around during use thereof. Also, they are slow firing, requiring a waiting period for the gas generation.

The proper metering of either the calcium carbide or the supply of water is of paramount importance in the

prior art devices, since it is well known that too little or too much of either one of the principal ingredients will result in a detonation which will either be scarcely noticeable or muffled.

Accordingly, one of the primary objects of the present invention is to provide a toy gas gun of simple and inexpensive construction and utilizing a self-contained gas supply which is automatically actuated to dispense an explosive gas in measured amounts prior to each firing of the gun.

Another object of the present invention is to provide a completely portable gas gun that is rapid firing in any position, and without waiting for the gas to be generated.

Another object of the present invention is to provide a toy gas gun having a gas supply which dispenses metered amounts of the gas after automatically purging the combustion chamber following the previous detonation.

Still another object of the present invention is to provide a gas gun having means for automatically purging the combustion chamber following each detonation of a charge therein and for subsequently automatically injecting into said combustion chamber a metered amount of explosive gaseous mixture.

With these and other objects in view, which will more readily appear as the nature of the invention is better understood, the invention consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated, and claimed.

A preferred and practical embodiment of the invention is shown in the accompanying drawings in which:

FIGURE 1 is a side elevation of a gas gun according to the present invention.

FIGURE 2 is a side elevation, on an enlarged scale and partly in section, showing portions of the device in their displaced or charging position.

FIGURE 3 is a partial perspective view showing portions of the device as they appear when in the purging position.

FIGURE 4 is a side elevation, partly in section and with parts exploded, showing a suitable gas cylinder as used with the present invention.

FIGURE 5 is a side elevation, partly in section, with the parts of the device as they appear when in the purging position.

FIGURE 6 is a top plan view, on an enlarged scale, of a portion of the device illustrated in FIGURE 1.

FIGURE 7 is a side elevation, partly in section, and illustrates an igniting means.

Similar reference characters designate corresponding parts throughout the several views of the drawings.

Referring now to the drawings, and more particularly to FIGURE 1, it will be seen that the present invention comprises a toy gas detonating device which may be contained within a housing H constructed to represent the facsimile of a machine gun, or any other type of fire arm which would be appealing to the intended users of the device. The gun comprises two basic subassemblies, namely, a fixed barrel and igniting means having disposed therebetween the sidewalls of a firing compartment. The second subassembly includes a relatively movable gas supply and top and bottom walls of the firing compartment.

The barrel 1 comprises a thin-walled tube having a central longitudinal bore 2 and joined to a front wall 3 of the firing compartment generally designated 4. The components of the gun may be constructed of any suitable material. Although light-weight metals may be preferred, the use of high-impact grade plastics would be acceptable since even though the ignition of the gas mixture produces an extremely large report, the actual force of the explosion against the walls of the firing compartment and bore of

the barrel is quite mild, as is also the amount of heat generated. Fixedly disposed with respect to the front wall **3** is a pair of spaced apart and parallel sidewalls **5** and **6** which are joined together at the rear thereof by means of a rear wall **7**. As will be most clearly seen in FIGURE 2, the front wall **3** is provided with a gas outlet opening **8** forming a means of communication between the combustion chamber **9** forming the interior of the firing compartmetn **4**, and the inner bore **2** of the barrel **1**. A small ignition port **10** is formed through the rear firing compartment wall **7** and communicates with any suitable form of igniting means, generally designated **11**, disposed to the rear of the firing compartment.

Mounted forwardly of the firing compartment **4** and movable relative thereto, is a gas cylinder or container **12**, which is slidably supported upon the barrel by means of front and rear cylinder support collars **13** and **14**, respectively. The gas cylinder **12** is similar to the pressurized containers currently so prevalent on the market for containing and dispensing any of numerous types of liquid and gaseous products and is intended in the present instance to contain a maximum amount of acetylene gas under a safe pressure. As will be most clearly seen in FIGURE 4, the gas cylinder **12** may be provided with a factory applied filler cap **12***a* and a base cap **12***b* which may be of any suitable configuration and is designed to enhance the appearance of the toy gun while also serving to increase the hand grip area of the movable subassembly of the present invention as will be readily apparent hereinafter.

Mounted upon the barrel **1** between the rear cylinder support collar **14** and the firing compartment front wall **3** is a bracket **15** forming a part of the slide assembly **16**. Connected to the upper and lower portions of the vertically disposed slide bracket **15** are fiiring compartment top and bottom walls **17** and **18**, respectively. In order to increase the sealing engagement between the top and bottom walls and the fixed side walls of the firing compartment, each of said side walls, as well as the rear wall **7**, may be provided with an inwardly directed lip **19** which, when the slide assembly **16** is in the position shown in FIGURE 2, will overlie and mask the peripheral edges of the top and bottom walls along the sides and rear thereof. Alternatively, the side and rear walls may be grooved to provide the same engagement. It will be understood that the width of the movable top and bottom walls **17** and **18** is such as will permit a smooth sliding fit of the slide assembly **16**, while the internal diameter of the cylinder support collars **13** and **14** also provides as close a sliding fit as possible with the outside diameter of the barrel **1**. In this manner, the smoothest possible sliding fit will be achieved as the gas cylinder **12** is reciprocated during its actuation to displace the slide assembly **16**.

The forward portion of the slide assembly **16** includes an arm **20** horizontally disposed and projecting forwardly of the vertical slide bracket **15**. As will be most clearly seen in FIGURE 2, the arm **20**, which is parallel to the barrel **1** is spaced away from the outer surface of the top of the barrel, a distance which is sufficient to permit free movement of the rear support collar **14** disposed immediately beneath the forward portion of the arm. This arm **20** contains an elongated slot **21**, the major axis of which is parallel to the longitudinal axis of the barrel **1**. Arranged to be continuously disposed within this slot is a limit pin **22** projecting upwardly from the top of the rear cylinder support collar **14**. The normal, or at rest, position of the limit pin **22** is as shown in the drawings, FIGURES 1 and 5, wherein it will be observed that the pin **22** is disposed at the forwardmost end of the slot **21** by reason of a helical gas cylinder return spring **23** disposed about the rear of the barrel and constantly urging the rear support collar **14** forwardly and away from the vertical slide bracket **15**. When the various components of the device are in this relative position, the gun may be considered to be in firing condition, having assumed that a measured amount of acetylene gas has been previously injected into the firing compartment **4**, as will be described hereinafter. With the gun thus in firing condition, detonation is achieved by manipulation of the igniting means **11** which projects a spark through the ignition port **10** into the combustion chamber **9**. At this point combustion will instantly take place, thereby producing an extremely loud report, together with expulsion of the products of combustion through the gas outlet **8** in the barrel **1**.

The igniting means **11** may be of any well-known construction and includes in the illustrated example, the basic components comprising a steel wheel **24** having a roughened outer surface and which is axially mounted to provide for rotary movement thereof. A flint holder **25** is disposed adjacent the periphery of the wheel **24** and contains a piece of flint which is constantly urged against said wheel by means of a hold down member **26**. A suitable actuating bar **27** for rotating the steel wheel against the flint is controlled by means of a trigger **28** to produce the sparks which are introduced into the combustion chamber **9** through the ignition port **10**. Quite obviously, any other form of igniting structure may be utilized.

Following the firing of a charge of gas, it will be understood that it is necessary to purge the combusion chamber **9** before a subsequent charge of acetylene gas may be introduced therein. Not only must the spent gases from the previous detonation be removed from the combustion chamber, but also, it is necessary to introduce a supply of oxygen into the chamber from the surrounding free air in order that a proper combustionable mixture may be formed with the acetylene gas as it is subsequently injected into the chamber. This purging is achieved by a simple rectilinear movement of the gas cylinder **12** from the position as shown in FIGURE 1 into the position as illustrated in FIGURES 3 and 5. Forward movement of the gas cylinder **12** causes a corresponding axial displacement of the slide assembly **16** due to the engagement of the limit pin **22** against the forward portion of a slot **21**. Thus, by this single-stroke movement, it will be seen that as the gas cylinder is moved forwardly to the position shown in FIGURES 3 and 5, the corresponding movement of the slide assembly will withdraw the top wall **17** and bottom wall **18** of the firing compartment **4** so that the firing compartment will be completely open at the top and bottom thereof, thereby permitting the ingress of fresh atmospheric air into the combustion chamber **9** as the movement of this air also purges spent gases and combustion therefrom.

When the slide assembly **16** is at its forward limit of travel as in FIGURE 5, it is immediately returned to the position of FIGURE 1 by rearward movement of the gas cylinder **12**. It should be pointed out that the spring **23** is of sufficient strength so that during this rearward movement all forces applied to the gas cylinder **12**, and thus the rear cylinder support collar **14**, will be transmitted through this spring to the slide assembly **16**, so that even during this rearward movement, the limit pin **22** will still remain against the forward end of the elongated slot **21**, for reasons which will become apparent immediately hereinafter.

With the components returned to the position of FIGURE 1, the firing compartment **4** will be closed to provide a sealed combustion chamber **9**. At any time following, the gun may be charged preparatory to firing. This may occur immediately after returning the parts to the closed position, or at a substantially later time. In order to accomplish the charging of the acetylene gas into the combustion chamber **9**, it is necessary only to pull back on the gas cylinder **12**, against the force of the spring **23**, for a short distance which, in effect, amounts to the limit of travel of the limit pin **22** from the forward end of the slot **21** to the rear thereof. FIGURE 2 illustrates in full lines the displaced position of the gas cylinder **12** during the charging operation wherein the normal at-rest position

of the gas cylinder is shown in broken lines. During the charging stroke the gas is injected into the combustion chamber through a gas feed tube or conduit **29** which comprises a rigid member having a central bore and which is fixedly attached to the firing compartment bottom wall **18** on the one hand and has the other end disposed in close proximity to the free end of a valve stem **30** projecting from the gas cylinder **12**. A valve actuating head **29***a* is mounted on the end of the tube **29** adjacent the valve stem **30** and is spaced therefrom when the cyinder is in the broken line position of FIGURE 2. It will be understood that the valve stem **30** forms a part of a metering valve **31** of well-known construction. Such a metering valve **31**, when depressed by any means, delivers a metered amount of gas, regardless of the length of time that the stem is depressed. In this manner, it will be understood that at all times a fixed or measured amount of acetylene gas will be supplied through the gas feed tube **29** into the combustion chamber **9** each time the gas cylinder **12** is moved rearwardly to the charging position as shown in FIGURE 2. After the charging stroke, the rearward pressure applied to the gas cylinder **12** is released, and the spring **23** returns the support collar **14** and gas cylinder to its normal at-rest position as shown in FIGURE 1, and the gun is again ready for firing by manipulation of the trigger **28**.

Thus it will be seen that a gas detonating gun is provided that eliminates the necessity of supplying a plurality of means for generating an explosive gas by offering novel means for utilizing metered amounts of a prepressurized gas supply.

The illustrated embodiment of the invention is directed to a gun provided with a self-contained gas supply which precludes the necessity of employing any additional structure to operate the device. However, it will be appreciated that alternative gas supply means may be utilized without departing from the scope of the invention. As an example, suitable gas supply means could be hand carried and include conduit means whereby the explosive gas therefrom would be injected into the combustion chamber **9** after actuating the slide assembly **16** to purge the chamber.

Additional forms of the invention may be practiced other than the example illustrated in the drawings without departing from the scope of the invention. Such embodiments may provide for the remote disposition of either one or both the pressure and metering valve devices. In such instances, the operator would carry a separate gas can preferably including a flexible tube which would be attached to the metering valve located in the gun or, when the metering valve is also remote, the flexible tube would lead from the metering valve contained in the can in which latter instance the free end of the tube would be inserted into the firing chamber in order to inject the gas therein.

It is to be understood that the invention is not limited to the specific features shown, but that the means of construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention will therefore be understood in any of its forms or modifications within the legitimate and valid scope of the appended claims.

What is claimed is:

1. A gun comprising, a firing compartment forming an enclosed combustion chamber therein, a barrel having a bore communicating with said chamber, explosive gas supply means mounted on said barrel for reciprocating movement relative thereto, said firing compartment including a movable wall, slide means on said barrel connecting said wall and said gas supply means whereby when said gas supply means is moved in one direction said wall and barrel slide means are likewise moved as a unit in the same direction to open said chamber to the atmosphere to permit air to enter therein and when said gas supply means is moved in the reverse direction said wall and barrel slide means are moved to close said chamber, conduit means fixedly attached at one end to said wall and leading to said gas supply means to inject the explosive gas into said chamber, said slide means constantly urging the other end of said conduit means into engagement with said gas supply means, and means adjacent said chamber for igniting gas injected therein.

2. A gas gun according to claim **1**, wherein said firing compartment includes two movable walls, each connected to said slide means, whereby when said gas supply means is moved in one direction, said chamber is opened to the atmosphere at two opposite sides thereof to permit purging of said firing compartment by passage of ambient air straight through said chamber.

3. A gas gun according to claim **2**, wherein said gas supply means includes a sealed container having a pressure actuated metering valve juxtaposed said other end of said conduit means, whereby after closing of said displaceable walls by said slide means further rearward movement of said slide means opens said metering valve as said conduit means depresses said valve.

4. A gas gun comprising, a firing compartment including a plurality of walls providing a combustion chamber therein, two of said walls slidably mounted with respect to the remaining walls and adapted to be displaced from a closed firing position to an open purging position whereby said chamber is open to the atmosphere, a barrel attached to one of said walls, a gas supply, a collar slidably mounted on said barrel and supporting said gas supply for rectilinear movement, a slide assembly attached to said sliding walls and having an arm engaging said collar, a rigid conduit having one end connected to one of said sliding walls and the other free end disposed adjacent said gas supply, pressure actuated valved dispensing means forming a part of said gas supply juxtaposed the free end of said rigid conduit, whereby movement of said gas supply in one direction displaces said collar and slide assembly to initially close said sliding walls and to secondly abut said valve means against said rigid conduit to inject gas into said chamber, and means adjacent said chamber to ignite gas injected into said chamber.

5. A gas gun according to claim **4**, wherein said arm engages said collar to provide limited movement therebetween, said arm including a longitudinal slot, a pin on said collar disposed within said slot, and spring means normally urging said collar and gas supply away from said slide assembly, whereby said valved means will not be pressure actuated by the free end of said rigid conduit until the force of said spring means is overcome.

6. In a gas gun, a firing compartment including a plurality of walls forming a combustion chamber therein, at least one of said walls displaceable from an open purging position to a closed firing position, a barrel connected to said firing compartment, a slide assembly connected to said displaceable wall and movable to open and close said displaceable wall, gas supply means including feed means for delivering measured amounts of gas to said chamber, gas supply support means engageable with said slide assembly to actuate said displaceable wall, said slide assembly including an arm and said support means comprising a collar slidably disposed around said barrel, means interlocking said arm and collar and providing limited relative movement therebetween, and spring means normally urging said collar in a direction away from said slide assembly, whereby after closing said displaceable wall by actuation of said slide assembly, gas will be delivered to said chamber by continued actuation of said slide assembly, and means adjacent said chamber for igniting gas delivered thereto.

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