Oct. 5, 1937. E. H. SMITH 2,094,854

GUN

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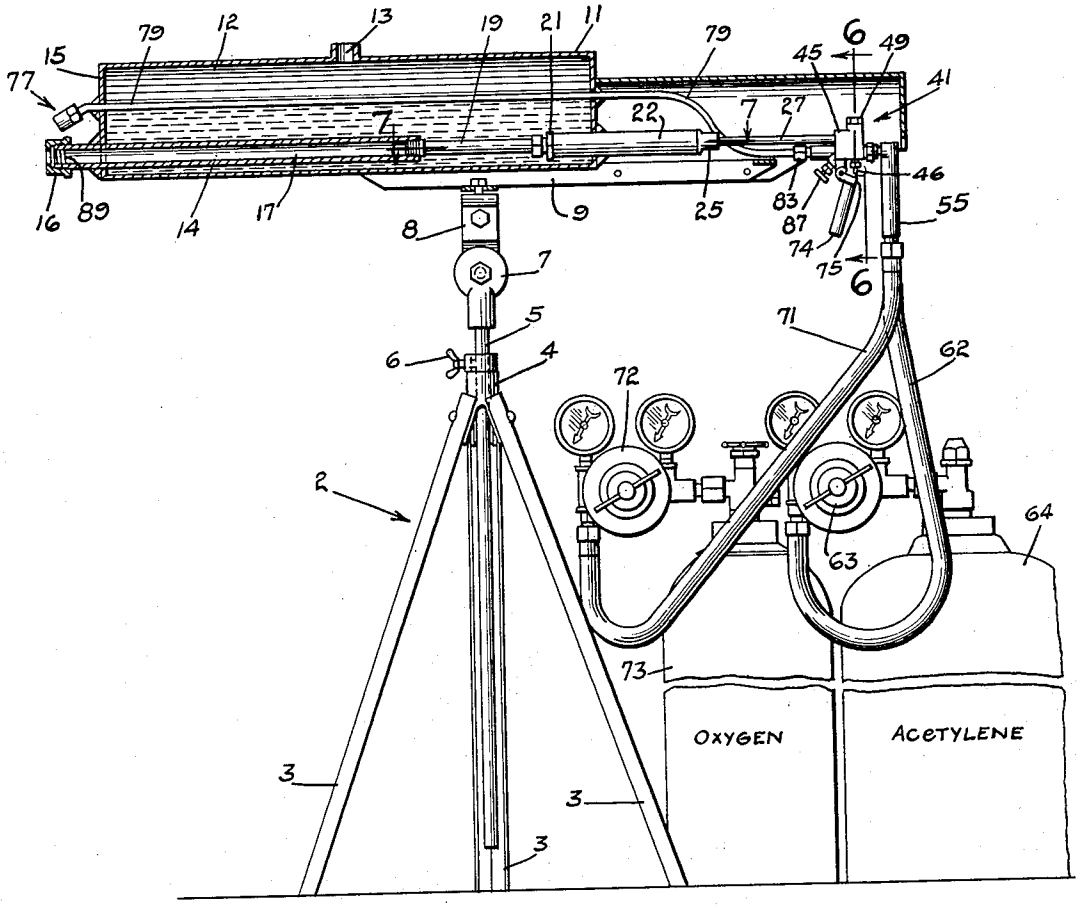


Fig.1

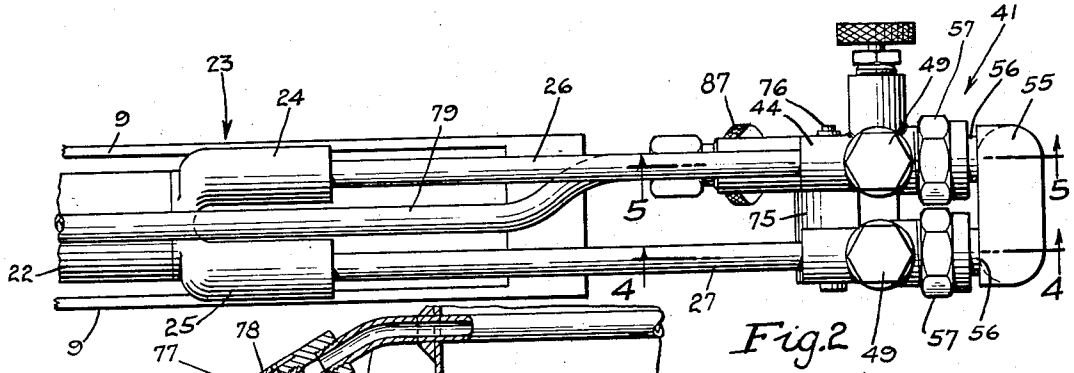


Fig.2

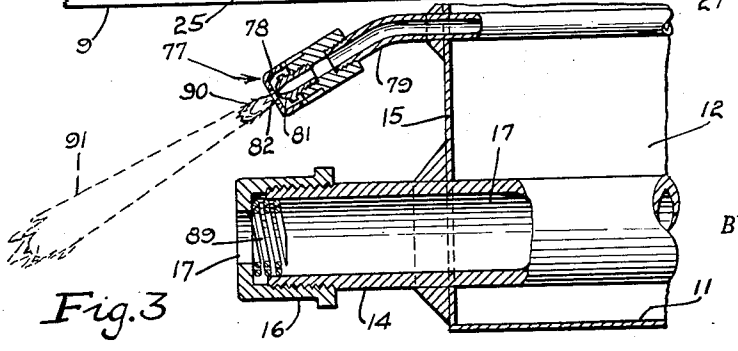


Fig.3

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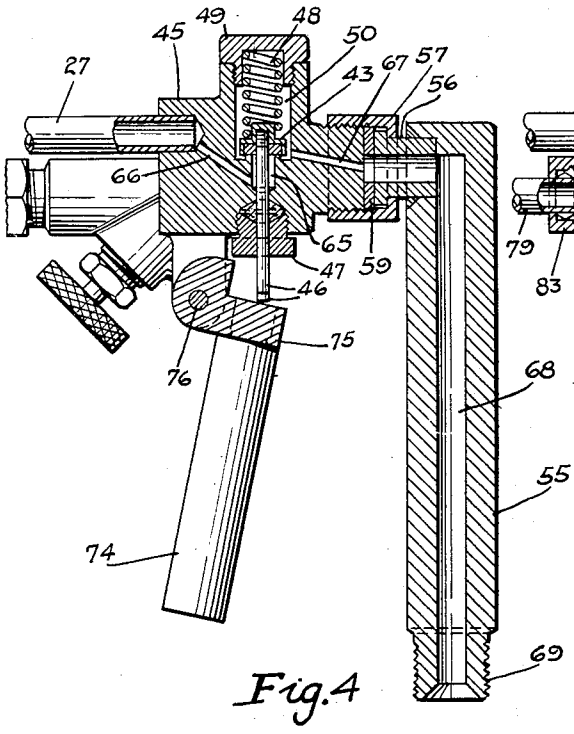


Fig.4

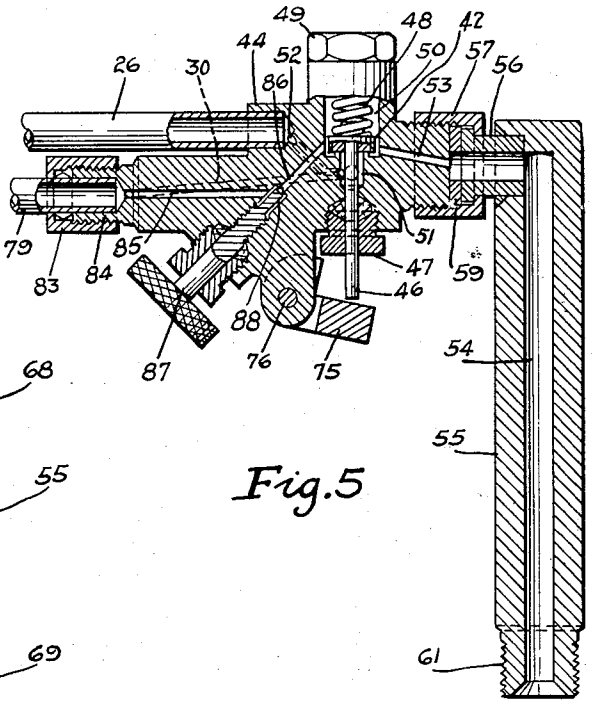


Fig.5

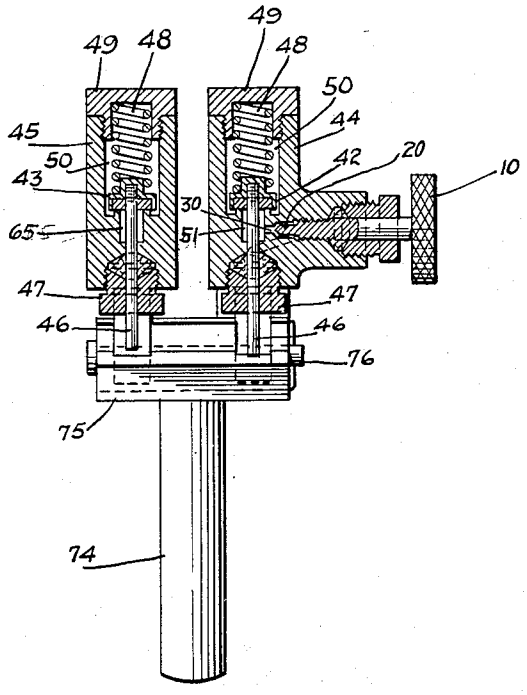


Fig.6

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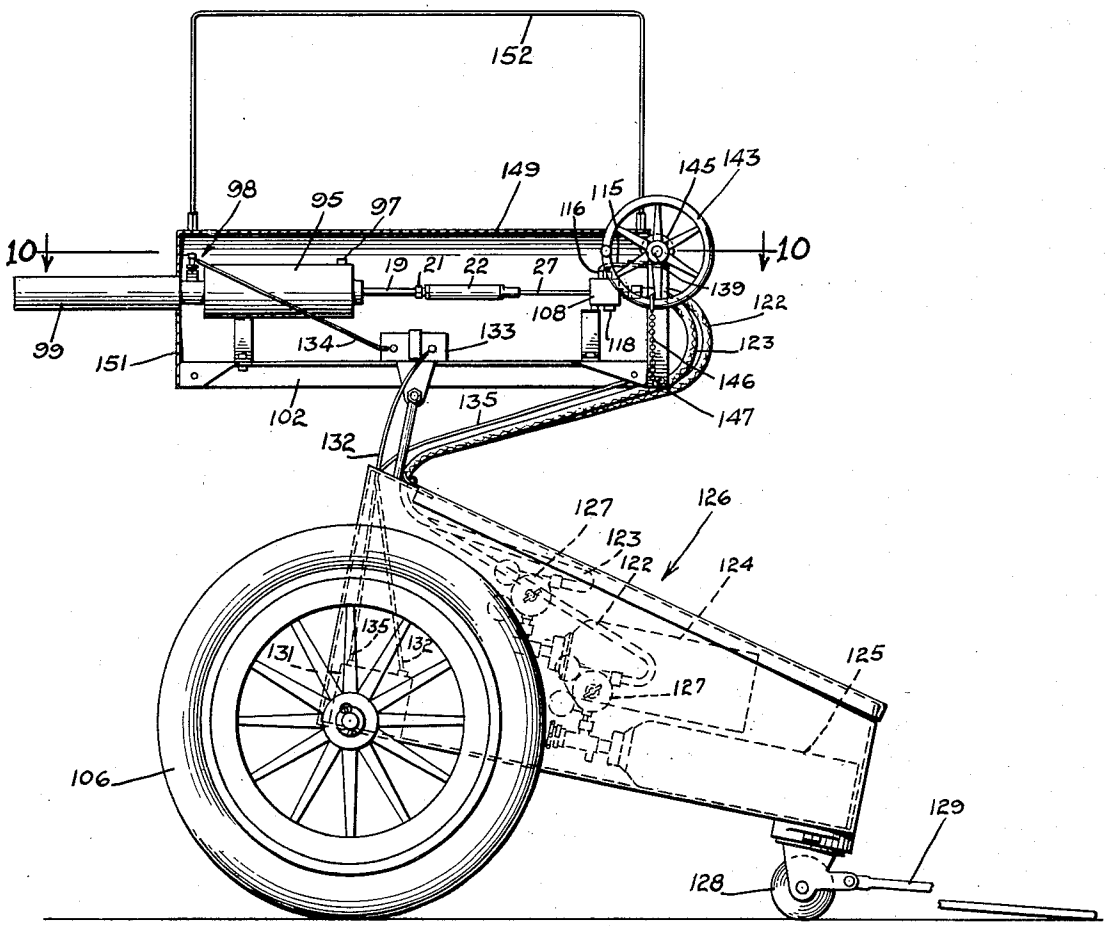


Fig. 8

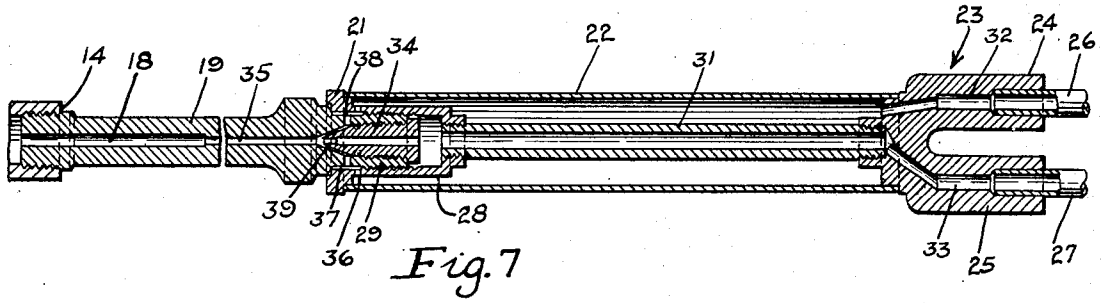


Fig. 7

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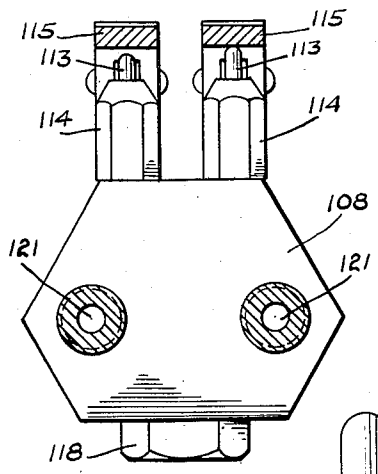


Fig. 13

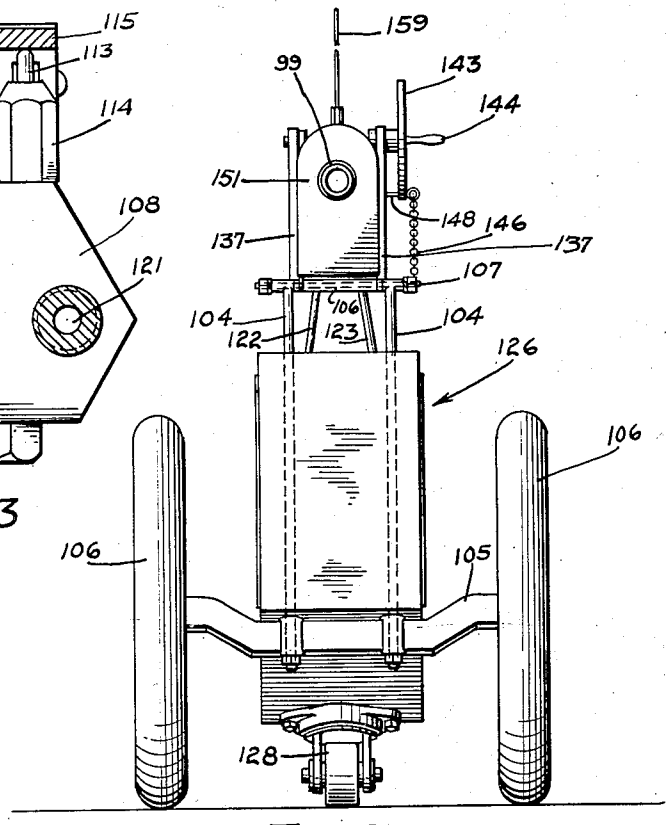


Fig. 9

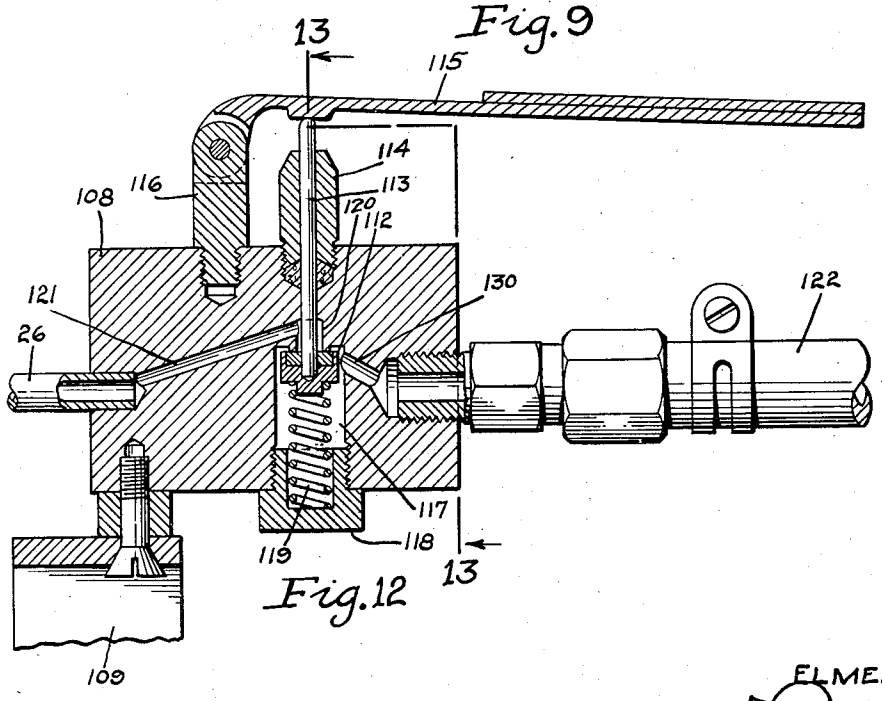


Fig. 12

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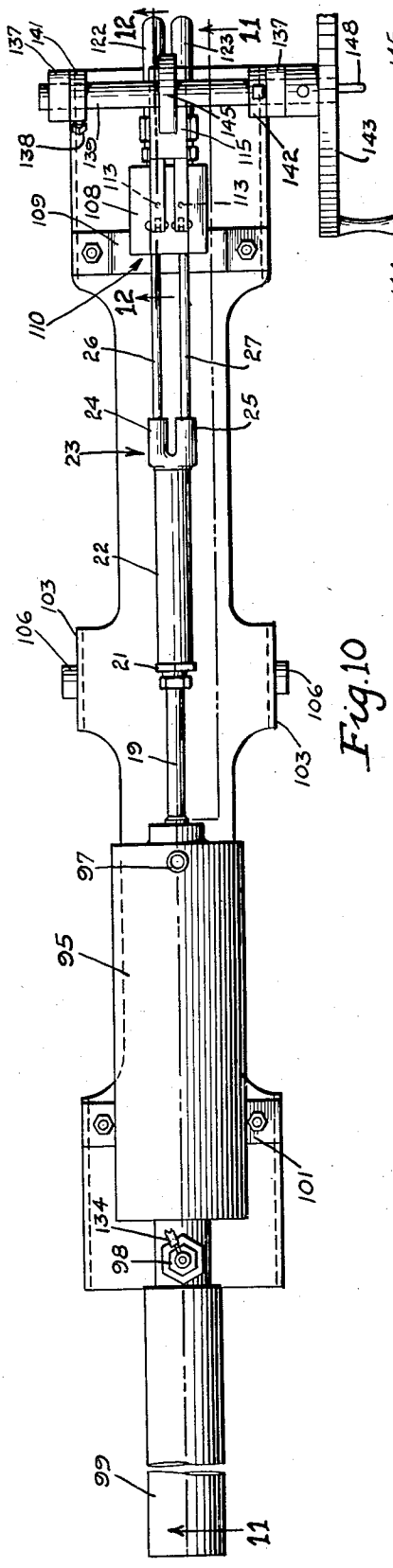


Fig. 10

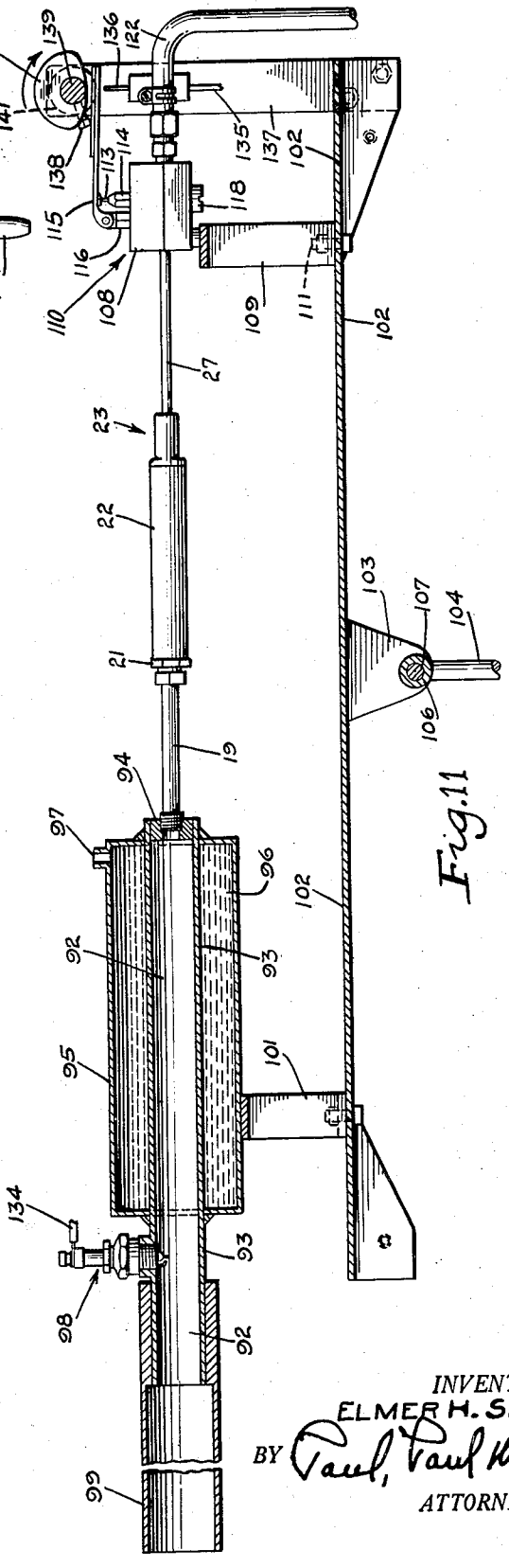


Fig. 11

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Patented Oct. 5, 1937 2,094,854

UNITED STATES PATENT OFFICE

2,094,854

GUN

Elmer H. Smith, Minneapolis, Minn., assignor to Smith Welding Equipment Corporation, Minneapolis, Minn., a corporation of Delaware

Application July 27, 1933, Serial No. 682,455

14 Claims. (Cl. 42—55)

This invention relates to new and useful improvements in guns, and more particularly to guns utilizing an explosive gas in lieu of powder to charge the gun.

This invention concerns itself more particularly with the provision of a gas-operated gun or cannon, which is particularly well adapted for use as a noise maker and, when in action, simulates an ordinary machine gun. While it is primarily designed for use as a noise maker, it may also be utilized for projecting small pellets or objects at a target. The gun is desirably designed to simulate an army machine gun, and because of its unique construction, may be operated at a very small cost as compared to an ordinary army machine gun using blank cartridges. It has therefore found a place in army and navy cantonments, as a substitute for the usual machine gun, during troop maneuvers and in sham battles. The gun fires with considerable violence and thus make a very loud report, whereby it provides a very practical device for Fourth of July and other celebrations. It may also be used on naval vessels for signalling purposes, when traveling through dense fogs, because of its ability to continue to fire in rapid succession for a considerable length of time.

An object of the invention, therefore, is to provide a simple gas-operated gun or cannon utilizing a highly explosive gaseous mixture for charging it; which is designed to make a very loud report when fired; which may be operated at small cost; which may be adjusted and set to automatically fire a large number of shots in rapid succession; and, which is extremely simple and safe to operate.

A further object is to provide an improved gas-operated gun adapted to utilize a highly explosive gas consisting of measured quantities of acetylene and oxygen.

A further object is to provide a rapid firing gas-operated gun which is adapted for automatic operation, and having means whereby the number of shots fired per minute may be varied.

Other objects of the invention reside in the simple and inexpensive construction of the gun; in the means for controlling the deliveries of acetylene and oxygen to the mixing chamber; in the novel arrangement and construction of the ignition means; in the means provided for cooling the walls of the explosion chamber whereby the gun may be operated for long periods without overheating; and, in the portability of the gun whereby it may be conveniently transported about from place to place.

Other objects of the invention will appear from the following description and accompanying drawings and will be pointed out in the annexed claims.

In the accompanying drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a side elevational view, partially in section, to show the interior construction of the gun and showing it mounted upon a suitable tripod;

Figure 2 is a detail plan view of the valve structure for admitting the gaseous fluids into the mixing and explosion chambers;

Figure 3 is an enlarged detail sectional view of the tip of the gun barrel, showing an ignition means;

Figure 4 is an enlarged detail sectional view on the line 4—4 of Figure 2, showing the oxygen control valve;

Figure 5 is a similar view on the line 5—5 of Figure 2, showing the acetylene control valve and also the needle valve for regulating the supply of fuel to the ignition pilot light;

Figure 6 is a cross-sectional view on the line 6—6 of Figure 1, showing the means for actuating the oxygen and acetylene control valves, and also showing the means for automatically increasing the supply of fuel gas to the pilot light each time the trigger is actuated to fire the gun;

Figure 7 is a sectional plan view on the line 7—7 of Figure 1, showing the mixing chamber;

Figure 8 is a side elevational view, partially in section, showing a gun mounted upon suitable carrying wheels;

Figure 9 is a front view of the gun shown in Figure 8;

Figure 10 is a sectional view substantially on the line 10—10 of Figure 8, showing the valve actuating mechanism;

Figure 11 is a longitudinal sectional view on the line 11—11 of Figure 10;

Figure 12 is an enlarged detail sectional view on the line 12—12 of Figure 10; and

Figure 13 is a cross-sectional view on the line 13—13 of Figure 12.

The novel gun disclosed in Figure 1 is shown comprising a supporting structure in the form of a tripod 2 having legs 3 pivotally connected to a member 4, which is bored to receive a rod or

shank 5 adjustably secured in the bore of the member 4 by a suitable wing nut 6. The rod 5 has a head 7, to which is pivotally connected a bracket 8 which supports a frame 9.

Upon the frame 9, there is supported a casing 11 which preferably is cylindrical in cross-section, and whose walls define a chamber 12 adapted to contain a suitable cooling fluid or liquid for purposes which will subsequently be stated. The casing 12 is provided with a suitable filler opening 13.

A tubular member 14 is shown positioned within the chamber 12 and provides the barrel of the gun. One end of said barrel projects through the end wall 15 of the casing 11 and forms the tip of the gun barrel. A suitable cap 16 is shown secured to the end of the barrel 14 and has a reduced aperture 17 therein through which the charge is fired, when the gaseous mixture within the barrel 14 is ignited. The walls of the barrel 14 cooperate to provide an explosion chamber 17 which communicates with a mixing chamber 18 provided in a connection 19, which connects one end of the barrel 14 to a head 21 secured in one end of a cylindrical member 22, as best shown in Figure 7. The opposite end of the cylindrical member 22 is suitably secured to a fitting 23 provided with spaced extensions 24 and 25 to which are secured the ends of a pair of tubes 26 and 27, respectively.

The head 21 secured to the forward end of the cylindrical member 22 has a reduced portion 28 extending into the member 22 and provided with a threaded socket adapted to receive the threaded extension 29 of the connection 19. A small tube or pipe 31 has one end suitably secured to the reduced extension 28 of the head 21, and has its opposite end suitably secured to the fitting 23, preferably by suitable threads whereby, when the fitting 23 is rotated relatively to the head 21, the cylindrical member 22 will be securely clamped between the head 21 and the fitting 23, as will readily be understood by reference to Figure 7.

The extension 24 of the fitting 23 has a passage 32 establishing communication between the tube 26 and the interior of the cylindrical member 22. A similar passage 33 establishes communication between the tube 27 and the pipe 31 mounted within the cylindrical member 22. Within the threaded extension 29 of the connection 19, there is provided a tapered nozzle 34 having an aperture extending lengthwise therethrough, which communicates at one end with the interior of the pipe 31 and at its opposite end with a passage 35 within the connection 19 and which connects the passage 34 with the expansion chamber 18 provided in the connection 19. The interior of the cylindrical member 22 communicates with the passage 35 in the connection 19 by means of suitable apertures 36, provided in the wall of the extension 28, and an annular space or chamber 37 provided between the bore of the head 21 and the periphery of the extension 29, and suitable radially disposed ducts 38 which connect the annular passage 37 with a conically shaped gap or chamber 39, provided between the walls of the tip of the nozzle 34 and the tapered bore or cavity in which said tip is positioned, as clearly shown in Figure 7.

The tube 26 is connected to a suitable source of acetylene gas and the tube 27 to a supply of oxygen as will subsequently be described. When acetylene gas is introduced into the cylindrical member 22 from the tube 26, it will flow through the radial ducts 36 in the walls of the extension 28 of the head 21, and into the annular space or gap 37 and thence through the radial ducts 38, into the cone-shaped cavity provided between the tip of the nozzle 34 and the walls of the tapered bore provided in the member 19, from whence the acetylene will enter the passage 35 and is delivered into the expansion chamber 18. At the same time, oxygen is delivered into the pipe or tube 31 and flows through the nozzle 34 and into the passage 35 where it mixes with the acetylene to thereby provide a highly explosive mixture which, as it flows from the passage 35 into the relatively larger passage or expansion chamber 18, is further intermixed so that when subsequently discharged into the explosion chamber 17 of the barrel 14, it constitutes a highly explosive mixture which may be readily ignited, as will subsequently be described.

The means for controlling the supplies of acetylene and oxygen to the explosion chamber 17, shown in Figures 1, 2, 4, 5, and 6, comprises a suitable valve mechanism generally indicated by the numeral 41 in Figures 1 and 2. This valve mechanism comprises two separate valves 42 and 43 mounted in suitable casings 44 and 45, as best shown in Figure 6. The valve 42 has a stem 46 which is slidably mounted in a guide provided in the casing 44, and in a suitable packing nut 47 secured to the lower portion of said casing. A spring 48 has one end seated against the upper end of the valve 44 and has its upper end seated against a cap 49 secured to the valve casing 44. The spring 48 constantly urges the valve 42 downwardly against its seat. The tube 26 has one end secured in a socket provided in the valve casing 44 and communicates with a chamber 51 provided beneath the valve 42, by means of a fluid circulating passage 52, shown in dotted lines in Figure 5. Acetylene gas is supplied to the valve chamber 50 by means of a passage 53 connecting it with a fluid circulating passage 54 provided in a member 55 to which the valve casing 44 is detachably secured by means of a flanged member 56 and a clamping nut 57. A suitable gasket 59 is provided between the adjacent surfaces of the flanged member 56 and threaded extension of the valve casing to provide a leak-proof connection between these parts. The member 55 has a threaded extension 61 at its lower end, to which may be coupled one end of a flexible hose 62, the opposite end of which is connected to a pressure regulator 63, of ordinary construction, mounted upon an acetylene supply tank 64.

The oxygen control valve 43 has a similar spring 48 constantly urging it downwardly against its seat, as shown in Figures 4 and 6. This spring is positioned within the valve chamber 50, which chamber is closed by means of a cap 49 similar to the one provided upon the valve casing 44. The tube 27 connected to the fitting 23 has one end suitably secured in a socket provided in the valve casing 45 and communicates with a fluid chamber 65 by means of a fluid circulating duct 66, shown in Figure 4. Oxygen is supplied to the chamber 50 of the oxygen control valve 43 by means of a duct 67 connecting it with a fluid circulating passage 68 provided in the member 55, as clearly shown in Figure 4. The valve casing 45 is secured to the member 55 in a manner similar to that shown and described with reference to the acetylene control valve casing 44. A threaded extension 69, similar to the threaded extension 61, is provided upon the member 55 in alinement with the fluid circulating passage 68,

and provides means whereby one end of a flexible connection 71 may be connected thereto, as shown in Figure 1. The opposite end of the connection 71 is coupled to a suitable pressure regulator 72, of ordinary construction, mounted upon the upper end of an oxygen supply tank 73. The member 55 is preferably shaped and positioned so as to provide a pistol grip whereby an operator may conveniently manipulate and operate the gun.

The means provided for opening the acetylene and oxygen control valves 42 and 43, respectively, is best shown in Figures 4, 5, and 6, and comprises a member 74 having an elongated head 75 pivotally secured to the valve casings 44 and 45 by a suitable pin 76. The springs 48 of the control valves 42 and 43, as hereinbefore stated, normally hold the valves upon their respective seats, whereby one of said stems 46 may engage the head 75 of the pivoted member 74 to thereby retain it in substantially the position shown in Figure 4. When it is desired to open the valves to admit the fuel gases into the explosion chamber 17, the member 74, which functions as a trigger, is moved in a direction towards the grip member 55 whereby its head will engage and actuate the valve stems 46 of the two valves to unseat said valves and thereby permit gaseous flow through the valve structure 41. The stem 46 of the acetylene valve 42 is preferably slightly longer than the stem 46 of the oxygen valve 43, whereby the acetylene control valve will be opened in advance of the oxygen valve 43. This is for the purpose of rendering the charge more readily ignitable, and whereby it will explode with considerable violence when subsequently ignited. By regulating the pressures of the fuel gases in the flexible connections 62 and 71 by means of the pressure regulator valves 63 and 72, the supplies of fuel gases may be delivered to the combustion or explosive chamber 17 in measured quantities, whereby the desired results may be obtained.

The means for igniting the charge delivered to the explosion chamber 17 is best shown in Figures 1, 3, 5, and 6, and comprises a pilot light, generally indicated by the numeral 77, shown composed of a cap 78 secured to the end of a fuel supply tube 79, having a small tip 81 mounted therein, which communicates with the tube 79. The cap 78 has a small orifice 82 through which acetylene is discharged from the tip 81, as clearly illustrated in Figure 3. The tube 79 extends through the chamber 12 defined by the walls of the casing 11 and has its opposite end suitably connected to the valve casing 44 of the acetylene valve 43 by a suitable coupling member 83, received in threaded engagement with an extension 84 provided upon the valve casing 44. A fluid circulating passage 85 in the valve casing 44 connects the tube 79 with a valve controlled passage 86 leading to the valve chamber 50 of the acetylene control valve 42, as best shown in Figure 5. A suitable valve 87 having a needle point 88 is mounted in the valve casing 44 and provides means for regulating the flow of acetylene from the valve chamber 50 to the pipe or tube 79, as will readily be understood by reference to Figure 5. Operation of the acetylene control valve 42 does not effect the flow of acetylene through the fluid circulating passages 86 and 85, as will readily be understood by reference to Figure 5. The valve 87 merely regulates the size of the small pilot flame 90, shown in Figure 3.

To facilitate igniting the charge, means is provided for extending or enlarging the pilot flame 90, as indicated by the dotted lines 91 in Figure 3, each time the trigger member 74 is actuated to fire the gun. Such means resides in the provision of an auxiliary valve 10 whose needle point 20 controls the flow of acetylene through a passage 30, which connects the pipe 79 with the chamber 51 beneath the acetylene control valve 42, as clearly shown in Figures 5 and 6. The auxiliary valve 10 is normally open, when the gun is operated, whereby each time the control valves 42 and 43 are opened by manipulation of the trigger member 74, an additional supply of acetylene will automatically be supplied to the pilot light 77, whereby the flame 90 will be extended or enlarged, as indicated by the dotted lines in Figure 3. This results because of the passage 30 of the auxiliary valve 10 being connected to the chamber 51, below the acetylene control valve 42, and not to the valve chamber 50 thereof, as is the pilot flame control valve 87.

An auxiliary ignition means may be provided at the tip of the barrel 14 within the cap 16, as clearly illustrated in Figure 3. This auxiliary ignition means may consist of a suitable coil of nichrome wire supported at the discharge end of the gun barrel 14. When the gun has been fired in rapid succession a few times, the ignition element or wire 89 will become heated to the extent that it will automatically continue to ignite the gaseous mixture discharged from the barrel 14 of the gun, after the firing operation has been initially started.

In the operation of the novel gun above described, the pilot light is initially ignited, and the pressure regulator valves 63 and 72 are then opened to permit the flow of acetylene and oxygen to the control valves 42 and 43. The gun is then ready to operate. The operator then grasps the grip provided by the members 55, and actuates the trigger member 74, whereupon measured quantities of acetylene and oxygen are delivered to the mixing chamber 18, from whence a gaseous mixture is discharged into the explosion chamber 17 of the gun barrel 14. Simultaneously, as the control valves 42 and 43 are opened, the flow of acetylene to the pilot light 77 will be increased, whereby the pilot flame 90 will be enlarged or extended, as hereinbefore stated, to thereby readily ignite the gaseous mixture discharged from the tip of the gun barrel, whereupon the latter will back fire or explode in the chamber 17 with considerable violence and, at the same time, a flame will shoot outwardly from the discharge end of the barrel, as will readily be understood. When the trigger 74 is again actuated, another supply of gas will be delivered to the explosion chamber 17 which will immediately become ignited when it reaches the discharge end of the barrel, as hereinbefore stated. If the gun is to be fired in rapid succession, the operator will merely hold the trigger in an operative position, whereby the valves 42 and 43 will be held open so that supplies of acetylene and oxygen are constantly being supplied to the explosion chamber 17. Following each explosion, the fresh gases delivered into the explosion chamber will travel forwardly towards the tip or discharge end thereof and will thus purge said chamber, and when said fuel mixture reaches the discharge end of the barrel, it is again ignited and exploded. Thus, when the trigger is held in an operative position to cause the valves 42 and 43 to remain open, the gun will automatically continue to fire in rapid succession, as long as the fuel mixture continues to flow into the

explosion chamber 17. By varying the pressure of the fluid in the flexible connections 62 and 71 connecting the valves to the supplies of acetylene and oxygen, the number of shots per minute may be varied at will, which has been found a very desirable feature. As hereinbefore stated, when the gun has been initially started, the auxiliary igniter 89 will become heated to the extent that it will automatically ignite the gaseous mixture delivered into the chamber 17 each time it approaches the discharge end of the gun barrel, whereby the gun will continue to fire automatically in rapid succession as long as the trigger 74 is retained in operative position.

The chamber 12 defined by the walls of the casing 11 may contain a suitable cooling medium such as water to prevent overheating of the walls of the explosion chamber 17, whereby the gun may be operated for long periods without interruption.

Figures 8 to 12, inclusive, illustrate a structure of slightly modified construction wherein a gun is mounted upon a pair of wheels and simulates a cannon. The gun comprises an explosion chamber 92 defined by the walls of a cylindrical member 93 having a head 94 secured to one end thereof. The member 93 is shown supported within a casing 95 which is relatively larger in diameter to provide a water chamber 96. The member 93 is suitably supported in apertures provided in the end walls of the casing 95, and is preferably welded thereto in leak-proof relation. The casing 95 is provided with a suitable filler opening 97.

The forward end of the cylindrical member or gun barrel 93 projects beyond the front end wall of the casing 95 and is shown having a suitable spark plug 98 mounted thereon, the electrodes of which are positioned within the chamber 92, as clearly shown in Figure 11. A relatively larger cylindrical member 99 is fitted to the forward end of the tubular member 93 and may function as a holder for pellets or objects to be projected by the gun such, for example, as wads of paper or other soft articles.

The casing 95 is supported upon a bracket 101 secured to a longitudinally extending frame member 102, shown provided at its intermediate portion with depending lugs 103 pivotally connected to a pair of upright supporting rods 104 which, in turn, are suitably secured to an axle 105 supported on carrying wheels 106. A suitable sleeve member 106 is interposed between the lugs 103 and is secured thereto by such means as welding. A suitable rod or bolt 107 passes through the sleeve 106 and apertured hubs provided at the upper ends of the supporting rods 104. Suitable nuts 100 are received in threaded engagement with the rod to secure said parts together. By thus supporting the gun upon the truck comprising the axle 105 and the wheels 106, the gun may readily be tilted to an inclined position in either direction by simply loosening one of the nuts 100 securing the rod 107 in position.

The means interposed between the gun barrel 93 and the valve mechanism for controlling the flow of gases thereto, indicated generally by the numeral 110 in Figures 10 and 11, are similar to the coresponding parts of the gun shown in Figure 1, and will therefore be referred to by like numerals.

As shown in Figures 10 and 11, the tubular member 19 has its forward end received in threaded engagement with the head 94 of the barrel 93, and communicates with the explosion chamber 92. The opposite end of the member 19 is received in threaded engagement with the cap 21 which is secured to one end of the cylindrical member 22, and to the opposite end of the member 22 is secured the fitting 23. The tubes 26 and 27 connect the fitting 23 to the valve mechanism 110. The interior constructions of the parts 19, 21, 22, and 23 are clearly shown in Figure 7.

The valve mechanism 110 for controlling the supply of acetylene and oxygen to the tubes 26 and 27, is best shown in Figures 10, 11, and 12 and comprises a valve body 108 supported upon a bracket 109 secured to the base member 102 by suitable bolts 111. Within the valve block 108, there is provided a pair of valves 112, one of which is shown in Figure 12. As these valves are alike in construction, but one will be described in detail. Each valve has a stem 113 slidably mounted in a suitable guide 114, such as a packing nut secured to the valve body 108. The upper ends of the valve stems 113 project from the guides 114, whereby they may be operated by an actuator 115 shown pivotally supported upon suitable standards 116 secured to the valve block 108. Each valve 112 is mounted in a valve chamber 117, the lower ends of which are closed by suitable nuts 118, each bored to receive the lower ends of suitable compression springs 119, the upper ends of which are seated against the valves 112 to thereby constantly urge them into engagement with their respective seats, as clearly illustrated in Figure 12.

Suitable ducts 121 connect the pipes 26 and 27 with chambers 120 provided over the valves 112, and other ducts 130 connect the valve chambers 117 to a pair of supply conduits 122 and 123 connected respectively to supply tanks 124 and 125 supported within the body of the truck, indicated generally by the numeral 126 in Figure 8. The tank 124 supplies acetylene gas to the conduit 122 and in like manner, the tank 125 supplies oxygen to the conduit 123, as clearly illustrated in Figure 8. Suitable pressure regulator valves 127 are provided in the connections between the conduits 122 and 123 in their respective tanks 124 and 125, whereby the pressure of the fluid supplied to the conduits 122 and 123 may be regulated at will. The tanks 124 and 125 may be conveniently stored in the body 126 of the apparatus, as clearly indicated in Figure 8. One end of the body 126 of the truck is shown supported upon a suitable castor 128. A suitable draft member or tongue 129 may be secured to the frame of the castor wheel 128, by which the apparatus may be propelled.

The spark plug 98 for igniting the charge, may be operated from an ordinary storage battery 131, supported within the body 126 of the apparatus, as shown in Figure 8. A conductor 132 leads from one terminal of the storage battery 131 to one side of a high tension coil 133 shown supported upon the frame member 102. A wire 134 connects the other terminal of the coil 133 to the spark plug 98. The spark plug may be grounded in the usual manner. A second wire 135 connects the other terminal of the storage battery to a flexible contact member 136 supported upon an upright frame member 137 secured to the lower horizontal frame 102.

A movable contact 138, here shown as comprising the head of a set screw received in threaded engagement with a collar 141 is adjustably secured to a shaft 139, mounted for rotation in suitable bearings provided in the upright posts 137, as shown in Figures 10 and 11. The collar 141

is secured to the shaft 139 adjacent to one of the bearings 137, and a similar collar 142 is secured to the shaft adjacent its opposite end in close proximity to the opposite bearing 137, whereby the collars 141 and 142 prevent longitudinal movement of the shaft 139. A suitable balance wheel 143 is shown secured to one end of the shaft 139 and has an operating crank 144 to facilitate rotating the shaft.

A cam 145 is secured to the shaft 139 and operates the actuator 115 to open and close the valves 112, when the shaft 139 is rotated. For each revolution of the shaft 139, the valves 112 will be opened to permit the flow of acetylene and oxygen to the mixing chamber 35, from whence it will flow through the expansion chamber 18 and into the explosion chamber 92. During rotation of the shaft 139, the contact screw 138 will engage the flexible contact 136, whereby a circuit is completed to the spark plug 98, which will ignite the charge in the chamber 92 and cause it to explode with considerable violence. The valves 112 are held open for substantially 180° travel of the shaft 139, as will be clearly understood by reference to Figure 11, and the contact screw 138 is so positioned upon the shaft with respect to the cam that it will engage the flexible contact 136 and cause the spark plug to function at substantially the same time as the valves are closed. It will thus be seen that as long as the shaft 139 is rotated, the gun will continue to fire in rapid succession.

The supply of acetylene and oxygen to the explosion chamber 92 is controlled by the regulator valves 127 of the tanks 124 and 125, in a manner similar to the structure shown in Figure 1. In other words, if the regulator valves 127 of the storage tanks 124 and 125 are operated to increase the pressure in the flexible conduits 122 and 123, the gaseous mixture will be delivered to the explosion chamber more rapidly than it will if the gun is operated with low pressure, whereby the number of shots per minute will be increased.

A suitable switch, not shown, may be provided in the ignition circuit, whereby the circuit may be opened to prevent accidental discharging of the gun, should the contact screw 138 accidentally engage the flexible contact 136. Suitable means, such as a chain 146 may be provided for locking the wheel 143 against rotation when the apparatus is in transit, and whereby the cam 145 may be locked in its inoperative position shown in Figure 11, to thereby prevent accidental opening of the valves 112. Such a chain is shown in Figure 8 and may have one end secured to the frame of the apparatus, as indicated at 147, and provided at its opposite end with a pin 148 adapted to be inserted through an aperture in the rim of the wheel, and into the frame 137, as shown in Figure 9.

A suitable housing 149 is secured to the base member 102 and provides a closure for the mechanism, as clearly illustrated in Figure 8. The front wall 151 of the housing 149 is apertured to receive the cylindrical extension 99 of the gun barrel 93. A suitable U-shaped rod 152 may be secured to the housing 149, as illustrated in Figures 8 and 9, for the purpose of supporting a banner or other article.

The novel gun herein disclosed has been found very practical in army maneuvers primarily because of its inexpensive operation. It may be designed to simulate in detail an army machine gun or cannon and, when mounted as shown in Figures 8 and 9, may readily be moved about from place to place in the same manner as an ordinary army gun. An important feature of the invention resides in the fact that the number of shots fired per minute may be varied by the simple manipulation of the regulator valves 127 of the gas storage tanks 124 and 125.

The portable gun shown in Figure 1 is adapted for automatic operation and when initially started, will continue to fire automatically in rapid succession as long as the trigger 74 is held in operative position. The speed at which the gun may be fired may be controlled entirely by manipulation of the pressure regulator valves 63 and 72, of the acetylene and oxygen storage tanks 64 and 73. In the form shown in Figure 8, the speed of the gun is controlled by rotation of the shaft 139 which, in the present instance, is adapted for manual operation. Suitable mechanism, not shown, may be provided for automatically rotating the shaft.

If desired, the gun illustrated in Figures 8 to 12, inclusive, may be provided with an ignition means 89, similar to that shown and described with reference to the previous figures.

I claim as my invention:

1. In a gas operated gun, a barrel having an explosion chamber therein, pressure means for supplying an explosive gas thereto, a spring-actuated valve for controlling the delivery of gas to the explosion chamber, said valve, when open, permitting uninterrupted gas flow to said chamber, an igniter at the discharge end of the gun barrel comprising a small flame adapted to be projected to ignite the gas discharging from the end of the barrel, thereby to cause the gun to fire, and the gas supply means for said igniter being operatively connected to said spring-operated valve, whereby each time the latter is operated, the igniter flame is extended.

2. In a gas operated gun, an explosion chamber, a mixing chamber connected thereto, pressure means for supplying acetylene and oxygen to said mixing chamber in measured quantities to provide an explosive charge, ignition means, valves for controlling the delivery of acetylene and oxygen to the mixing chamber and each having a valve stem, and a single member for successively operating said valves and, at the same time, operating the ignition means to fire the gun.

3. In a gas operated gun, a barrel having an explosion chamber therein, pressure means for supplying a plurality of different gases to said explosion chamber in measured quantities to provide an explosive charge, a pilot flame for igniting the charge, and means movable independently of the barrel for controlling the supply of gas to the explosion chamber and the operation of said ignition means.

4. In a gas operated gun, a barrel having an explosion chamber therein, a mixing chamber connected to the barrel, means for delivering acetylene and oxygen to said mixing chamber at predetermined pressures to provide an explosive charge and from which mixing chamber the charge will flow into the explosion chamber, a gas pilot flame adjacent the discharge end of the barrel, and a rotatable member for controlling the delivery of acetylene and oxygen to the mixing chamber, said member also operating to expand said pilot flame into the path of the explosive charge discharging from said barrel, whereby said charge is ignited.

5. In a rapid firing gun, an explosion chamber,

a mixing chamber connected thereto, conduits connecting said mixing chamber with supplies of acetylene and oxygen under pressure, normally closed valves in said conduits each comprising a valve stem, ignition means, and a single member for actuating said valve stems to open said valves, first one and then the other, thereby to permit acetylene and oxygen to enter said mixing chamber, said member also controlling the operation of said ignition means, whereby when the member is operated to retain the valves in open position, a gaseous mixture will be continuously delivered into the explosion chamber whereby the gun will continue to fire in rapid succession.

6. In a rapid firing gun, a barrel having an explosion chamber therein, a mixing chamber connected to the explosion chamber, conduits connecting said mixing chamber with supplies of acetylene and oxygen under pressure, normally closed valves in said conduits, a single member for opening said valves, first one and then the other, thereby to permit acetylene and oxygen to enter said mixing chamber in predetermined proportions, and an ignition means comprising a gas pilot flame situated at the discharge end of the barrel and connected to one of said valves, whereby when said valves are opened to permit an explosive charge to enter the explosion chamber, said pilot will be operated to project a flame therefrom to ignite the gaseous mixture discharging from the gun barrel.

7. In a gas operated gun, a barrel having an explosion chamber communicating therewith, a valve mechanism connected to said explosion chamber, means for supplying regulated quantities of acetylene and oxygen to said valve mechanism, a member for actuating said valve mechanism, a shaft having a cam thereon adapted to engage said member, when the shaft is rotated, to thereby alternately open and close said valve mechanism, and an ignition means also associated with said shaft and adapted to be operated by rotation thereof, said ignition means being timed to the operation of said valve mechanism whereby each time the valve is operated to admit a charge of acetylene and oxygen into said explosion chamber, said ignition means will ignite said charge and fire the gun.

8. A gun of the class described, comprising an explosion chamber having a mixing chamber communicating therewith, means for supplying measured quantities of acetylene and oxygen to the mixing chamber to provide an explosive charge, a valve mechanism for controlling the supply of acetylene and oxygen to the mixing chamber comprising a body having a pair of valves mounted therein and each provided with a valve stem, a member positioned to engage said valve stems and which, when operated, will cause the acetylene valve to open slightly in advance of the oxygen valve, whereby the charge is rendered more readily ignitable, and means made operable by the valve mechanism for igniting the charge delivered to the explosion chamber.

9. A gun of the class described, comprising an explosion chamber having a mixing chamber communicating therewith, means for supplying acetylene and oxygen to the mixing chamber in measured quantities to provide an explosive charge, valves for controlling the flow of acetylene and oxygen to the mixing chamber, an operating mechanism for actuating said valve mechanism, including a cam, and ignition means controlled by said operating mechanism to ignite the charge in the explosion chamber.

10. A gun of the class described, comprising an explosion chamber, means for delivering an explosive charge thereto, comprising a valve mechanism, a shaft, a cam operatively connected to the shaft for actuating the valve mechanism, and ignition means controlled by manipulation of said shaft to thereby ignite the charge in the explosion chamber.

11. A gun of the class described, comprising an explosion chamber, means for delivering an explosive charge thereto, comprising a valve mechanism including a body having a plurality of valves therein, and each valve having a stem projecting from said body, a pivoted member engaging said valve stems, an ignition means, and cam means for operating said valves and the ignition means whereby the gun may be fired in rapid succession.

12. A gun of the class described, comprising an explosion chamber, means for delivering an explosive charge thereto, comprising a body having a pair of valves mounted therein and each having a valve stem projecting from said body, a pivoted member engaging said valve stems, ignition means, and an operating mechanism for actuating said valves and ignition means, comprising a shaft having a cam thereon for engaging said pivoted member.

13. A gun of the class described, comprising an explosion chamber, means for delivering an explosive gaseous mixture into said chamber, a controllable igniter, and an auxiliary ignition means comprising an element positioned at the discharge end of the explosion chamber which when heated by the products of combustion, will subsequently automatically ignite successive charges delivered to the explosion chamber, whereby the gun may be automatically fired in rapid succession.

14. A gun of the class described, comprising an explosion chamber, means for delivering an explosive gaseous mixture into said chamber, a main igniter for igniting the charge initially delivered to the explosion chamber, and an auxiliary igniter comprising a coiled element movably supported at the discharge end of the explosion chamber which when heated by the products of combustion, will subsequently ignite successive charges delivered to the explosion chamber, whereby the gun may be automatically fired in rapid succession without manipulation of said main igniter.

ELMER H. SMITH.