May 26, 1931. J. W. MacDONALD 1,806,633

TOY GAS CANNON

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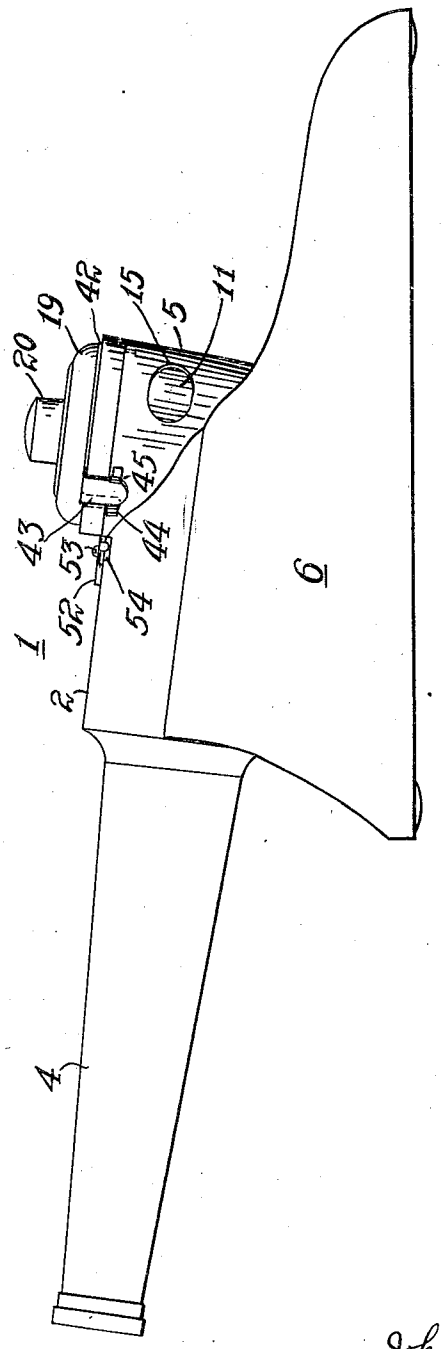

Fig. 1.

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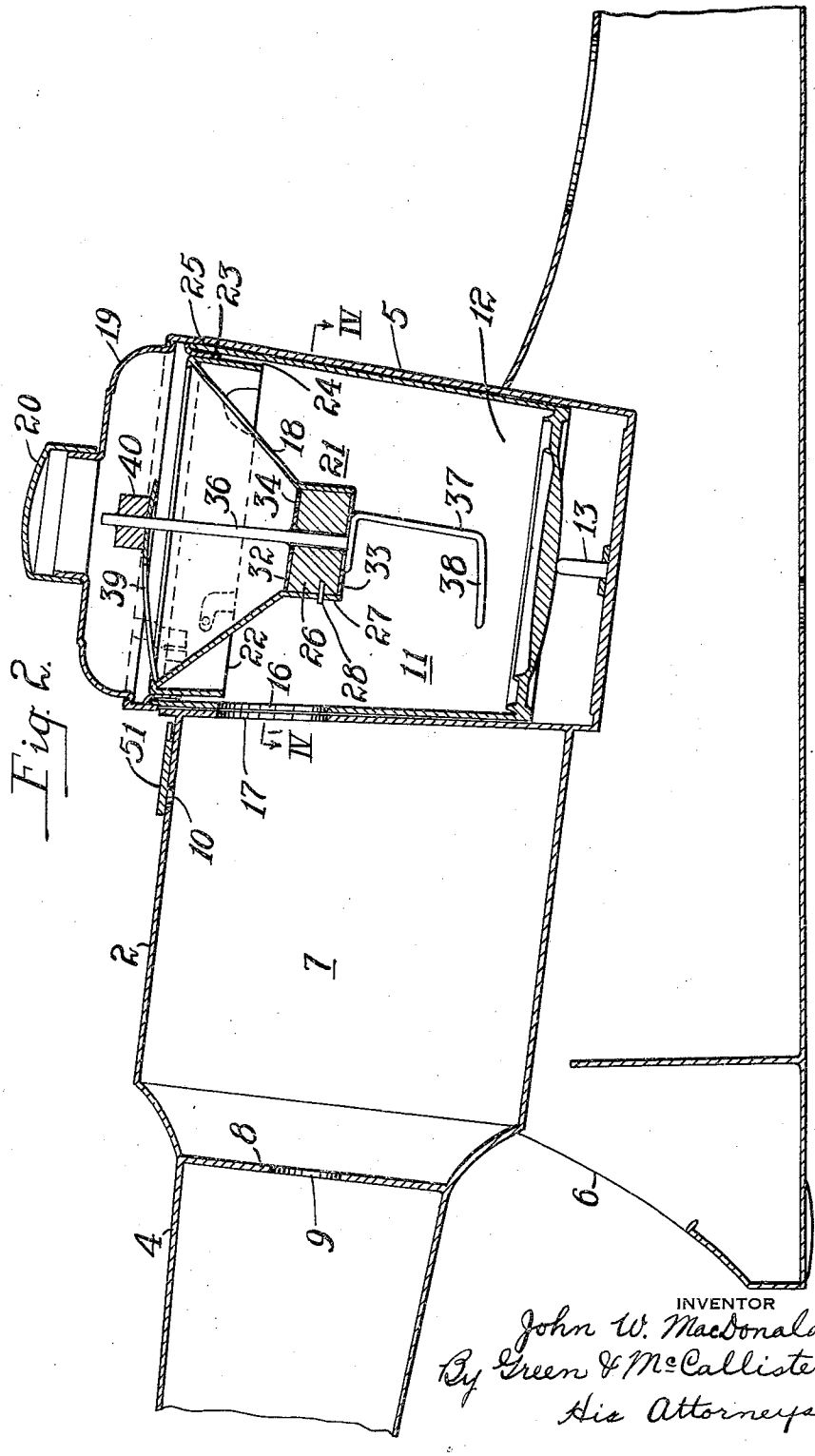

Fig. 2.

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Fig. 5.

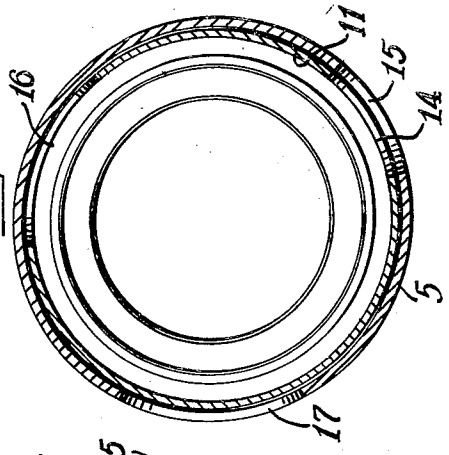

Fig. 4.

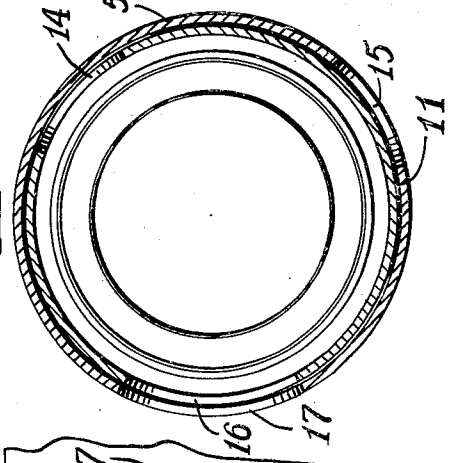

Fig. 3.

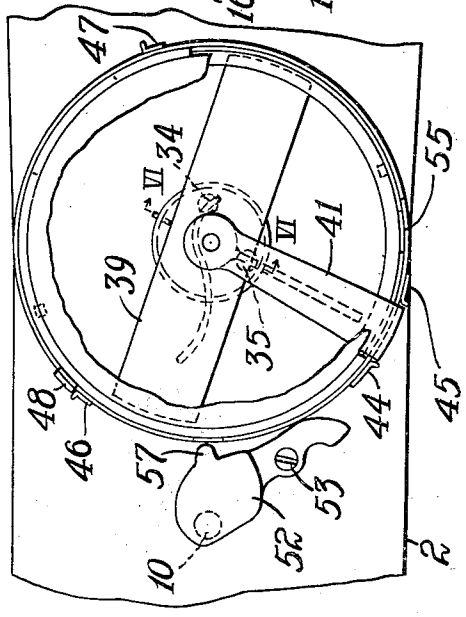

Fig. 10.

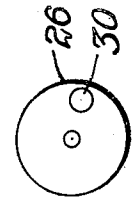

Fig. 9.

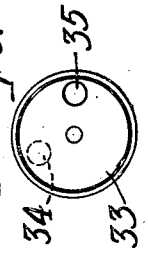

Fig. 8.

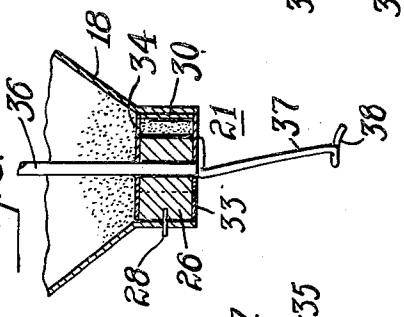

Fig. 7.

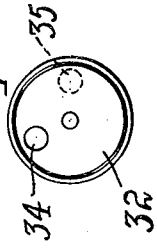

Fig. 6

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Fig. 12.

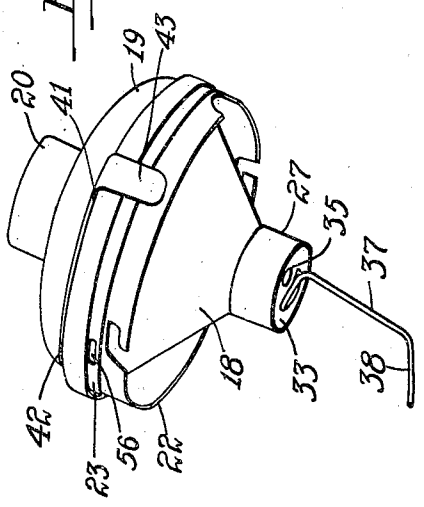


Fig. 13.

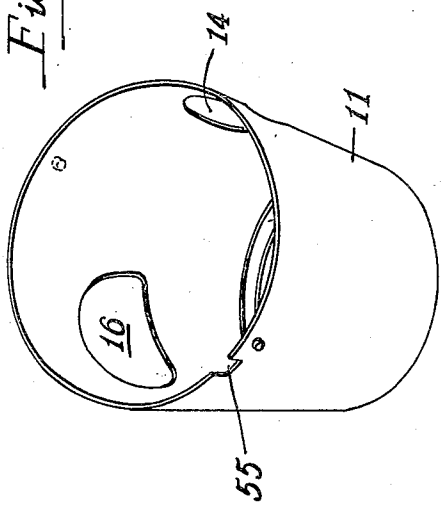
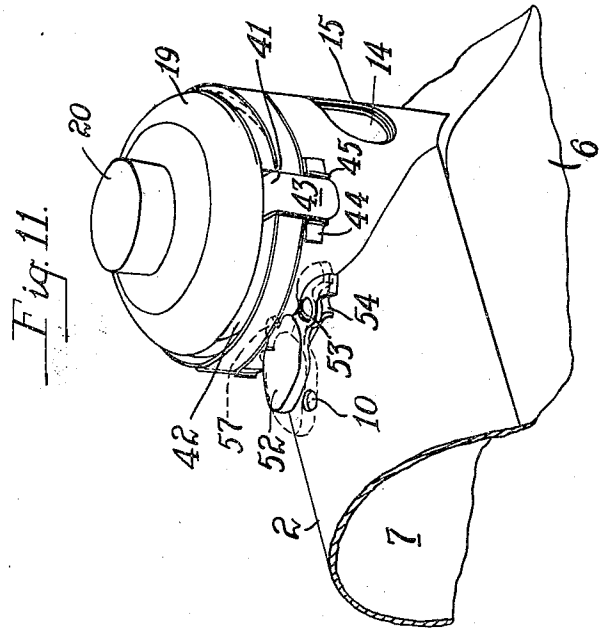


Fig. 11.



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Patented May 26, 1931 1,806,633

UNITED STATES PATENT OFFICE

JOHN W. MacDONALD, OF WILKINSBURG, PENNSYLVANIA

TOY GAS CANNON

Application filed January 28, 1930. Serial No. 423,939.

This invention relates to toy gas cannons.

An object of this invention is to provide a gas cannon that can be safely and efficiently operated and easily cleaned.

And to that end the invention provides a form of construction whereby an explosive gas is developed in one chamber of the cannon and detonated in another and separate chamber of the cannon.

And as a necessary requisite for the development of such gas, a combined water basis or reservoir and generating chamber is provided so designed as to form when in place a vertical tapered turnable breech block for opening and closing the cannon breech.

A further object is to provide a means automatically operative with the movement of the gas generator for charging the water reservoir or basin therein with a predetermined quantity of gaseous material such as calcium carbide and distributing the residuum of such charge.

A further object is to provide a communicating means, opened and closed by movement of the cannon breech block which forms a part of the gas generator, that will permit the explosive gas to flow from the generator wherein it is developed into the explosion chamber of the cannon, and means for preventing the firing of the cannon until the communication between the explosion chamber and the gas generator is interrupted or cut off.

Other objects of the invention will, in part, be obvious and will, in part, be apparent to those skilled in the art from the following description taken in conjunction with the accompanying drawings in which:

Figure 1 is a side view in elevation of a toy gas cannon arranged and constructed in accordance with the invention;

Fig. 2 is a partial view in section, taken on line II—II of Fig. 1;

Fig. 3 is a partial top plan view of the cannon shown in Figs. 1 and 2;

Fig. 4 is a view in section taken on line IV—IV of Fig. 2 showing the gas generator in a position in which a gaseous explosive mixture may flow therefrom to the explosion chamber of the cannon;

Fig. 5 is a similar view showing the gas generator in a position in which communication is cut off between the explosion chamber and the gas generator, this being the position of the gas generator when an explosion is to take place in the explosion chamber of the cannon;

Fig. 6 is a partial view in section taken on line VI—VI of Fig. 3 of a magazine or hopper and a measuring device embodied in the gas generator, the measuring device being in a position in which gaseous material is delivered to the gas generator;

Fig. 7 is a view in section of the device shown in Fig. 6 taken on line VII—VII thereof;

Fig. 8 is a view similar to Fig. 6, but illustrating the measuring device in its measuring position;

Fig. 9 is a bottom view of the measuring device shown in Fig. 8;

Fig. 10 is a view of a detail embodied in the measuring device;

Fig. 11 is a partial enlarged view in perspective of the gas cannon illustrating the relative positions of the gas generator and the explosion chamber of the cannon;

Fig. 12 is a view in perspective of a magazine or hopper and a measuring device which comprises a part of the gas generator; and

Fig. 13 is a view in perspective of a breech block, the lower portion forming a water basin, which with the hopper and measuring device of Fig. 11 constitutes the gas generator in which gas is developed upon the admission of gaseous material from the hopper into the water in the container.

Throughout the drawings and the specification like reference characters indicate like parts.

Referring to the drawings, and more particularly to Fig. 1, a gas cannon 1 is shown that comprises an explosion cylinder 2 having a barrel 4 at one end and a hollow tapered breech 5 at the other end, the breech forming an integral part of the cannon. The cannon may be mounted on a support 6.

It is to be understood that the cylinder 2 is hollow (see Fig. 2) so as to provide a chamber 7 in which an explosive gas may be

detonated. In order that the detonation of the gas may produce a loud and sharp report, a baffle 8 having an aperture or opening 9 therein is mounted in the barrel 4 at the point where it merges into the cylinder 2. The size of the opening 9 may be varied in accordance with detonation qualities desired of the cannon.

The cylinder 2 is provided also with a touch-hole 10 through which sparks may be admitted to explode the gas in the chamber 7 of the cannon. Any suitable form or type of sparking device may be employed, and for this purpose pyrophoric ignition devices will suffice.

The breech 5 forms a housing within which a breech block 11 is housed. The breech block, as shown, is hollow and tapered to conform to the shape of the breech 5.

In order that breech block 11 may be turned easily within the housing, the block is mounted on a bearing 13 that extends upwardly from the bottom of the breech 5 (see Fig. 2).

The breech block 11 constitutes the gas generator for the cannon and, as such, is both a water chamber and gas generating chamber.

When the breech block is turned to one position a measured quantity of gaseous material, such as calcium carbide, is deposited in the breech block 11, the bottom portion 12 of which forms a basin for water. The reaction between the water and the gaseous material causes gas to be evolved. This gas without a proper mixture of air is non-explosive. Therefore, in order that an explosive mixture of air and gas may be developed, the breech block and the breech 5 are provided with openings 14 and 15, respectively, through which air is admitted to the interior of the breech block when the block is in the position in which the gaseous material is admitted thereto.

While the explosive gaseous mixture is being developed, the breech block cuts off communication between the gas developed therein and the explosion chamber 7. By turning the breech block 11 to a position in which openings 16 and 17 coincide in the block and breech, respectively, the explosive gaseous mixture flows into the explosion chamber 7. When the openings 16 and 17 coincide to permit the gas to flow from the breech block to the explosion chamber, the opening 15 in the block 5 is closed, thereby cutting off communication between the interior of the breech and the atmosphere. This is so because the openings 14 and 15 do not coincide as shown in Fig. 4. Obviously, when the openings 14 and 15 coincide, the opening 16 in the breech is closed by the breech block 11 because the openings 16 and 17 do not coincide as shown in Fig. 5.

In order that measured quantities of the gaseous material may be admitted to and deposited in the water of the breech block 11 in response to turning of the block to the position in which the openings 14 and 15 coincide, a magazine 18 having a dome 19 closed at the top by a cap 20, and a measuring device 21 are provided. As shown, the magazine, the measuring device and the breech block 11 form a unitary, compact structure, when assembled for operation, which may be designated as a gas generator having a gas generating chamber and a water container. As stated hereinbefore, the breech block forming a part of this generator, not only allows for the formation of gas, but also controls the flow of the gas to the explosion chamber 7. In this respect, the breech block functions as a valve to control, when in one position, the flow of explosive gas to the chamber 7, and, when in another position, the admission of air to its interior or gas generating chamber.

The magazine 18 is provided with a depending annular flange 22 which is of smaller diameter than the diameter of the upper end of the breech block 11. Also, the dome 19 is provided with a depending annular flange 23 that extends into an annular space 24 between the annular flange 22 and the upper end of the container or breech block 15 (see Fig. 2). As shown in Fig. 2, the dome 19 includes an annular depending flange 25 adjacent to the upper end of the hollow breech block 11.

The measuring device 21 comprises a member 26 which is stationarily mounted and supported within an annular depending sleeve 27 that is preferably made integral with the hopper or magazine 18. In the present case, the member 26 may be held in place by a pin or rivet 28.

The member 26 has an opening 30 therethrough extending from the upper face to the lower face thereof. The thickness of the member 26 is preferably such that the volume of the opening 30 will be substantially equal to the measured quantity of carbide or other gaseous material to be admitted to the gas generator.

In order that a measured quantity of gas liberating material, such as carbide for example, may be alternately admitted into and discharged from the opening 30 in the member 26, plates 32 and 33 are provided. The plates 32 and 33 are secured to a shaft 36 which passes through the member 26, the plates being located above and below the member 26, respectively, as shown in Figs. 2, 6 and 8.

The plates 32 and 33 have apertures or openings 34 and 35, respectively, offset from one another but located at the same radial distance from a shaft 36, to which the plates are secured, as the opening or hole 30. By turning the shaft 36 in one direction and then in the opposite direction, the apertures 34 and 35 alternately coincide with the top and bottom of the aperture 30 in the member 26 of the measuring device.

It will be observed that when the aperture

34 coincides with the top of the opening 30 (see Fig. 8) the gaseous material flows into and fills the hole 30. The amount of the material that fills this hole 30 is the measured quantity. By turning the shaft 36 so that the aperture 35 in the plate 33 coincides with the bottom of the hole 30, the measured quantity of material falls into and is deposited in the water of the breech block 11 and gas is generated. Since, the openings 14 and 15 (see Fig. 5) coincide when the material is deposited in the water, air mixes or combines with the gas formed by the reaction between the water and the gaseous material, to produce an explosive mixture.

When the breech block 11 is in the position in which the openings 16 and 17 coincide (see Fig. 4), the opening 34 in the plate 32 coincides with the top of the opening or hole 30, and the bottom thereof is closed by the plate 33. A measured quantity of gaseous material, therefore, fills the hole 30. In this manner gaseous material and explosive gas are alternately charged into the breech block 11 and permitted to flow in to the explosion chamber 7, respectively, in response to turning of the breech block in one direction and then in the opposite direction.

In order to prevent the residuum caused by the reaction between the gaseous material and the water from mounting or piling up in the breech block 11, a stirring rod 37 is attached to the plate 33. This rod is provided with a laterally extending hook or arm 38 that effectively increases the area of sweep of the stirring rod whereby the residuum is distributed somewhat uniformly over the bottom of the breech block. If this is not done, the residuum will pile or mount up and prevent the gaseous material from reaching the water in the breech block.

The upper end of the shaft 36 is guided by a resilient bridging member 39 through which it passes and is bowed upwardly, as shown in Fig. 2, and secured at its ends to the rim of the hopper 18. The middle portion or "hump" of the resilient bridging member 39 bears against a hub 40 of a lever 41. Lever 41 extends outwardly through a slot 42 in the dome 19. The outer end of the lever 39 is bent downwardly as indicated at 43.

When the gas generator is mounted in place in the hollow breech 5, the portion 43 of the lever 41 is held against turning movement between two lugs 44 and 45 which are secured to the breech 5 at the top thereof (see Figs. 1, 3 and 11). Since the hub 40 is rigidly secured to the upper end of the shaft 36, relative movement of the plates 32 and 33 with respect to the member 26 of the measuring device 21 may be obtained by bodily turning the gas generator.

To limit the turning movement of the gas generator, stops 46 and 47 are secured to the upper end of the hollow tapered breech 5 and a lug 48 is secured to the dome 17. The lug 48 contacts with one or the other of the lugs 46 and 47 when the generator has been turned to one or the other of its limiting positions. When the gas generator is turned to the position shown in Fig. 3 of the drawings, that is, to the position in which the lug 48 contacts with the stop lug 46, the opening 34 in the plate 32 registers with the passageway or hole 30 in the member 26. Carbide from the magazine 18 will then fill the passageway 30. Upon turning the gas generator to a position in which the lug 48 contacts with or engages the stop lug 47, the aperture or opening 35 in the plate 33 will register with the passageway 30 in the member 26 and the carbide will be discharged into the water in the breech block 11.

In order to prevent firing of the explosive gaseous mixture, after it has flowed into the explosion chamber, until communication has been cut off between the interior of the breech block 11 and the explosion chamber 7, a cover member 52 is turnably mounted on the cylinder 2 by means of a screw 53 and a clip 54 secured to the breech 5. The cover member 52 is arranged to cover the touch-hole 10 (see Figs. 2 and 3) when the openings 16 and 17 of the breech block 11 and breech 5 coincide (see Figs. 2 and 4).

To preclude firing of the cannon until communication between the breech block and the explosion chamber 7 has been cut off and communication established between the atmosphere and the breech block through the openings 14 and 15, the breech block 11 and the flange 23 of the dome 19 are provided with notches or recesses 55 and 56 that receive a lug 57 of the closure member 52 when the breech block 11 and the breech 5 occupy the relative positions shown in Fig. 5 of the drawings. When in this position the closure member 52 may be actuated to the position indicated in full lines in Fig. 11 of the drawings to uncover the touch-hole 10 so that sparks may be admitted into the explosion chamber 7 to ignite the gas.

In operation of the cannon illustrated in the drawings, the cap 20 is removed in order to permit filling the magazine or hopper 18 with carbide or other gaseous material. The cap is then closed to preclude the entrance of moisture into the carbide. Also the breech block 11 is partially filled with water or other liquid which will cause the proper reaction between the carbide and the fluid or water. A predetermined measured quantity of the gas liberating material may be charged or deposited in the water of the breech block by first turning the gas generator to the position in which the stop 48 is in engagement with the stop lug 47. In this position carbide fills the passageway 30 in the member 36.

The next step in the operation of the cannon includes the return of the gas generator

to the position shown in Fig. 3 of the drawings, that is, to that position in which the lug 48 engages the stop lug 46. In this position the carbide is discharged into the water and gas is formed. As the gas forms it mixes with the air in the breech block that has entered through the openings 14 and 15 when in the registering position as shown in Fig. 5 of the drawings. When the gas has flowed into the explosion chamber, the gas generator is turned to the position indicated in Fig. 11 in which position the touch-hole 10 may be uncovered to permit the admission of a spark therethrough into the explosion chamber.

By repeating the steps of operation set forth above, the cannon may be fired at short intervals.

Where carbide is employed as the gaseous material, it is well known that the gas evolved therefrom when it comes into contact with any surface condenses and forms deposits of carbide on the surface. Ordinarily, such deposits would interfere with the turning of two bodies located one within the other. Since the breech block 11 and the hollow breech 5 are tapered, the block will merely move upwardly if deposits are formed in the space between the breech block and the breech.

While various modifications and changes may be made in the toy cannon herein shown and described without departing from the spirit and the scope of the invention, it is to be understood that only such limitations shall be placed on the invention as are imposed by the prior art and the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A gas cannon comprising a chamber in which gas may be exploded, a turnable hollow breech block having a water basin integral therewith, a source of gas liberating material mounted on the turnable breech block, a measuring device for admitting measured quantities of gas liberating material to the water basin, and means for operating the measuring device in response to a turning movement of the turnable chamber.

2. A gas cannon comprising an explosion chamber, a hollow breech block turnably disposed with reference to the explosion chamber, said breech block having a water basin in the bottom thereof, means for establishing communication between the chamber and breech block when the breech block is turned to one position and for cutting off communication when turned to another position, a source of gaseous material and means for transferring a measured quantity of said material to the breech block in response to the turning of the breech block to one of said positions.

3. A toy cannon comprising an explosion chamber, a rotatable breech block having a water chamber, a magazine for gas liberating material and means for charging a predetermined amount of said material into the water chamber in response to a turning movement of the breech block.

4. In a toy cannon, in combination, a support, a gas generator turnably mounted on the support, a container for gaseous material disposed on said gas generator, and means for admitting a measured quantity of gaseous material to said generator in response to a turning movement of the gas generator.

5. A gas generator for a toy cannon comprising a breech, a hollow breech block having a basin for water, turnably mounted in the breech, a magazine for gaseous material mounted on the block and a measuring device for admitting a measured quantity of gaseous material to the water in said block.

6. A gas generator for a toy cannon comprising a breech, a hollow breech block for water turnably mounted in the breech, a magazine for gas liberating material mounted on the block, a measuring device for admitting a measured quantity of gaseous material to the water in said block, and means for operating said measuring device in response to turning movements of said block relative to the breech.

7. A gas generator for a toy cannon comprising a breech, a hollow breech block for water turnably mounted in the breech, a magazine for gas liberating material mounted on the block, a measuring device for admitting a measured quantity of gaseous material to the water in said block and means for stirring the water in the block in response to operation of the measuring device.

8. A gas generator for a toy cannon comprising a breech, a hollow breech block for water turnably mounted in the breech, a magazine for gaseous material mounted in the block, a measuring device for admitting a measured quantity of gas liberating material to the water in said block, means for operating said measuring device in response to turning movements of said block relative to the breech, and means for stirring the water in the container in response to operation of the measuring device.

9. A gas cannon comprising an explosion chamber, a gas generator, means for transferring gas from the generator to the explosion chamber, and means for charging the gas generator with measured quantities of gas liberating material in response to the operation of the gas transferring means.

10. In combination with a toy cannon having a hollow tapered breech, of a combined water chamber and gas generating chamber forming a vertical tapered turnable breech block for opening and closing the cannon breech.

11. As an article of manufacture, a hollow tapered turnable breech block forming a combined water chamber or reservoir and a gas generating chamber.

12. In a toy cannon, in combination, a support, a gas generator turnably mounted on the support, a container for gaseous material disposed on said gas generator, and means for admitting air and a measured quantity of gaseous material to said generator in response to a turning movement of the generator.

13. A gas generator for a toy cannon comprising a breech, a hollow breech block having a basin for water, turnably mounted in the breech, a magazine for gaseous material mounted on the block, means for admitting a quantity of gaseous material from said magazine to the water in said block and means for admitting air to said block when said block is in gaseous material receiving position.

14. A gas generator for a toy cannon comprising a support, a container for water mounted on the support and movable to gas generating and gas delivery positions, a magazine for gaseous material on said container, a device for admitting a charge of gaseous material to the water in said container when in gas generating position and means for admitting air to the container when moved to said generating position.

In testimony whereof, I have hereunto subscribed my name this 27th day of January, 1930.

JOHN W. MacDONALD.