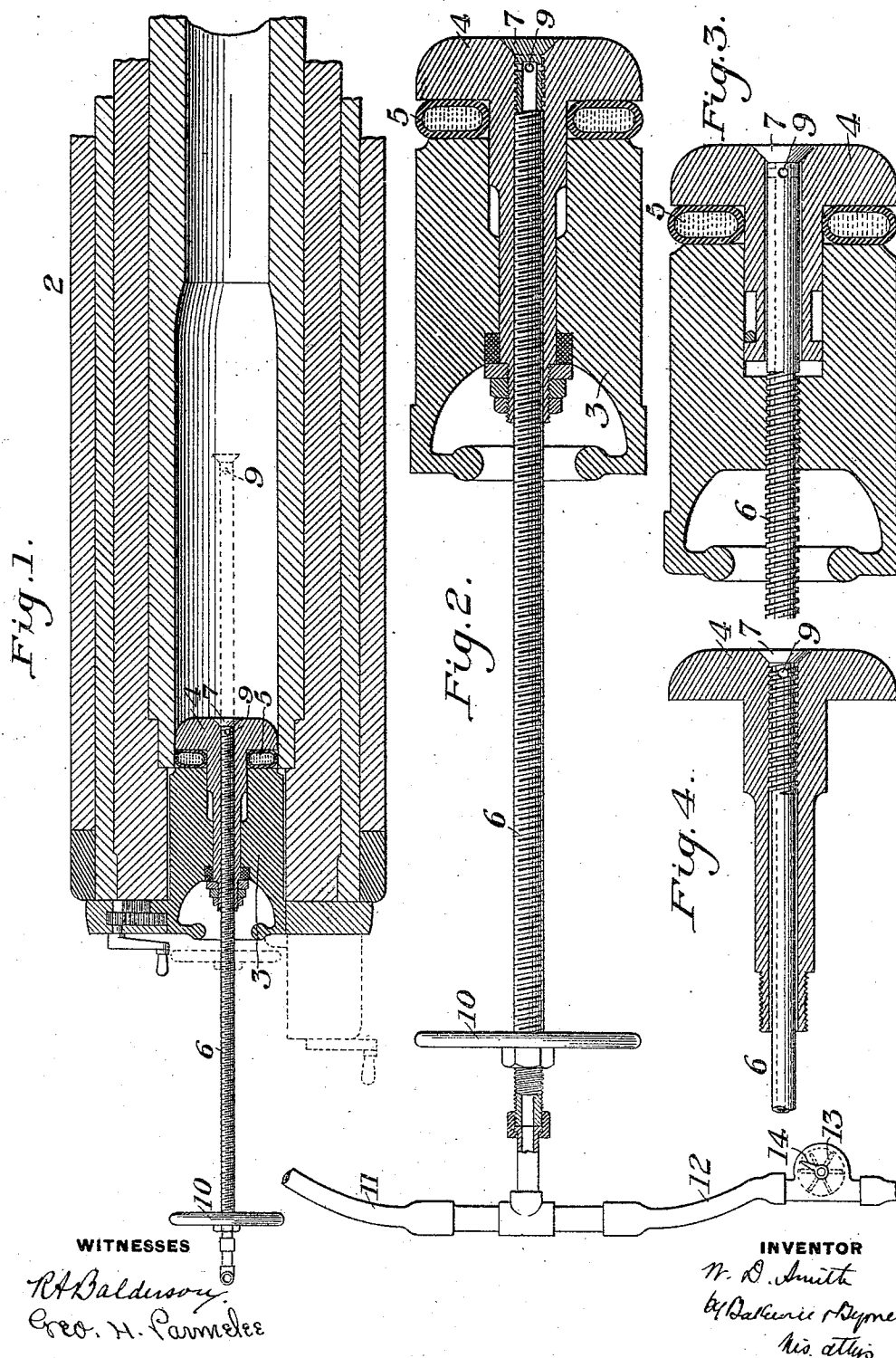


W. D. SMITH.
METHOD OF CLEANING THE EXPLOSIVE CHAMBERS OF ORDNANCE AFTER FIRING.
APPLICATION FILED OCT. 9, 1905.

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Patented Dec. 28, 1909.

2 SHEETS—SHEET 1.



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Fig. 5.

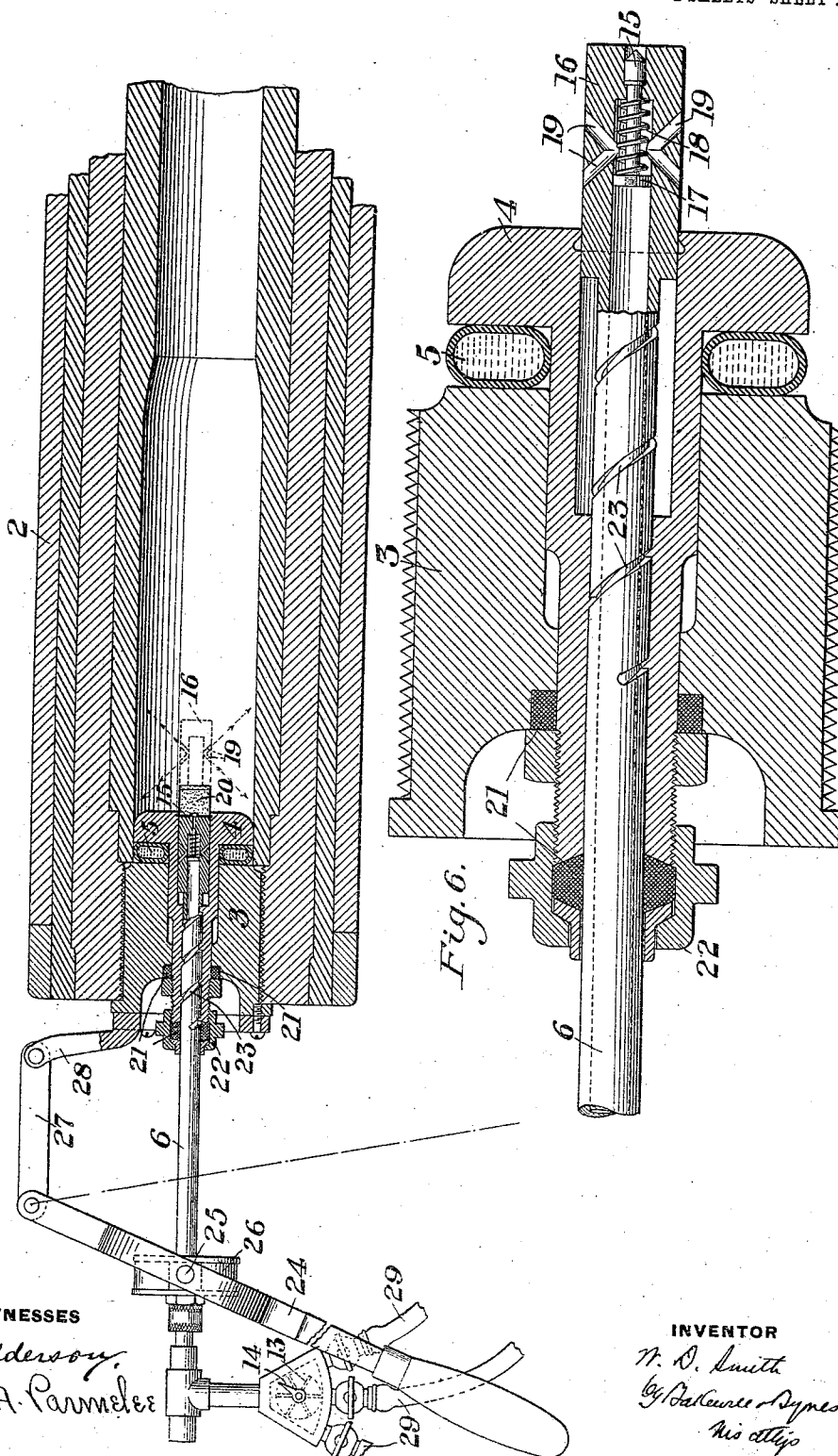


Fig. 6.

WITNESSES

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UNITED STATES PATENT OFFICE.

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METHOD OF CLEANING THE EXPLOSIVE-CHAMBERS OF ORDNANCE AFTER FIRING.

944,974.

Specification of Letters Patent.

Patented Dec. 28, 1909.

Application filed October 9, 1905. Serial No. 281,930.

To all whom it may concern:

Be it known that I, WILLIAM D. SMITH, of Denver, in the county of Denver, Colorado, have invented a new and useful Method of
5 Cleaning the Explosive-Chambers of Ordnance After Firing, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in
10 which—

Figure 1 is a longitudinal section of a gun constructed in accordance with my invention, a part of the gun being broken away; Fig. 2 is an enlarged sectional view of the
15 breech-block with my attachment applied thereto; Fig. 3 is a sectional view of the breech-block showing a modified construction; Fig. 4 is a sectional view of the mushroom-head; Fig. 5 is a view similar to Fig. 1
20 showing another modification; and Fig. 6 is an enlarged sectional view of the breech-block, firing-pin and injector, as shown in Fig. 5.

In the handling of large guns, serious and
25 destructive accidents have occurred by what is termed the "flare-back", the flame resulting from the ignition, in some manner not fully understood, of the residual gases attendant upon the combustion of smokeless
30 powder. Accidents of this kind are particularly apt to happen when firing guns to windward, but under the conditions heretofore existing, they may happen under any circumstances, and the serious consequences
35 resulting render it of the greatest importance to provide means by which they can be certainly prevented.

It is one purpose of my invention to accomplish this result, and I have found that
40 it can be attained by injecting into the gun after firing and before removal of the breech-block, a jet of fluid, such as water, steam or air, which will act to displace the residual gases or other foreign matter contained within the gun. When the fluid used
45 for this purpose is water or steam, it will also act to effectually extinguish all sparks, and will thus render it safe to remove the breech-block and to introduce the next
50 charge.

While the use of steam, air, or any other suitable liquid or gas, is within the scope of my invention, I have found water to be particularly advantageous for the purpose,

for the reason that it not only displaces the
55 residual gases and other foreign matter in the gun, but it effectually washes out the gun after each discharge and obviates the necessity of sponging; also, if the combustion does not take place promptly, instead of
60 waiting for a sufficient period to elapse to insure absolute safety, the jet of water may be introduced and the powder saturated with the same, thus allowing the immediate opening of the breech with safety.

A further object of my invention is to provide an improved method of operating the firing-pin by means of a jet of air, water, or other fluid under pressure, and I
65 preferably subsequently make use of this same jet of fluid for the purpose first described.

My invention also provides for the thorough lubrication of the chamber of the gun.

My invention may be carried out with apparatus of various constructions. I have,
75 however, invented apparatus which I deem preferable, and which I have shown in the drawings and will now describe, premising that my invention is not limited thereto.

In these drawings, 2 represents a gun which in the usual manner is built up of a series of concentric tubes, 3 is the breech-block, 4 is the mushroom-head which is
85 slidably mounted at the inner end of the breech-block, and 5 is the usual compressible gas-check which is expanded by the backward motion of the mushroom-head when the gun is fired. These parts are common and well known, either in the form in which
90 I have illustrated them or any other equivalent forms.

In carrying out my invention I provide a tube 6 which extends longitudinally through a passage in the breech-block, and has a conical or otherwise enlarged head 7 which
95 seats at the end of said passage, so that when the tube is retracted to its full extent, as shown by full lines in Fig. 1, the head seating at the end of the passage will close
100 the same against the back passage of the gases from the gun, but when the tube is moved forward as indicated by dotted lines in Fig. 1, it will expose lateral passages 9
105 from which the jets of cleansing fluid can be discharged as described below. This tube is preferably moved through the breech-block by providing it with external screw-

threads extending throughout its length as shown in Fig. 1, fitting in a female thread in the passage in the breech-block, so that by turning the tube by means of a hand-wheel 10 or otherwise, it can be moved forward and caused to project from the mushroom-head within the gun to the desired extent. I may, however, as shown in Fig. 4, form the screw-thread only along a portion of the length of the tube 6 and along only a corresponding portion of the passage in the mushroom-head. The first few turns of the tube will then screw the tube forwardly within the mushroom-head and will disengage its screw-threads from the latter, and thereupon it can be moved forwardly during the remainder of its stroke by a longitudinal motion. This enables the device to be operated more quickly and therefore may be more desirable where very rapid firing is sought for.

In the modification shown in Fig. 3, the screw-thread on the tube engages the breech-block, and not the mushroom-head as in the other figures. In this case I may employ the tube as a means of drawing the mushroom-head toward the breech-block and thus compressing and expanding the gas-check independently of the act of explosion, thus causing the force of the explosion to be less severe on the breech-block than heretofore. This compression of the gas check is effected before each firing to effect an initial compression of the check substantially equal to or greater than that ordinarily effected by the explosion.

When the apparatus is constructed as shown in Figs. 1 and 2, immediately after the firing of the gun the operator screws forward the tube 6 so as to cause its inner end to project forward of the mushroom-head, and thereupon a current of the cleansing fluid is forced through the tube 6 and out of the jet holes 9. The screw is then turned farther and is caused to advance within the combustion chamber of the gun as shown by dotted lines in Fig. 1, and as it advances with a rotary motion, the jets are caused to impinge around the circumference of the combustion chamber and are distributed around the same, thus reaching all parts of the wall of the combustion chamber and effectually cleaning it from hot sparks as well as displacing the residual gases from the combustion chamber forwardly and out of the gun. This entirely prevents portions of burning gunnysack or powder from adhering to the rifling or any portion of the gun, and also displaces all residual gases from the combustion chamber so as to make it perfectly safe to remove the breech-block and to introduce a new explosive charge. Where steam or water is introduced, the current not only mechanically displaces the gases and sparks, etc., but also extinguishes

such sparks, steam being well known to be one of the most effectual mediums for the extinguishment of sparks and fire.

Where the form of the invention shown in Fig. 4 is employed, after the tube has been turned sufficiently to disengage its screw-threads from the threads of the mushroom-head, the tube is then pushed forward by hand, and may be rotated while it is being pushed so as to accomplish the distributing of the jets which I described above.

The apparatus shown in Fig. 3 may be operated in like manner as that shown in Fig. 1.

A further useful feature of my invention consists in providing the pipes 11, 12 by which the steam and air are supplied to the tube with small vanes or fluid-operated wheels 13 which may be provided with exterior index hands 14. So long as any substantial current is passing through the tubes these vanes will rotate, causing the hand on the outside to rotate. Thus, when the operator turns the tube 6 so as to project its forward end within the combustion chamber of the gun, if the gun has been fired the jet will immediately pass through the tube and the corresponding vane or vanes will rotate with great rapidity. If, however, these vanes should not rotate when the tube is thus projected the gunner will immediately know that the gun has not been discharged, and by thus providing a reliable and efficient means of determining this point, this portion of my device affords an important safeguard against accident arising from premature opening of the breech-block.

Figs. 5 and 6 illustrate a construction which may be employed for carrying out my improved method of operating the firing-pin. In these figures the firing-pin 15 is seated in the chambered block 16 which is located within the mushroom-head 4 and is carried by the tube 6 which is similar to the corresponding tubes of the constructions first described, in that it may be used to introduce a jet of fluid under pressure. Seated within the block 16 is a piston 17 which operates the firing-pin 15 against the pressure of a retracting spring 18. 19 are discharge or jet passages in the block 16. These discharges are directed at different angles, and any desired number of them may be provided, their inner ends communicating with the interior of said block and with the passage of the tube 6. 20 indicates the priming cartridge or shell, which is arranged to be held in the end of the mushroom-head in such a manner that it can be readily forced out by the longitudinal movement of the tube 6. 21 designates suitable packing rings, and 22 a stuffing box. The tube 6 may be operated by any suitable means, including those shown on Sheet 1 of the drawings, but in Fig. 5 I have shown it as pro-

vided with an external screw-thread 23 engaging a corresponding thread in the stem of the mushroom-head. 24 is an actuating lever pivoted at 25 to a collar 26, and connected by a link 27 with a support 28. By actuating the lever 24 the tube 6 may be rotated and at the same time advanced or retracted, its advanced position being shown by the dotted lines in Fig. 5, and in full lines in Fig. 6, while its retracted position is shown in full lines in Fig. 5. 29 designate the supply pipes for the tube 6.

The operation is as follows:—A jet of fluid, such as water, air or steam being admitted to the tube 6, impinges upon the piston 17 and thereby actuates the firing-pin. After the firing has taken place, the tube 6 is advanced, thereby bringing the openings 19 within the chambered gun and the fluid is discharged against the walls thereof as the said tube continues to be advanced and rotated in a similar manner to that effected by the arrangement shown on Sheet 1 of the drawings. After the products of combustion have been removed by the introduction of the jet of water or other fluid in the manner described, a jet of oil under pressure may be injected through the tube 6 in the same manner, the supply being by way of one of the pipes 29.

In doing this, the screw 6 is actuated just sufficient to separate the inclined surface of the head 7 from its seat in the head 4, without advancing the openings 9 into the chamber of the gun. The oil, which enters the tube 6 under pressure, is thrown forward into the bore of the gun which is thereby lubricated. This lubrication very greatly reduces wear in the bore, and materially prolongs the life of the gun.

While, as before stated, I may use any suitable fluid in accomplishing the first object of my invention, I prefer water for the reasons stated, and for the further reason that it has a maximum cooling effect upon the gun.

My invention not only eliminates danger to the person who is operating the gun, but also excludes the entrance of foul air from the gun into the turret, thereby increasing the comfort of the gunners and enabling them to work more quickly and efficiently. It also enables a much more rapid firing. By keeping the guns clean and cool after each passage, as well as thoroughly lubricated, the danger of shells sticking and bursting in the muzzle of the gun is eliminated. Undue stress from crystallization of the steel is also prevented.

It will be readily understood that my invention can be carried out with many different forms of apparatus and that those which I have shown and described herein are merely illustrative of suitable apparatus for the purpose.

What I claim is:—

1. The method herein described, which consists in introducing a movable laterally directed fluid jet into the combustion chamber of a gun after the explosion and before removing the breech-lock; substantially as described. 70

2. The method herein described, which consists in introducing a fluid jet into the fluid jet, such as water, air or steam, into the combustion chamber of the gun after the explosion and before removing the breech-block, and moving such jet forwardly along the course of the combustion chamber; substantially as described. 75 80

3. The method herein described, which consists in introducing a fluid jet into the combustion chamber of the gun after the explosion and before removing the breech-block, and imparting a rotation to such jet within the combustion chamber; substantially as described. 85

4. The method herein described, which consists in introducing a fluid jet into the combustion chamber of the gun after the explosion and before removing the breech-block, and imparting a rotative longitudinally advancing movement to the jet within the combustion chamber; substantially as described. 90 95

5. The method herein described, which consists in opening into the combustion chamber of the gun, a path for a fluid, such as water, steam, air or other gas, after an explosion, applying such fluid under pressure thereto, and applying the force thereof to an indicator to determine whether the gun has been discharged; substantially as described. 100

6. The method herein described, which consists in introducing through a passage in the breech-block into the combustion chamber of a gun, after it has discharged and before removal of the breech-block, a fluid jet, such as water, steam, air, or other gas, rotating said jet relatively to the chamber, then removing the breech-block, inserting another charge, and firing the same while said passage is closed; substantially as described. 110 115

7. The method herein described, which consists in introducing a longitudinally and circumferentially moving jet of water into the combustion chamber of the gun after the explosion and before removing the breech-block; substantially as described. 120

8. The method herein described, which consists in introducing into the combustion chamber of the gun after firing and before opening the breech block, a movable jet of lubricating fluid; substantially as described. 125

9. The method herein described, which consists in introducing a movable fluid jet into the combustion chamber of the gun after the explosion and before removing the 130

breech-block, for the purpose of cleaning the gun and removing the products of explosion therefrom, and subsequently introducing to said chamber a jet of lubricating fluid; substantially as described.

5 10. The method herein described of operating the firing pin of a gun by applying fluid pressure thereto, and subsequently causing the actuating fluid to be ejected into
10 the chamber of the gun; substantially as described.

11. The method herein described, which consists in operating the firing pin of a gun by means of fluid pressure applied thereto,
15 and subsequently after the explosion introducing jets of the fluid into the chamber of the gun for the purpose of cleaning the same; substantially as described.

12. The method herein described, which consists in operating the firing pin of a gun
20 by means of a fluid under pressure applied thereto, and subsequently, after the explosion, advancing the pin carrier into the chamber of the gun and ejecting the fluid
25 into said chamber; substantially as described.

13. The method herein described, which consists in actuating the firing pin of a gun by means of fluid supplied thereto under pressure, subsequently, after the explosion,
30 introducing jets of the fluid into the chamber of the gun to cleanse the same, and prior to re-loading, introducing a lubricating jet into said chamber; substantially as described.

14. The method herein described, which
35 consists in injecting a moving jet of liquid into the combustion chamber of the gun after the explosion and before removing the breech-block; substantially as described.

15. The method of operating guns which
40 consists in actuating the mushroom-head after closing the breech, and before firing, to produce independently of the explosion, a compression of the gas check substantially
45 equal to or greater than that usually effected by the explosion; substantially as described.

In testimony whereof, I have hereunto set my hand.

W. D. SMITH.

Witnesses:

GEO. B. BLEMING,
GEO. H. PARMELEE.