(No Model.)

2 Sheets—Sheet 1.

W. A. BARTLETT.

PNEUMATIC CANNON.

No. 294,351. Patented Mar. 4, 1884.

Fig 44.

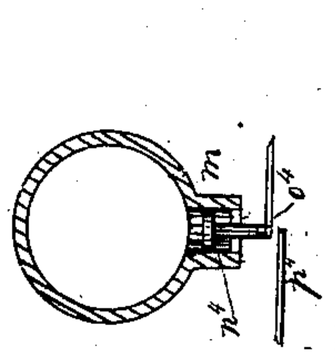


Fig 41.

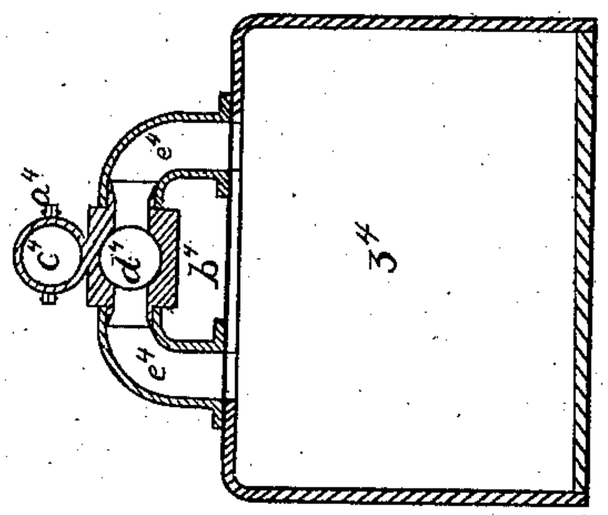


Fig 40 XX

Fig 40 X

Fig 43.

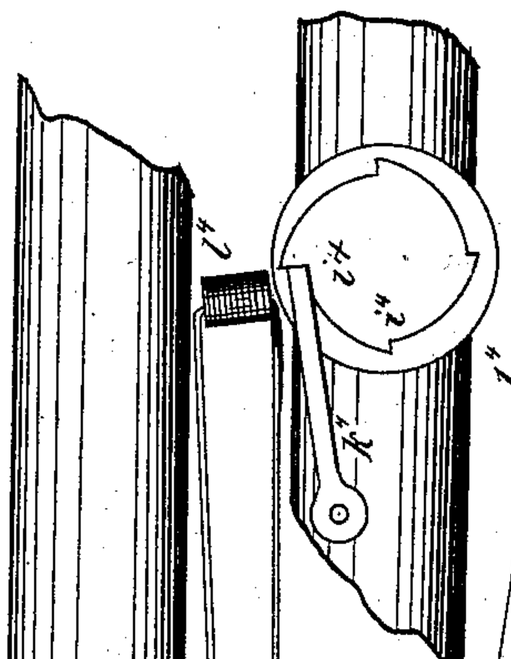


Fig 40.

Fig 42.

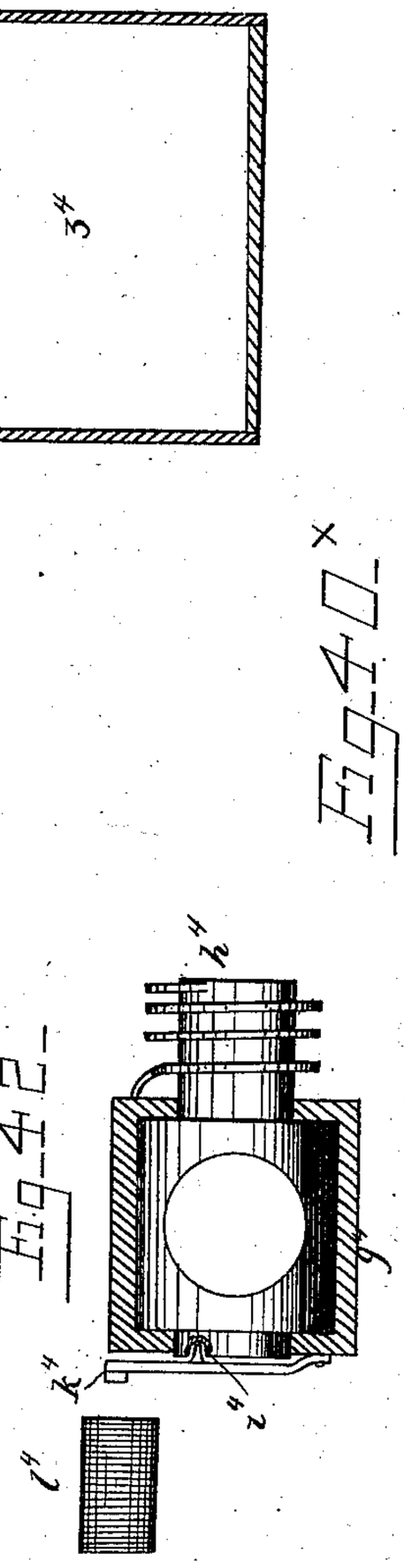
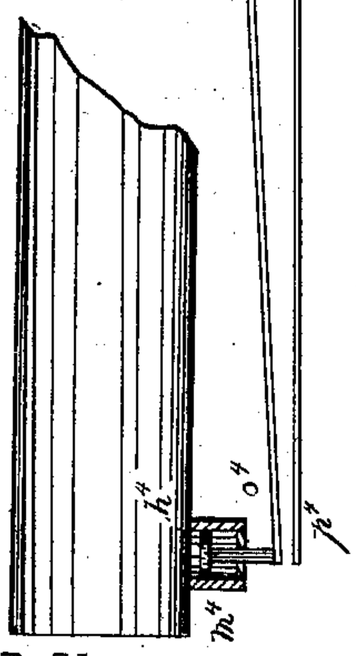


Fig 45.

Fig 44.



Witnesses—

E. H. Brown.

Philip Hawley

Inventor—

Wallace A. Bartlett

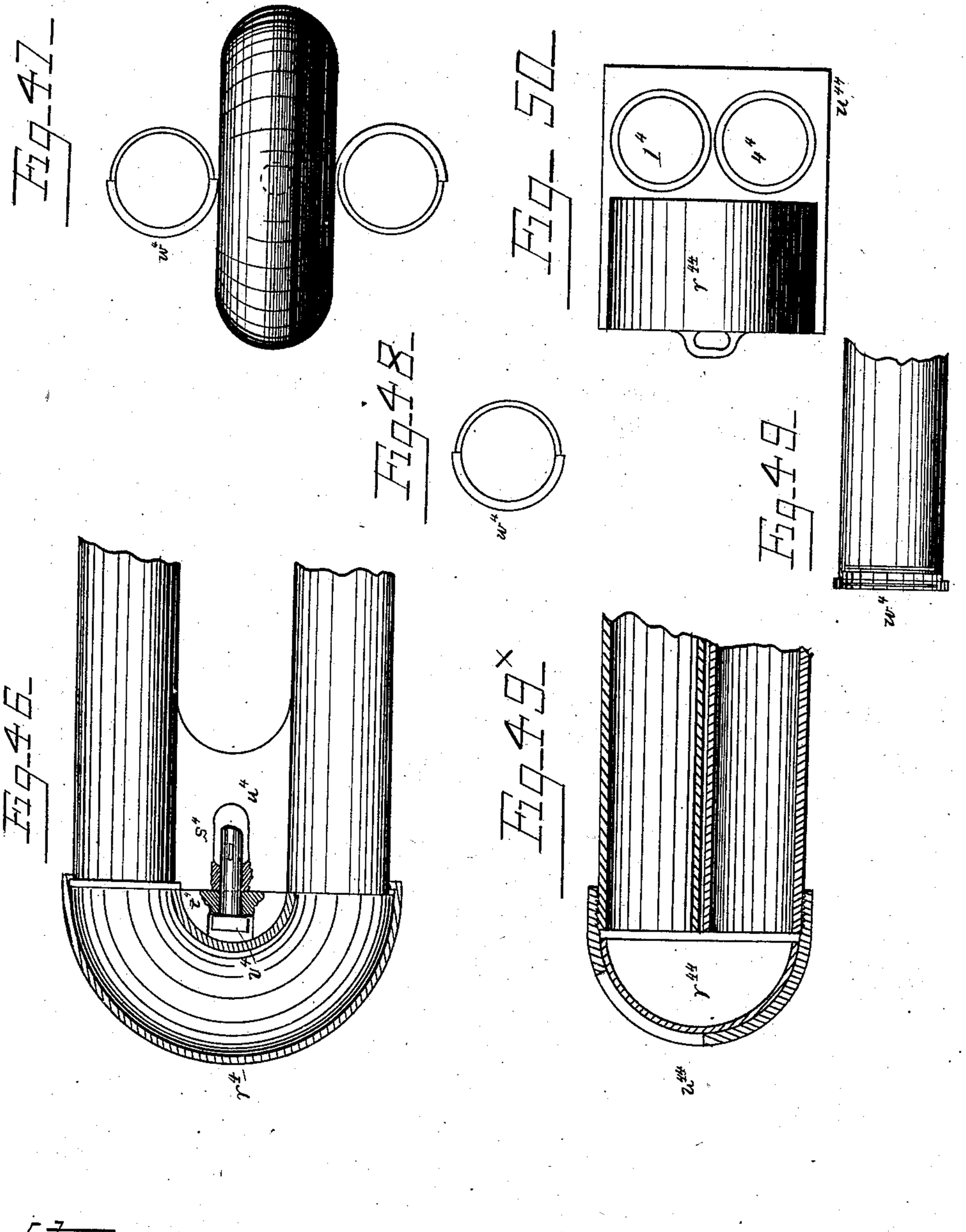
(No Model.)

2 Sheets—Sheet 2.

W. A. BARTLETT.

PNEUMATIC CANNON.

No. 294,351. Patented Mar. 4, 1884.



Witnesses.
C. W. Brown.
Philip C. Hawley.

Inventor.
Wallace A. Bartlett

UNITED STATES PATENT OFFICE.

WALLACE A. BARTLETT, OF WASHINGTON, DISTRICT OF COLUMBIA.

PNEUMATIC CANNON.

SPECIFICATION forming part of Letters Patent No. 294,351, dated March 4, 1884.

Application filed January 8, 1884. (No model.)

To all whom it may concern:

Be it known that I, WALLACE A. BARTLETT, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Pneumatic Cannon, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to pneumatic cannon or similar ordnance in which the projectile is thrown by the pressure of compressed air or gas which is generated or contained in a flask which is separate from the gun-tube.

The invention consists in the structure and mounting of the gun in relation to the flask; also, in mechanism for closing the supply-valve; also, in a breech-closing apparatus; also, in certain details hereinafter claimed.

The object of the invention is to produce a gun which shall be capable of projecting shells loaded with dynamite or other high explosive without great initial shock, and consequently without danger of bursting in the gun.

In the drawings, Figure 40 is a side elevation of the gun mounted on the flask, which serves as a carriage. Figs. $40^{\times}$ and $40^{\times\times}$ are views showing the application of tie-rods to the gun-tube supports. Fig. 41 is a cross-section through the trunnions; Fig. 42, a plan of valve. Fig. 43 is a broken section, showing on a larger scale mechanism for operating the valve automatically. Fig. 44 is a cross-section of the barrel near the muzzle; Fig. 45, one of the trunnions in section, enlarged; Fig. 46, a side elevation of the breech-closing mechanism; Fig. 47, a rear elevation of the same, the breech being open. Figs. 48 and 49 are details of the breech mechanism. Figs. $49^{\times}$ and 50 illustrate a modified form of breech-closing apparatus.

1^4 indicates the gun tube or barrel, which passes through and is supported by a trunnion-band, a^4, and is strengthened against flexure by a strengthening piece or web, 2^4, which we may call a "fore-stock." The trunnion-piece b^4 is hollow or cored for the passage of the gun-tube at c^4, and also has a T-shaped passage, d^4, leading to the trunnion-supports e^4; or it may have a single passage through one trunnion and support, and so to the flask 3^4, the other trunnion and support being solid. The two trunnion-supports e^4 e^4 are preferably secured solidly to the top or dome of the flask 3^4, although the trunnion-supports may be on a swiveled plate having communication with the interior of the flask 3^4; but as this requires the sealing of another joint against the passage of gas under great pressure, I prefer to train the gun by the movement of the flask, which may be mounted on rolls for the purpose. The trunnions turn in gas-tight bearings in the supports e^4. To assist in closing the joint I make the hollow trunnions, or a lining for them, with a sharp edge, as shown in Fig. 45, so that the expansive force of the gas in the trunnion will expand the thin edge of the tube and act as a gas-closing joint.

The supply-pipe 4^4, preferably a little larger in diameter than the gun-tube, leads from the trunnion-piece b^4 to the rear of the gun, and is supplied with valves, preferably two in number, for closing the air-passage. The valve nearest the flask f^4 may be simply a turn-cock or gate-valve, and is to relieve the operating-valve g^4 from pressure when not in use.

The valve g^4 is in a suitable valve-case, and its spindles extend through said casing, the casing of course being a continuation of the supply-pipe 4^4. One of the spindles h^4 of the valve is surrounded by a strong spiral spring, which is so connected to the valve-casing and spindle as to have a constant tendency to rotate the valve when the spring is wound up. Mechanism by which the spring may be wound up without rotating the valve is described in another application filed of even date herewith, and is not herein claimed, but may be used with this valve. The other valve-spindle (or it may be the same one) has stops or notches i^4, with which the trigger k^4 engages to hold the valve against the rotative force of the spring. The trigger k^4 is pivoted or mounted a little back from the valve, and may engage with perforations in the end of the valve-spindle, as at Fig. 42, or with ratchet-teeth on the edge thereof, as in Fig. 43. The trigger may be mounted on elastic bearings, or be faced with elastic material, the better to resist the shock of the sudden stoppage of the valve.

The gun-tube near the muzzle has a small cylinder affixed thereto, which cylinder m^4 has a piston and rod, n^4, which actuate one wire,

o^4, of an electric circuit. The cylinder has communication with the bore of the gun, and when the muzzle of the gun is closed by the passing projectile the pressure of air in the bore will actuate the piston, and so close circuit between the wires o^4 p^4.

In lieu of the cylinder and piston for closing the electric circuit, other devices may be employed—as, for instance, a pivoted lever, as described in one of the applications hereinbefore referred to, filed by me of even date herewith.

The closing of the circuit excites or brings into operation the electro-magnet l^4, which causes the trigger k^4 to rise or release the stop i^4 on the valve-spindle; but as the passage of the projectile is almost instantaneous, the pressure on piston n^4 will be as instantaneously removed, and the circuit will be broken by rising of the piston, caused by the pressure of the air in the cylinder beneath it, or by a spring. The magnet at once loses its power, and the trigger falls into the path of the next succeeding stop and arrests the valve when it has made a quarter of a revolution. The closing of the circuit may also indicate the time of the passage of the projectile through the barrel. The trigger is balanced by springs, so as to be under control of the magnet, but must act instantly when released to catch the valve; or a permanent stop may be arranged to prevent the valve moving too far, in which case the valve will have to be turned back or "set" after each discharge.

It will be understood that a quarter-turn of the valve opens the pipe 4^4 and the next quarter-turn closes it. Thus when the spring is wound up and the valve closed, the first "pull" of the trigger (which need not be by the magnet) releases the valve and permits the spring to turn it to "open" position, where it is caught by the trigger. The next pull of the trigger, which should be by the magnet, (thrown into operation as the projectile is about to leave the muzzle,) permits another quarter-turn of the valve, which shuts off the passage through pipe 4^4.

It must be understood that I do not limit myself to the details of construction herein described. The valve may be a slide-valve or any other form of valve. The electro-magnet may act directly on the trigger or through intermediate mechanism. The same trigger may be made to release the valve for its opening and closing movements; or separate devices may be employed. I believe myself to be the inventor of the method of closing the supply-valve by the flight of the projectile, which I claim, broadly, in another application, before referred to. In this application I limit myself only to mechanism by which the work is done by the closing or breaking of an electric circuit, said mechanism being the equivalent of that herein described. This mechanism need not be put in operation by the projectile, but by hand, by clock-work, or in other ways. Figs. 46, 47, 48, and 49 illustrate a breech-closing mechanism by which the supply-pipe 4^4 may be thrown into connection with the gun-tube. The breech block or elbow r^4 is of such size as to have a passage-way at least equal in sectional area to the area of the bore. In fact, all the passages from the flask to the gun-tube are preferably a little greater in capacity than said tube, so that the full pressure of the gas in the flask may be brought to the projectile without throttling. The valve may be opened gradually if the first shock of the gas pressure on the projectile approaches the limit of safety; but this has not yet been found necessary.

The two inner ends of the bent tube which forms the breech-piece are connected by a web, t^4, which is perforated for the passage of a bolt, s^4, which bolt has a lock-nut, v^4, or a head formed thereon between the web and the tube; or the bolt s^4 may be integral with the breech-piece. The bolt s^4 passes into a seat in the block w^4, which may be the frame of the gun, and is firmly secured to the gun-tube and supply-pipe. If the bolt s^4 is integral with the breech-piece, it must be allowed a partial turn in this block w^4; otherwise the block may turn on the bolt.

The edge of the gun tube or frame is offset a little at w^4, and said offset has a groove into which a corresponding lip on the breech-block fits when the breech is swung to closed position. To open the breech the piece r^4 is swung as shown in Fig. 47. The weight being balanced on the bolt s^4, very little power is required to open and close it. When closed, the breech should be retained in position by a catch.

I may use a common sliding breech-piece, as in Figs. $49^\times$ and 50, in which the block r^{44} slides in frame w^{44}. The block r^{44} has a passage-way leading from the supply-pipe to the gun-tube. Any of the usual devices employed in breech-loading guns to prevent gas-escape may be employed.

The web or angle-iron which supports the gun-tube is preferably secured to the trunnion-piece by bolts, and may be supported at the outer ends by tie-rods, as shown in Figs. 40, $40^\times$, and $40^{\times\times}$. The tube may be slightly adjustable on the brace (to compensate for inequalities in the support) by screws, wedges, or packing.

The gun is loaded by passing a projectile into the gun-tube and closing the breech, it being understood that the flask 3^4 is filled with compressed air or gas, which may be pumped in through any suitable connection, and should be maintained at as nearly a uniform pressure as may be.

The gun is elevated and depressed by any of the devices known in training ordnance, such forming no part of my present invention.

The intermediate valve being open, the gun is discharged by a pull on the trigger, which permits the spring to throw the operating-

valve open. The passage of the projectile operates mechanism; as before explained, to close the valve and prevent further gas-escape.

I claim—

1. The combination of the gun-tube, the supply-pipe, and a trunnion-piece which unites and furnishes a support for both tubes, and a supporting-brace for the gun-tube, secured to the trunnion-piece, substantially as described.

2. The combination of the gun-tube, the supply-pipe, and a trunnion-piece having a socket, as c^4, for the gun-tube, a socket for the supply-pipe, and a supporting-web for the gun-tube, with a hollow trunnion-support through which and through the trunnion gas is supplied to the supply-pipe and gun, as set forth.

3. The trunnion-piece, substantially as described, having a support or sleeve for the gun-tube, a separate support or socket for the supply-pipe, and hollow trunnion with passage-way to the supply-pipe, substantially as stated.

4. The combination of the trunnion-piece, supply and gun tubes, and hollow trunnion-support, as described, with the hollow trunnion having a gas-closing joint consisting of a thin-edged tube and bearing therefor, all constructed and arranged substantially as described.

5. The flask, trunnion-support, trunnion-piece, and supply and gun tubes, constructed and arranged relatively to each other, substantially as described, and two valves—a relief and an operating valve—arranged in the supply-pipe, as set forth.

6. The method herein described of closing the operating-valve of an air-gun, which consists in causing the passage of the projectile to open or close an electric circuit, and by such circuit controlling the movement of the valve, substantially as set forth.

7. The combination, with a pneumatic gun, of electrical connections, substantially as described, arranged to be thrown into operation by the passage of the projectile, and having control of the starting or stopping mechanism of the operating-valve, as set forth.

8. The combination, with the supply-pipe of a pneumatic gun, of a valve, mechanism, substantially as described, to propel such valve, and a trigger or stop under control of an electric circuit, so as to be actuated thereby to permit the opening or closing of the valve.

9. The combination, with the supply-pipe of a gun of the character described, of a spring-valve, a stop or detent for said valve, and electrical mechanism, substantially as described, whereby said detent may be controlled.

10. The combination, with an electric circuit leading from near the muzzle of a gun, of a gas-escape passage from the gun-tube, and mechanism, substantially as described, whereby the escape of gas through said passage will close said circuit, as set forth.

11. The combination, with the air-supply pipe and gun-tube of a pneumatic gun, of a breech-block having a passage-way from one tube to the other, said breech-block being pivoted between said tubes, so as to open or close both tubes when turned on its pivot.

12. The combination of the trunnion-piece, the gun-tube, the brace or web supporting said tube, and tie-rods connecting said brace to the trunnion-piece, as set forth.

13. The combination of the trunnion-piece, the gun-tube, the web or brace secured to the trunnion-piece and supporting the gun-tube, and mechanism, substantially as described, whereby the gun-tube may be adjusted with reference to its supporting-web.

In testimony whereof I affix my signature in presence of two witnesses.

WALLACE A. BARTLETT.

Witnesses:

PHILIP HAWLEY,

C. W. BROWN.