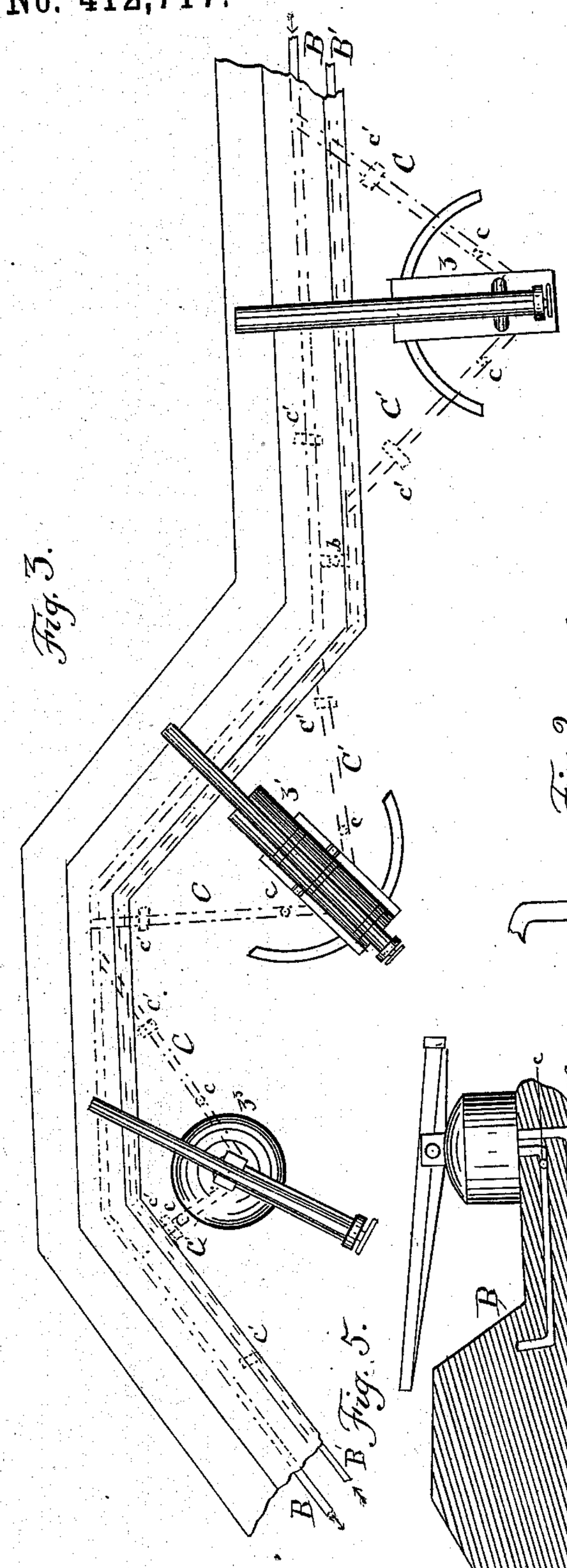
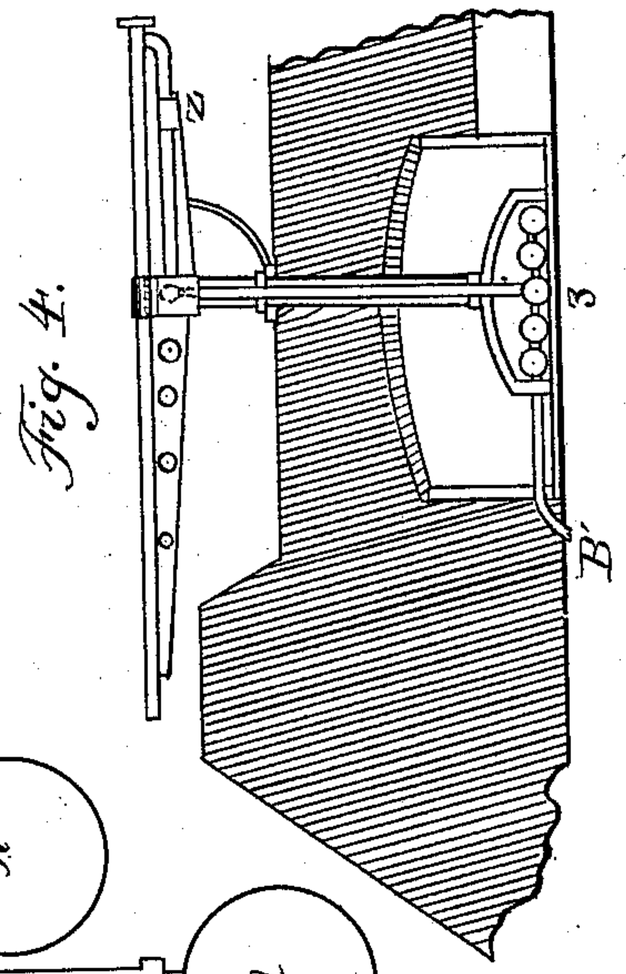
(No Model.) 4 Sheets—Sheet 1.

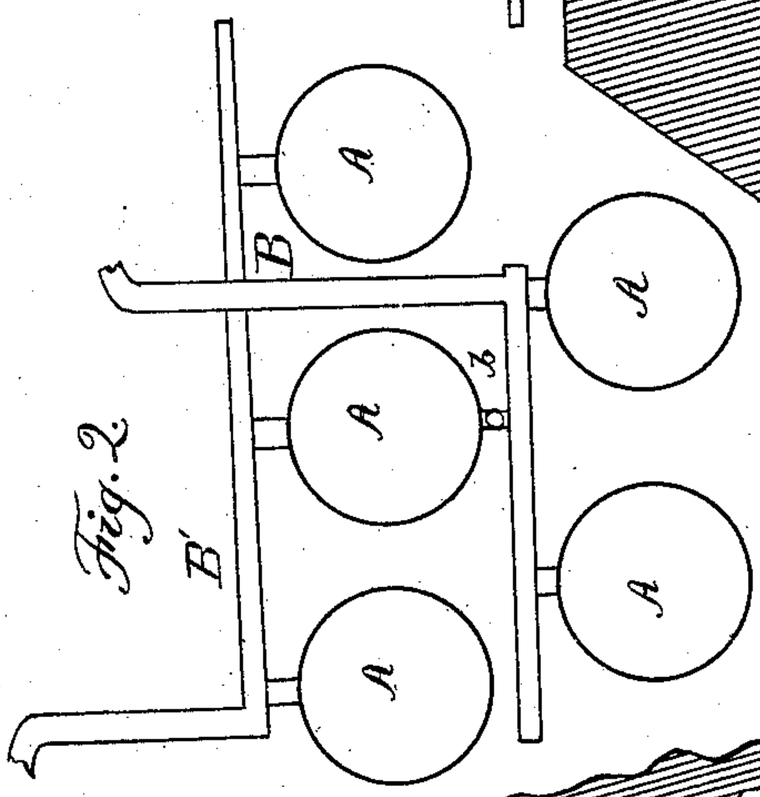
W. A. BARTLETT.

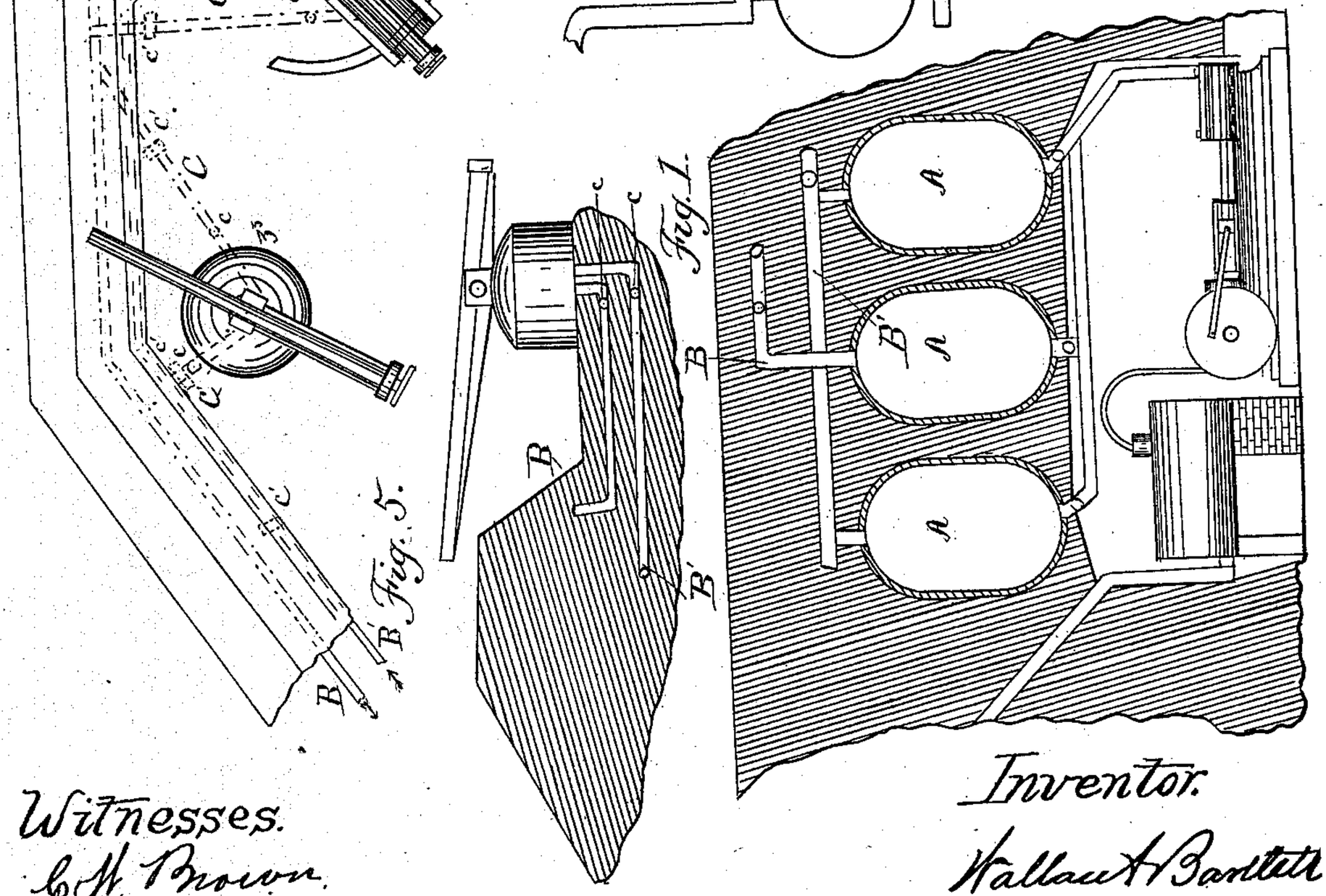
PNEUMATIC CANNON AND SUPPLY SYSTEM.

No. 412,717. Patented Oct. 15, 1889.









Witnesses.
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PNEUMATIC CANNON AND SUPPLY SYSTEM.

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Fig. 7.

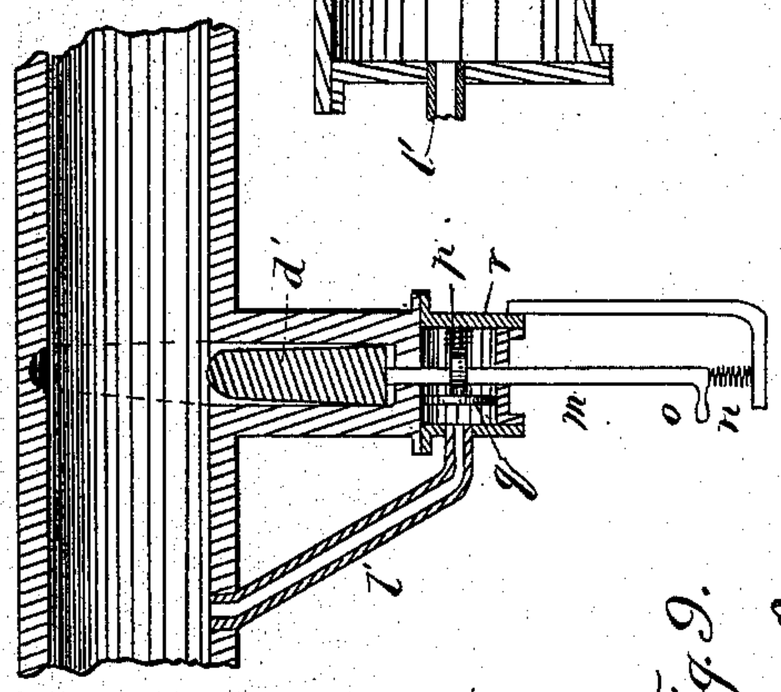


Fig. 8.

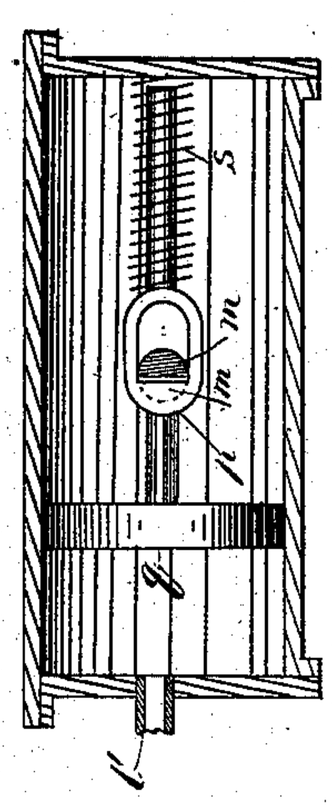


Fig. 9.

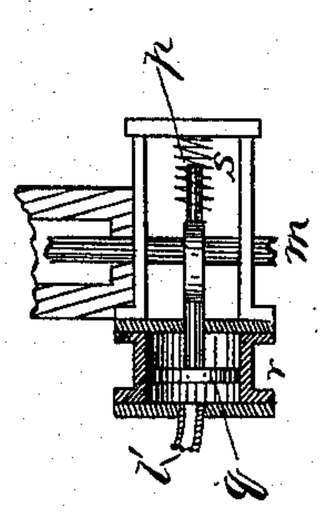


Fig. 9x.

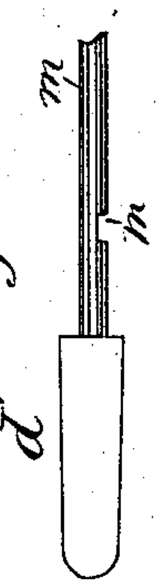
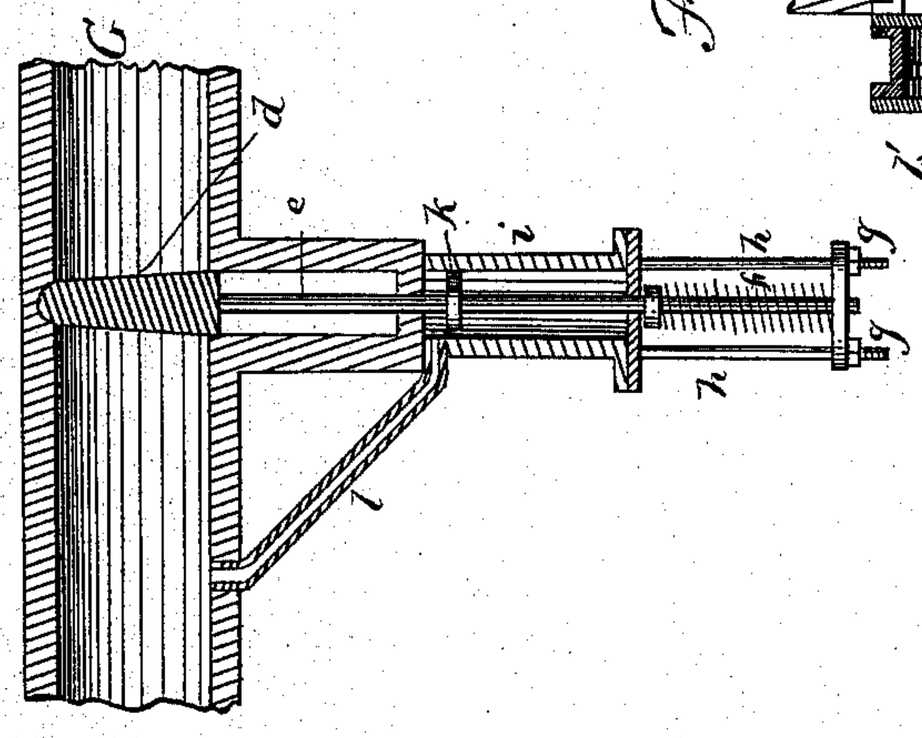


Fig. 6.



Witnesses.
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(No Model.) 4 Sheets—Sheet 3.

W. A. BARTLETT.

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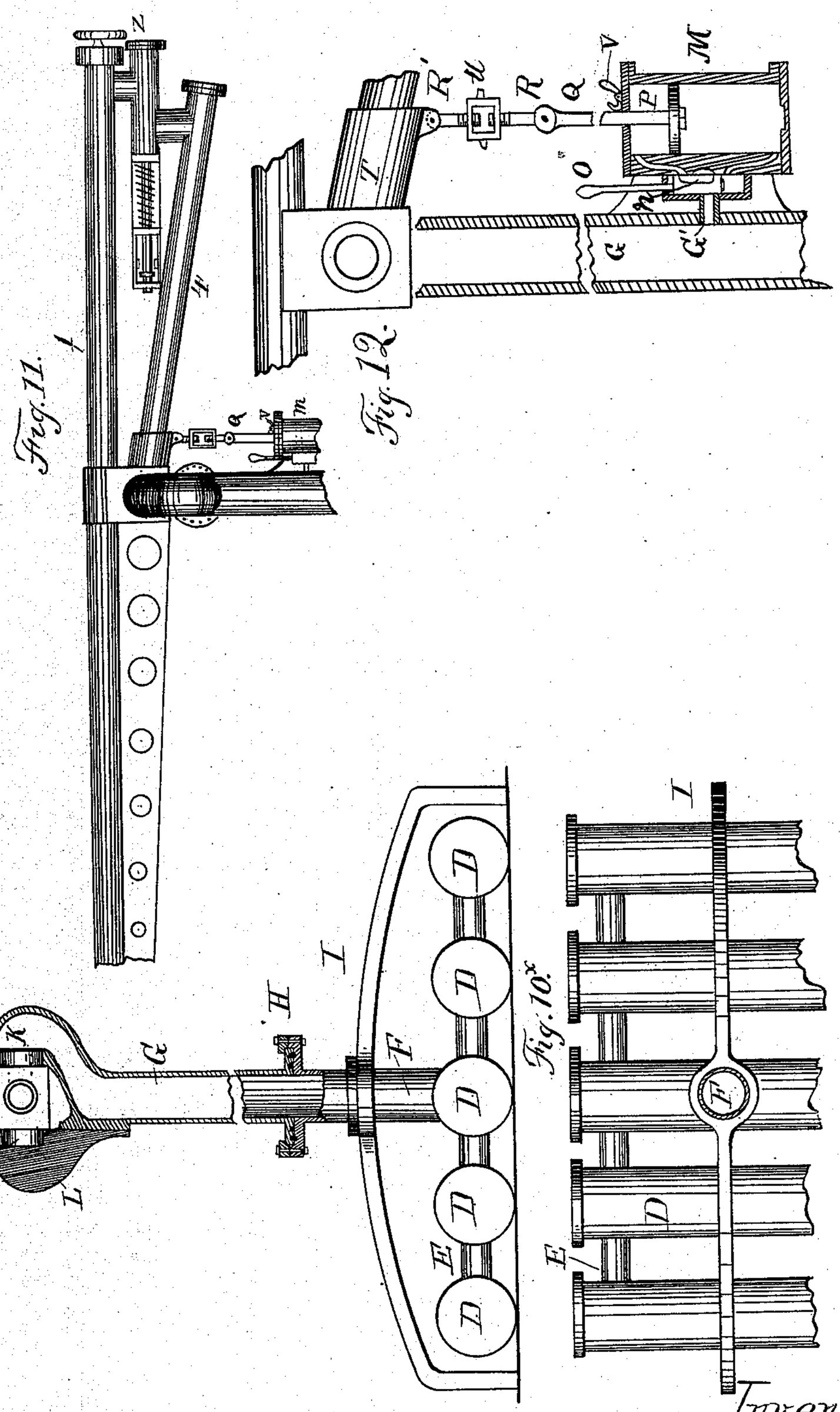

Fig. 11.

Fig. 12.

Fig. 10.

Fig. 10ˣ.

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PNEUMATIC CANNON AND SUPPLY SYSTEM.

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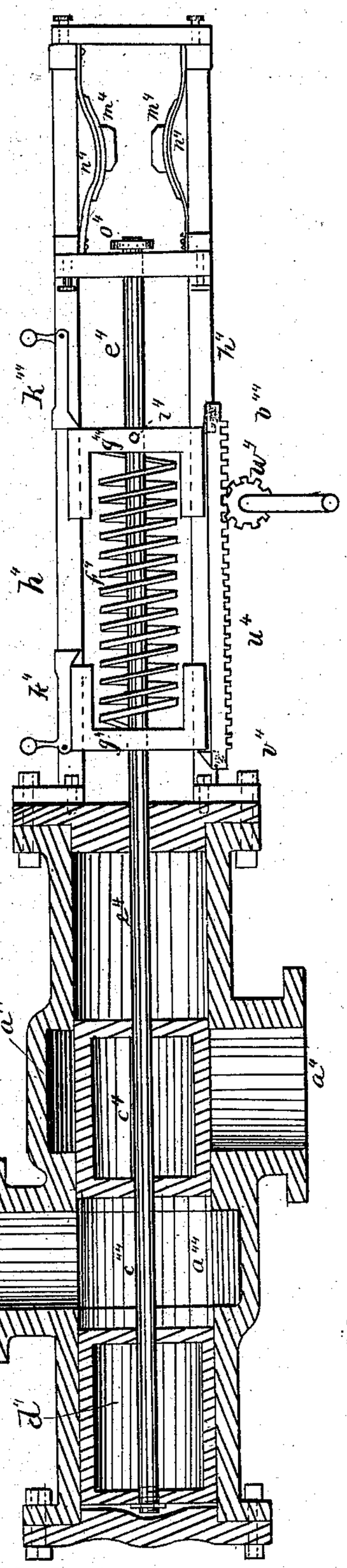

Fig. 13.

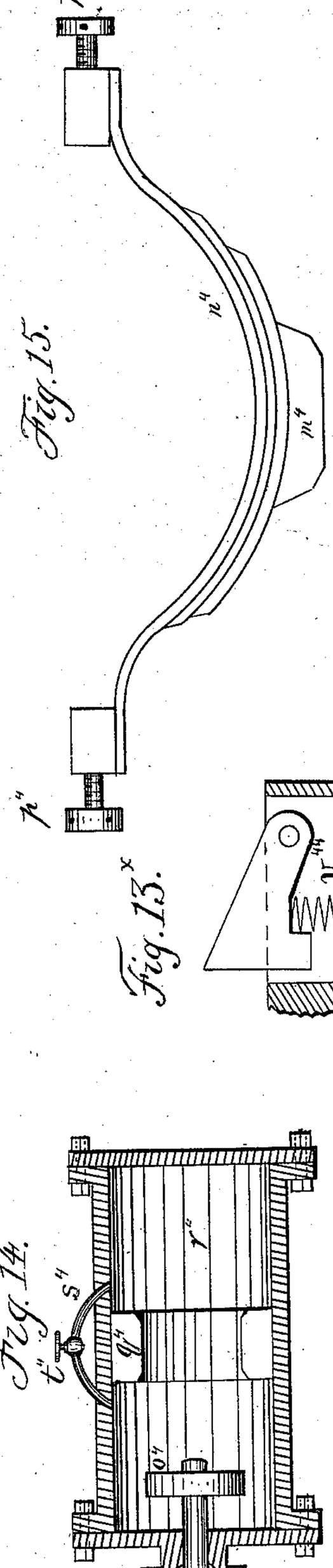

Fig. 15.

Fig. 13x.

Fig. 14.

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UNITED STATES PATENT OFFICE.

WALLACE A. BARTLETT, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE PNEUMATIC DYNAMITE GUN COMPANY, OF NEW YORK, N. Y.

PNEUMATIC CANNON AND SUPPLY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 412,717, dated October 15, 1889.

Application filed March 8, 1884. Serial No. 123,532. (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 and Supply Systems, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to pneumatic or similar cannon and a system of covered or protected supply of compressed air or gas to the same.

My invention consists in the construction and arrangement of a storage or supply reservoir under cover or protection from fire and a system of distributing-pipes therefrom; also, in certain details of construction of the gun and flask, all as hereinafter described and claimed; also, in mechanism for training the gun by means of air-pressure.

In the drawings, Figure 1 is a section of a portion of the body of a fortification or earthwork, showing a bomb-proof containing an air-compressor and storage-reservoirs inclosed in the masonry or earth. Fig. 2 is a plan showing an arrangement of storage-reservoirs. Fig. 3 is a plan of a line of fortification, showing position of guns and supply-pipes. Fig. 4 is a section showing gun mounted with flask in bomb-proof. Fig. 5 is a section showing the connection of supply-pipes with a flask. Fig. 6 is a section of a pipe and stop-valve. Fig. 7 is a section of a pipe and modified stop-valve. Fig. 8 is an enlarged detail of Fig. 7. Fig. 9 is a modification of the detail shown in Fig. 8. Fig. 9× is a further detail of Fig. 7. Fig. 10 is an elevation, partly in section, of a gun-flask, standard, and trunnion-piece. Fig. 10× is a plan of part of said flask. Fig. 11 is an elevation of a gun mounted on said standard. Fig. 12 is an enlarged section of part of the same, parts being in elevation. Fig. 13 is a partial section and partial side elevation of an operating-valve. Fig. 13× is an enlarged detail thereof. Fig. 14 is a modification of the retarding device. Fig. 15 is an enlarged view of one of the springs, Fig. 13.

A A, &c., represent supply or storage reservoirs for compressed air. These reservoirs may be likened to the magazines of a ship or fort, and are placed in such position as to be least exposed to hostile shot. In a fortification they may be sunk as far as needful beneath the surface. In a ship they will preferably be in the bottom of the hold. These reservoirs will be strong iron or steel flasks, of such size as may be most convenient in construction.

The reservoirs A will preferably be in two series or systems, as shown in Fig. 2, each system complete and independent of the other. Each system, whether consisting of one or more reservoirs, will have a supply-pipe leading to the gun or battery which it is to supply with compressed air.

B represents a main supply-pipe from one reservoir, and B′ a similar pipe from the other, These pipes will be entirely independent of each other, although connections may be made, as at *b*, which are normally closed, but which may be opened in case of necessity. The object of a duplicate system, however, is to have one set of pipes in operation even if the other be disabled, and to that end all communications between the two systems must be normally closed.

The main supply-pipes B B′ are placed some little distance apart along the line of fortification, or in a ship, and lead from the storage-reservoirs A to the gun-flasks 3 3′, &c., wherever said flasks may be in battery. The pipes are covered and protected as far as possible and are preferably on different levels. The preferred arrangement is that the air-current shall pass in one line of pipes from right to left and in the other from left to right.

Each supply-main B B′ will have a branch pipe C or C′ leading to each gun-flask. These branch pipes will preferably approach the gun-flask from different directions, so as to avoid to the greatest extent the liability of injury to both at the same time.

The pipes C C′ will usually be supplied with check-valves, as *c c*, to prevent back-

flow or escape from the gun-flasks. Stop-valves c' c' will be placed in each of the branch pipes C C'. These stop-valves are held open by back-pressure from the flask or the portion of the pipe beyond the source of supply, but are closed automatically whenever the back-pressure falls below a certain limit. A valve of this character is shown in section in Fig. 6. In this figure C represents the pipe; d, a gate-valve in said pipe; e, a draw-rod by which said gate is operated; f, a spring tending to close the gate; g g, nuts on sustaining-bars h, by which the tension of the spring may be regulated; i, a cylinder in which piston k slides, said piston being attached to rod e; l, a small pipe leading into the cylinder i from pipe C. When the pressure through this pipe overcomes the force of the spring, the valve will open. When it ceases, the spring will close the valve. Another form of stop-valve is shown in Figs. 7, 8, and 9. In these figures d' represents the valve; m, the rod by which the valve is operated; n, a spring which tends to close the valve, and o a handle by which the valve may be opened. The valve-stem m has a notch m' therein, in which a sliding catch or bolt p may be made to engage. Said bolt p is the piston-rod of a piston q, which works in cylinder r. A pressure on the piston through pipe l' tends to hold the bolt p into the notch m' when the rod m is in position for such engagement; but a spring s bearing on said bolt tends to throw it out of engagement. Thus when the pressure on piston q is sufficient to overcome the force of the spring the bolt p will hold the valve d' open by engagement with its stem; but when the pressure is not sufficient to overcome the force of said spring the valve will be closed automatically. I present these valves as showing the mode of operation, rather than the construction, of such as will be employed with my system of pneumatic supply-pipes.

The valve last described may be slightly modified and used as an operating-valve for the pneumatic cannon. In the present application I intend to cover the method of cutting off the supply automatically by the decrease of pressure, rather than the specific mechanism by which such result is attained.

It is obvious that rotary valves may be used instead of gate-valves, weights instead of springs, and other similar mechanical expedients be resorted to without departing from the spirit of my invention.

It is intended that the pressure in the gun-flasks shall be approximately uniform. Should one of these flasks in a battery be perforated, the escape of gas from that flask would quickly lower the pressure, when the stop-valves would immediately close, cutting out that flask from the mains and leaving mains and the other connections with them undisturbed. By omitting the check-valves both systems of supply-pipes will be connected through the gun-flasks. This may be resorted to on occasion; but I prefer the arrangement by which each system is made to operate independently of the other. In such case one system may be used habitually and the other only thrown into operation in case of accident or disaster to the first.

In first charging a gun-flask from the main it will be necessary to open one of the stop-valves by hand until the pressure in the flask rises high enough to hold the valve open, when it will remain open automatically as long as there is sufficient pressure in the flask. Each gun-flask will be provided with a pressure-gage and safety-valve.

As a pipe of an inch diameter will be ample to supply a number of guns in battery, the plant for a duplex system of supply will not be expensive, and, if found desirable, more than two mains can be laid, although I believe two to be ample to afford security against accidents and casualties.

In Figs. 4, 10, and 10× I illustrate a gas-flask of such construction as to be covered and protected from fire and at the same time a flask which may be cheaply and readily made, and by reason of being in sections may be passed through a small door or aperture, as in a casemate, and there assembled or completed. Figs. 4 and 10 show a pivot-carriage on such a flask.

D indicates a section of the flask. This section is simply a tube or pipe, preferably of steel, closed at both ends. As many sections as may be necessary are joined together by pipes E. The flask composed of these sections is placed in a casemate or pit or the hold of a ship. A pipe F extends upward and forms a pivot for the gun, as well as a means of conveying the air-supply to said gun. The upper portion G of this pipe is connected by a swiveled joint H to said pipe F, so as to turn thereon, care being taken that there is no leakage at the joint. The weight of the pipe G may be supported on a brace I, which spans the flask, so that it shall not rest on the flask, or the weight may be supported by a collar at the level of the floor or deck. The upper section of the pipe G is offset, and serves to support one trunnion K of the gun. The other trunnion is supported by a separate piece L. The air-supply may be led into one trunnion or both, as found desirable. The pipe and its attachment form a yoke or Y, in which the gun is supported. The trunnion-piece and its connections with the air-supply pipe are quite similar to that shown and described in my patent, No. 294,351, of March 4, 1884.

The gun may be elevated and depressed by gas-pressure in the following manner: Alongside the pipe or standard G, I place a cylinder M, which is supplied with compressed air from said pipe or standard through a small pipe-connection G'. The entrance of air to the cylinder is controlled by a slide-valve N,

which is operated by a lever O. A piston P in the cylinder has a rod Q projecting upward. A pitman R R′ connects this piston with the gun or its supply-pipe in rear of the trunnions, as at T. By the admission of compressed air or gas to the cylinder M the piston P will be driven up or down, and in this manner the gun will be elevated or depressed. To insure greater nicety of elevation the pitman-rod (or it may be the piston-rod) is made capable of elongation by means of a turn-buckle U, operating with its right and left screws on threads on the rods R R′, or by an extensible screw-rod. The piston may be clamped firmly in position by means of a cam V, bearing on the piston-rod, should the variation of pressure in the pipe G or in the cylinder tend to disturb the equilibrium of the gun.

The gun can be quickly elevated or depressed to near its firing position by the air-pressure and the final adjustment made by means of the screw. As the sight will usually be applied to the trunnion-piece, the lever and screw will be convenient to the hand of the gunner in training the gun.

The operating-valve is represented at Z. This valve is connected with the supply-pipe through port a^4 and to the gun through port b^4. As shown in Fig. 13, the valve is closed by the plug c^4. This plug c^4 and a similar plug d^4 are carried on a valve-rod e^4. When the rod is moved to the right, the plug c^4 will open the passage between the inlet and outlet ports. A continuation of the movement will close the passage by the entrance of the plug d^4 into position between the inlet and outlet ports. Thus the passage will be opened and then closed by a continuous movement of the valve-rod. Recesses or balance-chambers a^{44} are placed in the valve-chamber in the positions shown in Fig. 13, so that the valve-plugs will be always balanced against the air-pressure, no matter what position they may be in. The valve-rod e^4 will be driven by the spring f^4. This spring is inclosed between cross-heads g^4 and g^{44}, which work in the supporting-bars h^4 of the frame. The valve is shown in position to operate by moving to the right. The cross-head g^{44} is drawn back, compressing the spring f^4 between itself and the other cross-head g^4. The cross-head g^{44} is locked to the rod by a key i^4, and the cross-head g^{44} is held back by the trigger or catch k^{44}. On lifting the trigger or catch k^{44}, the other parts being properly connected, the valve-rod will be thrown to the right, thus opening and then closing the valve.

The valve should open very quickly, then remain open a short time, and then close quickly. The parts can be so proportioned that a movement of the plug of a little more than one inch will throw the aperture fully open for a six-inch gun.

In order that the valve may remain open a little time and to regulate that time, I retard the movement of the valve-rod after the port is fully open. This may be done by friction-pieces m^4, which are held in position by springs n^4. A bearing-piece o^4 on the valve-rod engages these pieces with a frictional contact, and the velocity of movement of the rod is thus reduced. The cross-heads g^4 and g^{44} may be drawn back against the force of the spring f^4 by a rack-bar u^4, which has spring-catches v^4 and v^{44}, one at each end. One or the other of these catches is brought into engagement with its cross-head by turning the pinion w^4. When the valve has been opened and closed by the movement of rod e^4 in one direction, it may be again opened and closed by movement in the reverse direction, the other cross-head in that case being drawn back and engaged by its appropriate trigger. The tension of springs m^4 may be regulated by screws p^4, so that the amount of retardation may be varied.

Instead of the spring-retarding mechanism described above, a cylinder r^4, filled with oil, may be put in the position of the spring-retarding mechanism. The head o^4 of the valve-rod will move with slight resistance in the oil-cylinder until it reaches the portion q^4 of the cylinder, where it will barely pass. The oil in front of the head o^4 is then forced over through pipe s^4 to the other end of the cylinder. The flow through pipe s^4 may be regulated by cock t^4, and thus the velocity of the piston or head o^4 and rod e^4 be regulated.

The communication from supply-pipe 4′ to gun-tube 1 may be in right lines through the valve or in other convenient direction.

I do not herein claim, broadly, the combination, with the supply-pipe of a pneumatic cannon, of a valve therefor, and a retarder operating on the valve against the power of its driver to regulate the speed of movement of the valve.

I claim—

1. A pneumatic cannon, an air-flask therewith, a source of air-supply, (as a compressor or tank,) and separate systems of protected supply-pipes leading to the gun-flask from the source of supply.

2. In combination with a gun, a supply-pipe leading thereto, a stop-valve, connections with the pipe and valve on the gun side for opening said valve, and automatic mechanism (as a spring or its equivalent) for closing the valve on the reduction of back-pressure.

3. In combination with the gas-flask of a pneumatic cannon, a plurality of supply-pipes leading thereto, each pipe being provided with a check-valve and a back-pressure valve.

4. The combination, with the gas-supply pipe of a pneumatic cannon, of a closing-valve, a spring or its equivalent to close the same, and a bolt or catch operated by the back-pressure in the pipe to retain the valve open, but to permit its closure on the reduction of back-pressure, substantially as set forth.

5. The combination, with a pneumatic training device, of a supplementary screw attachment between the same and the gun, whereby the final accurate training of the gun may be effected, substantially as stated.

6. In combination with the gas-flask of a pneumatic cannon and a supply-pipe or standard leading therefrom, on which the gun is supported, a support for said standard independent of the flask, substantially as described.

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

WALLACE A. BARTLETT.

Witnesses:
C. W. BROWN,
E. L. WHITE.