

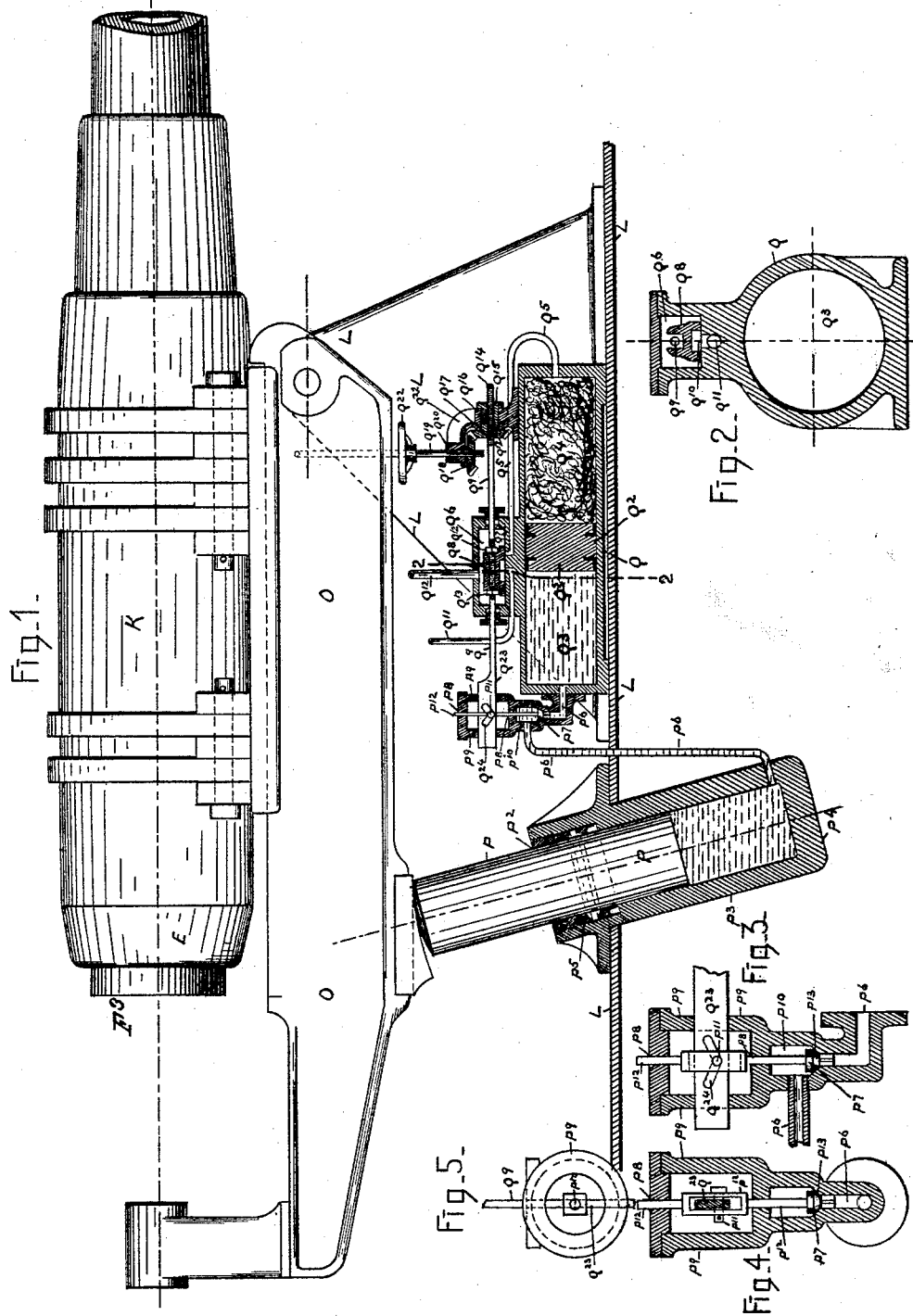
(No Model.)

H. A. SPILLER.

HYDROPNEUMATIC OPERATING MECHANISM FOR GUNS.

No. 458,345.

Patented Aug. 25, 1891.



WITNESSES.
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HYDROPNEUMATIC OPERATING MECHANISM FOR GUNS.

SPECIFICATION forming part of Letters Patent No. 458,345, dated August 25, 1891.

Application filed October 3, 1889. Serial No. 325,863. (No model.)

To all whom it may concern:

Be it known that I, HARRY A. SPILLER, a citizen of the United States of America, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Hydropneumatic Elevating-Gear for Guns, of which the following is a full, clear and exact description.

This invention relates to hydropneumatic gun-carriages.

The object of the invention is to produce a gun-carriage whereby a gun may be raised and lowered rapidly and at will, and retained at any desired elevation, and whereby the recoil of a gun may be taken up without undue shaking or jarring.

With this object in view the invention consists in the combination, with a pivoted gun, of an obliquely-arranged piston or ram attached to the gun, a water-cylinder receiving the piston or ram, and a cylinder containing water under pressure communicating with the cylinder receiving the piston or ram, and having its piston-head operated by compressed air.

Furthermore, the invention resides in the combination, with a pivoted gun having a piston or ram attached thereto, of a water-cylinder receiving the piston or ram and a supplemental cylinder containing water and communicating with the cylinder receiving the piston or ram, a piston-head, and a compressed-air inlet whereby the piston-head may be moved to impose pressure on the water in the cylinder.

Furthermore, the invention resides in the combination, with a pivoted gun, of a piston-rod or ram attached to the gun, a water-cylinder receiving the piston or ram, a supplemental cylinder containing water on one side of its piston-head and having an opening for the admission of compressed air on the other side, a connection between the portion containing water and the water-cylinder, and valves operated by a common rod and governing the passage of water to the water-cylinder and the admission of compressed air to the supplemental cylinder.

Furthermore, the invention resides in various novel details of construction, whereby the object of the invention is attained.

I have illustrated the invention in the accompanying drawings, in which—

Figure 1 is a side elevation of the gun, a beam supporting the gun, a support having the beam pivoted thereon, and a section of the mechanism to raise, depress, and support the gun. Fig. 2 is an enlarged transverse section in detail, the section being taken on line 2-2 of Fig. 1. Figs. 3 and 4 are enlarged vertical sections of the check-valve and mechanism to open and close it, the sections in the figures being taken in planes at right angles to each other, and Fig. 5 is an interior plan view of the valve.

In the drawings, K represents the gun. The gun lies lengthwise of and is supported on a beam O, which is journaled at the forward end, or toward the muzzle of the gun, on a support L, shown as stationary, but which may be a rotating gun-carriage or other suitable support for the gun. The beam O preferably extends to the rear of the breech of the gun.

P is a solid (preferably cylindrical) ram or piston entering the upper open end P^2 of a cylinder P^3 . The cylinder P^3 is fixed on the gun-support L, and its axis and that of the ram are coincident and in an oblique line of direction to the axis of the gun, so as to present the upper end, preferably rounded off, of the ram in position for the rest of the gun-carrying beam O. The axes of ram and cylinder are in the line of the arc of a circle described from the axis of the journal of said beam as a center and in intersection of the axis of the gun at the breech of the gun. The ram P is free to move up and down in the cylinder P^3 , and is suitably packed at P^5 against leakage of a column of water held under pressure in the cylinder below the ram to support the ram and through it and beam O the gun in position and to raise and lower the muzzle of the gun and to resist the recoil of the gun when fired.

P^6 is a pipe leading from the lower end of the cylinder P^3 and upward to one end of a

horizontal supplemental cylinder Q, and making water communication between said two cylinders. The cylinder Q is immovably held on the gun-support L.

5 Q³ is a piston-head, suitably packed and free to move forward and backward in and separating the cylinder into two compartments Q³ Q⁴, one on each of the opposite sides of the piston-head. The compartment 10 Q³ is in communication with the water-chamber of the cylinder P³, as has been explained, and the compartment Q⁴ has a pipe or passage Q⁵ opening into it at the head of the cylinder. This pipe Q⁵ is for the purpose of 15 admitting air under pressure into the compartment Q⁴ of the cylinder Q, and for that purpose it is to be connected with any suitable compressed-air supply. In the present instance this air-passage Q⁵ leads into a horizontal air-chest Q⁶, held on the upper side of 20 the cylinder Q, and having a horizontal valve-stem Q⁹ extending, suitably packed through and projected from the opposite ends of the valve-chest, in position to be used to move 25 the slide-valve forward and backward on its seat Q⁷. This valve-stem is also preferably connected to a valve P⁷ of the water-pipe P⁶, in order that the valves may be operated simultaneously.

30 The slide-valve Q⁸, at its under and seating face and intermediately of the length of said face, has an exhaust-chamber Q¹⁰ open to the valve-seat Q⁷, and the valve-seat has an air-passage Q¹¹ leading from it and this air-passage Q¹¹, which is the exhaust. The valve 35 and the exhaust-chamber Q¹⁰ of valve, as also the air-passage Q⁵ leading from valve-seat to air-compartment Q⁴ of chambered cylinder, are relatively constructed and arranged so that with the slide-valve moved to 40 open the air-passage Q⁵ of chambered cylinder Q to the air-chest Q⁶ the exhaust air-passage Q¹¹, while opened to the exhaust-chamber Q¹⁰ of the valve, is closed to said 45 air-passage Q⁵, and so that with the slide-valve moved to close the air-passage Q⁵ of chambered cylinder Q to the air-chest Q⁶, said air-passage will then be opened to the exhaust-chamber Q¹⁰ of the valve, and it in turn 50 opened to the exhaust air-passage Q¹¹.

Q¹² is a pipe leading into upper side of air-chest Q⁶, and to be connected (the connection not shown) in any suitable and well-known manner to a suitable and any well-known air-supply under pressure, (not shown,) 55 and all so that air under pressure may be admitted into the air-chest, to be from it entered into or shut off from the air-compartment Q⁴ of the chambered cylinder Q by a 60 proper adjustment of the slide-valve Q⁸, as has been explained. The slide-valve Q⁸ is rigidly attached to its valve-stem Q⁹, which passes lengthwise through it and is confined on the stem by screw-nuts Q¹³, so that by 65 suitably turning and setting up the screw-nuts the valve may be adjusted lengthwise on the stem. The valve-stem at one end Q¹⁴ is

screw-threaded and receives a screw-threaded nut Q¹⁵, which is held against longitudinal movement, but free to turn in a bearing Q¹⁶, 70 rigidly held on the upper side of chambered cylinder Q and formed at one end with a vertical bevel gear-wheel Q¹⁷, meshing a corresponding bevel gear-wheel Q¹⁸ held on the lower end of a vertical spindle Q¹⁹, turning in, 75 but suitably held against movement through, a bearing-block Q²⁰ of a standard Q²¹, held on the chambered cylinder Q and supporting also the bearing-block Q¹⁶ for the screw-threaded nut Q¹⁵ and its vertical bevel gear- 80 wheel Q¹⁷, before referred to.

Q²² is a wheel-handle held on gear-wheel spindle Q¹⁹, for convenience in turning it. By suitably turning the wheel-handle Q²² through the gear and other connections between it and 85 the slide-valve Q⁸, all as described, the slide-valve is moved forward or backward, as the case may be, on its seat in the air-chest Q⁶. The opposite end Q²³ of the slide-valve stem Q⁹ to that end Q¹⁴, carrying the screw-threaded nut Q¹⁵, is vertically flat-sided and introduced through a vertical and corresponding 90 guideway P⁸, extending from side to side of a vertical shell or casing P⁹ in upward extension of the water-chamber P¹⁰ for the valve 95 P⁷, hereinbefore referred to, and in the water-passage P⁶, leading between the ram-cylinder P and the water-compartment Q³ of the chambered cylinder Q. The flattened portion of the slide-valve stem Q⁹ has a V-shaped 100 slot or camway Q²⁴, which receives a horizontal pin P¹¹, held on the vertical stem P¹² of the valve P⁷ of the water-passage P⁶. The valve-stem P¹² passes through suitable vertical guideways of the shell or casing P⁹ and 105 water-chamber P¹⁰, containing the valve P⁷, and the valve P⁷ has a suitable seat P¹³ in the water-chamber P¹⁰ of the water-way P⁹, so that with the valve on its seat to close and with the valve raised from its seat to 110 open the communication by the water-passage P⁶ between the ram-cylinder P and the water-compartment Q³ of the chambered cylinder Q. The cam-and-pin connection Q²⁴ P¹¹, between water-valve stem P¹² and slide- 115 valve stem Q⁹, secures the opening and closing of the water-valve on a movement of the slide-valve in opposite directions, and this connection is arranged, for purposes herein- 120 after described, relatively to the opening of the slide-valve either to allow air to enter or to exhaust air from the air-compartment Q⁴ of the chambered cylinder Q, as described, to open and relatively to the closing of the slide-valve, as has been explained, to close the 125 water-valve.

Under the arrangement of mechanism described with the slide-valve Q⁸ opened for the admission of air to and closed to the exhaust or outlet of air from the air-compartment Q⁴ of the cylinder Q and with the water-valve P⁷ opened for water communication between the water columns of the cylinder Q and of the ram-cylinder P, all as has 130

been described, obviously by forcing air into and compressing it in the air-compartment Q⁴ of the chambered cylinder Q the water contained in water-compartments of the cylinder Q and ram-cylinder will be placed under pressure and to a degree sufficient not only to support the gun acting on it through the ram P and the gun-carrying bearing O, but also by raising the height of the water column in the ram-cylinder to raise the gun at its breech, depressing its muzzle, and there to support it on a confined column of water in ram-cylinder P³. With the slide-valve Q³ opened to the exhaust or outlet of air from the air-compartment Q⁴ of the chambered cylinder Q, at the same time opening the water-valve P⁷, and so opening communication between the water columns of the ram-cylinder P and the chambered cylinder Q, the air-pressure in the chambered cylinder Q can be thereby reduced, so as to secure a lowering of the height of the water column in the ram-cylinder and through the ram and gun-carrying beam O a lowering of the gun at its breech and a raising of it at its muzzle, as may be desired, on which, by then closing the slide-valve Q³, so as to shut off the exhaust or outlet of air, as described, at the same time shutting off the water communication between the water columns of ram-cylinder and chambered cylinder the gun can and will be then supported in its position of adjustment by the water column confined in ram-cylinder.

It is thus plain from the description given of the mechanisms of this invention acting in co-operation with a confined column of water under the ram and under pressure the gun is made adjustable, vertically considered, by the rise and fall of a column of water under pressure and is supported in its positions of adjustment on a confined column of water, and again that the rise and fall in the height of said water column is secured from action of a column of air placed either under a greater or less degree of compression, according as it is either in or out of connection with the air-supply under pressure or with the exhaust, and that the recoil of the gun when fired is resisted by a confined column of water, all substantially as has been described.

It is preferable to connect the water-valve P⁷ and air-valve Q³, so as to be operated simultaneously, as has been described; but the connection described or any other suitable connection for the same purpose may be dis-

pensed with and the valves arranged for separate and independent operation. Again, the water-valve P⁷ may be simply a check-valve of any of the ordinary or other suitable constructions and arrangements, but such as to open against and to close with the pressure of the water column in ram-cylinder. A water-valve P⁷, however, constructed and arranged substantially as described is most preferable.

Preferably the gun, as has been particularly described, is supported on a beam journaled on a suitable support; but obviously the gun may be journaled directly on the support itself.

In conclusion, it will be observed that while air and water are specially mentioned as used for the operations of the mechanisms of this invention and as particularly explained the invention is not to be limited in these regards.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a pivoted gun, of an obliquely-arranged piston or ram adapted to act upon the gun-support, a water-cylinder receiving the piston or ram, a cylinder containing water under pressure communicating with the cylinder receiving the ram and having its piston-head operated by compressed air, and valves operated by a common connection and governing the passage of the piston-actuating liquid and the admission of the compressed air to the piston-head, substantially as described.

2. The combination, with a pivoted gun, of a piston-rod or ram attached to the gun, a water-cylinder receiving the piston or ram, a supplemental cylinder containing water on one side of its piston-head and having an opening for the admission of compressed air on the other side, a connection between the portion containing water and the water-cylinder, and valves operated by a common connection and governing the passage of water to a water-cylinder and the admission of compressed air to the supplemental cylinder, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HARRY A. SPILLER.

Witnesses:

ALBERT W. BROWN,
HENRY F. MCKEEVER.