

(No Model.)

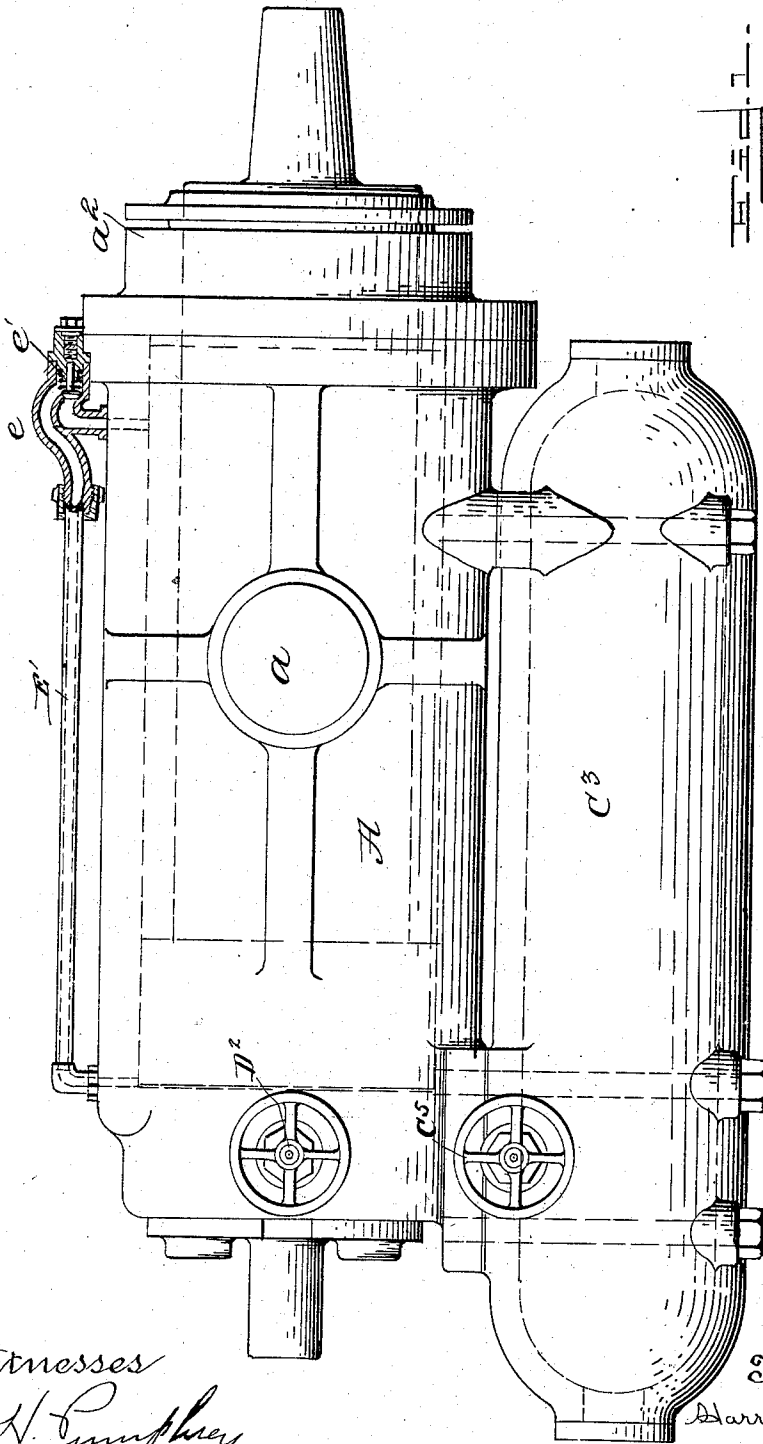
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H. A. SPILLER.

PNEUMATIC RECOIL CHECK FOR GUN CARRIAGES.

No. 552,075.

Patented Dec. 24, 1895.



Witnesses

W. H. Humphrey
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by

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his Attorney.

(No Model.)

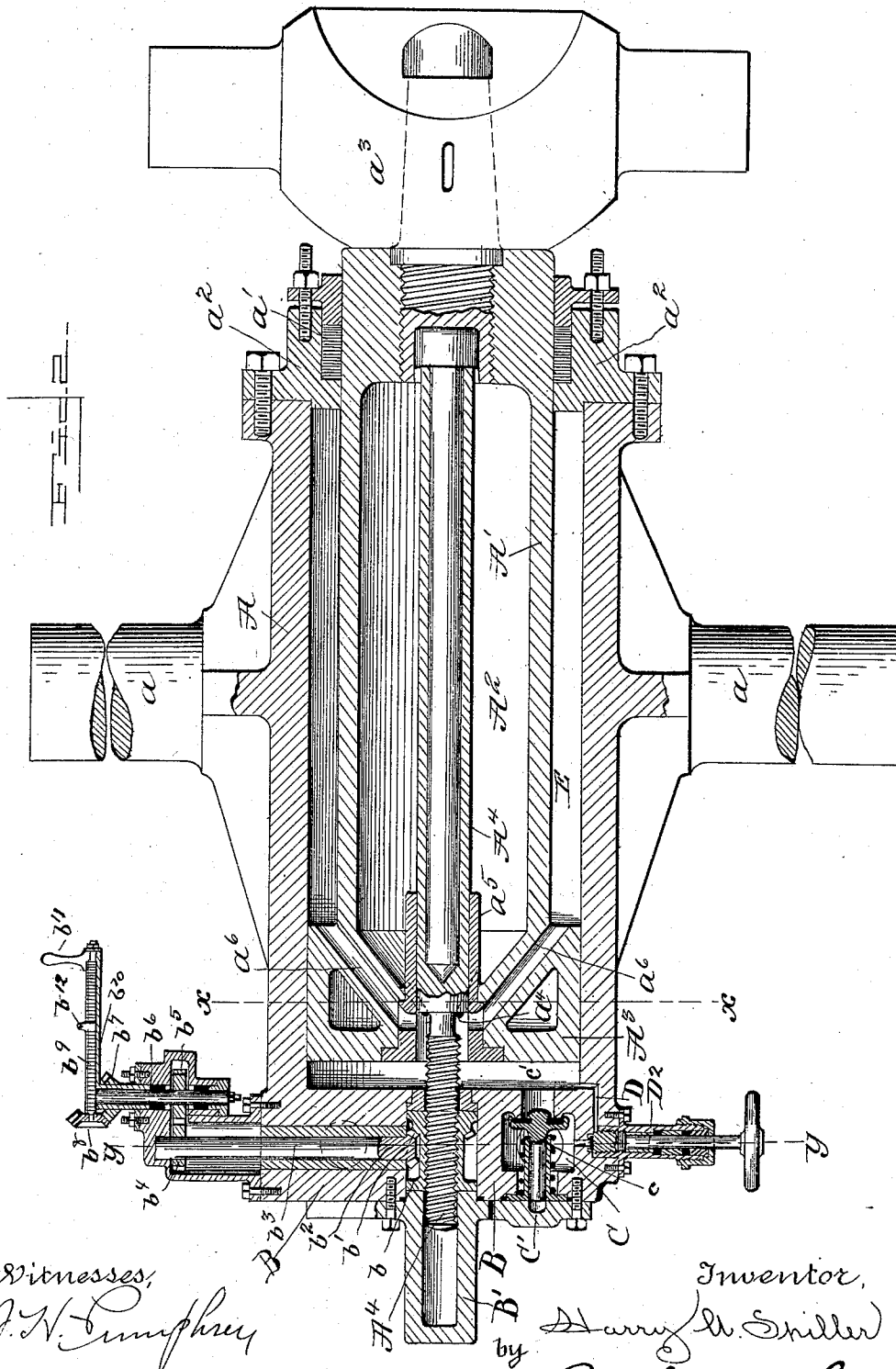
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(No Model.)

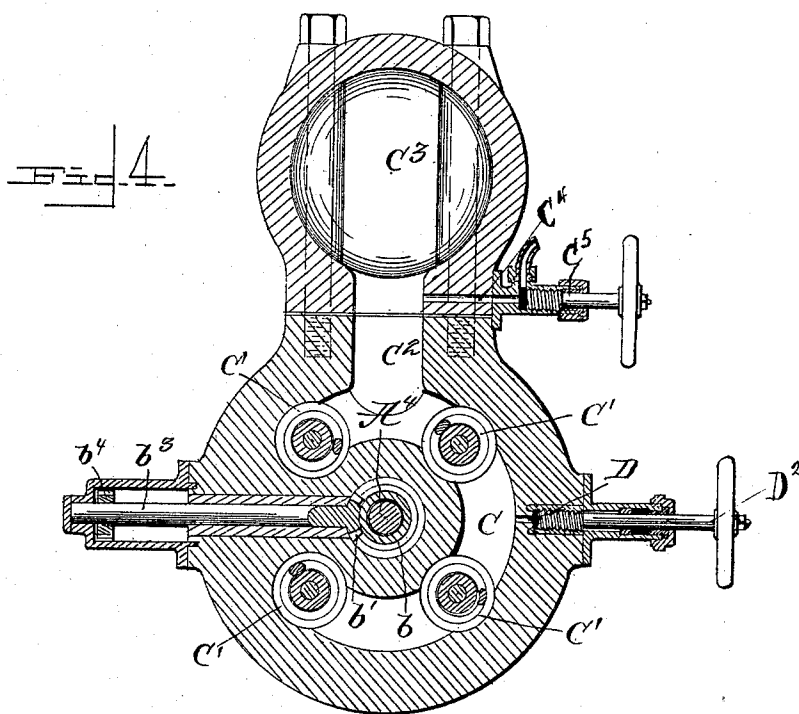
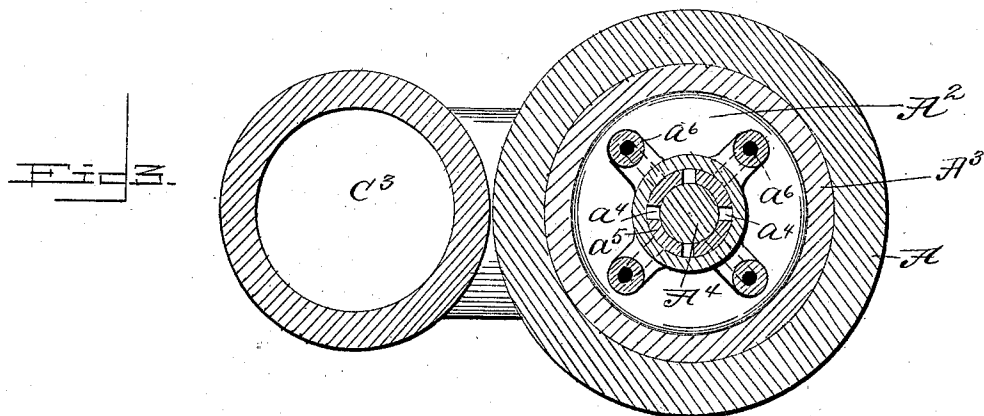
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Witnesses

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(No Model.)

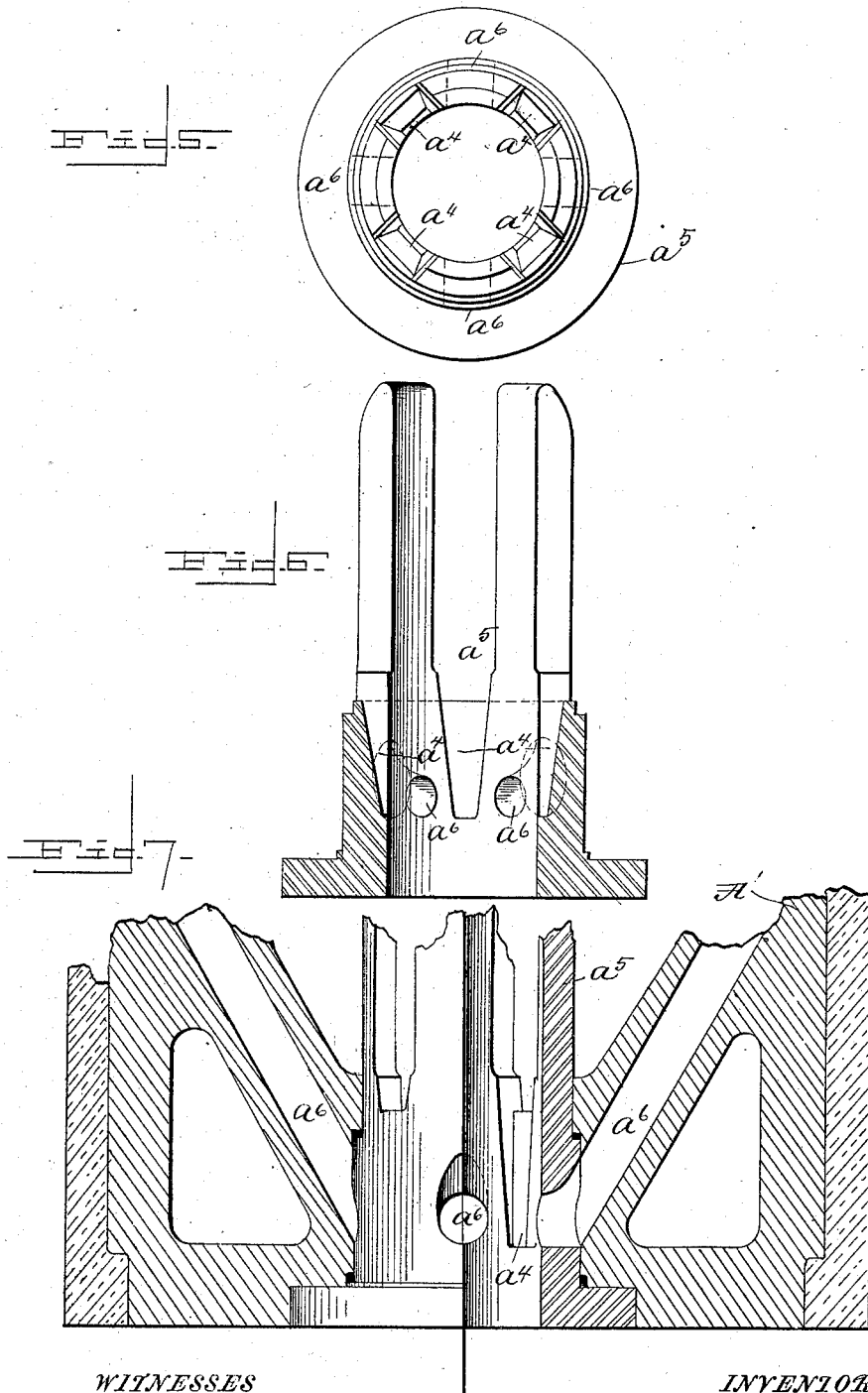
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WITNESSES

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UNITED STATES PATENT OFFICE.

HARRY A. SPILLER, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE PNEUMATIC GUN CARRIAGE AND POWER COMPANY, OF WHEELING, WEST VIRGINIA, AND WASHINGTON, DISTRICT OF COLUMBIA.

PNEUMATIC RECOIL-CHECK FOR GUN-CARRIAGES.

SPECIFICATION forming part of Letters Patent No. 552,075, dated December 24, 1895.

Application filed October 30, 1891. Serial No. 410,392. (No model.)

To all whom it may concern:

Be it known that I, HARRY A. SPILLER, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Pneumatic Recoil-Checks for Gun-Carriages; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to recoil-checks for gun-carriages.

The object is to produce an apparatus or system to elevate or depress a gun to any desired angle, to take up the recoil and counter-recoil of the same, and return it to loading position without shock to the structure.

With these objects in view, the invention consists in a recoil-check for gun-carriages, comprising a main cylinder containing a piston adapted to move in the same, an auxiliary cylinder or reservoir for containing a fluid under pressure, such as compressed air, arranged adjacent to the main cylinder and communicating therewith at a point beneath the piston, means by which the compressed fluid from the reservoir may be admitted beneath the piston at will to move the same, and means by which this fluid under pressure, after raising the piston in its cylinder, may be conveyed to the reservoir; furthermore, in a recoil-check for gun-carriages, comprising a main cylinder having a piston-rod moving in the same, a head on the piston-rod provided with passages, a cylindrical rod passing within the piston, means for adjusting the position of the rod, an auxiliary compressed fluid-containing chamber, means by which the compressed fluid may be admitted at will beneath the piston-head to move the same, and means by which the fluid, after raising the piston, may automatically flow to the auxiliary chamber; furthermore, in a recoil-check for gun-carriages, comprising a main cylinder, the lower head of which has for a fluid under pressure a passage from an auxiliary or storage chamber arranged adjacent to the main cylinder and communicating with the same at a point beneath the pis-

ton, a piston-rod in the main cylinder provided with a piston-head having chambers for the passage of a compressed fluid from a point beneath the piston-head upward, means by which the compressed fluid may be admitted beneath the piston to move the same, means for controlling the passage of this fluid from an auxiliary chamber to the main cylinder, and means for allowing the fluid to escape from the main cylinder; furthermore, in a recoil-check for gun-carriages, comprising a main cylinder provided with trunnions by which it is supported in position on the carriage, a piston-rod adapted to move in the main cylinder and provided with a head having passages in the same for compressed fluid, a rod within the piston, a guide collar or sleeve to move over the rod, having ports, the rod to slide over the ports regulating the passage of a compressed fluid through the same, mechanism for adjusting the position of the rod, and means for indicating on a scale the adjustment of the same, and at once the exact position of the rod; furthermore, in a main cylinder provided with trunnions by which the cylinder and its attending mechanism are supported in position on the carriage, and containing a piston-rod adapted to move in the same and having a head provided with passages through it from below upward, an annular chamber within the piston-rod, a cylindrical rod in this chamber within the piston-rod, a guide collar or sleeve on the cylindrical rod, ports in the collar by means of which communication to the annular chamber within the piston-rod from below is had, the said rod having its lower portion somewhat smaller than its body, this smaller portion being screw-threaded and extending downward through the lower head of the main cylinder into a cap fixed to the bottom of the main cylinder, mechanism connected with and operating to adjust the rod to open and close the passages in the piston-head and the ports in the guide-sleeve, as desired, a circular passage in the lower head of the main cylinder having communication to underneath the piston-head by passages controlled by valves, and communication into the same from above by ports controlled by valves, an auxiliary chamber adjacent to the

main cylinder, a passage from the same to the main cylinder, means regulating the supply into this reservoir, and a connection outside of the main cylinder from above to below the piston-head; and finally, in various novel details of construction.

In the accompanying drawings, forming part of this specification, and in which like letters of reference indicate corresponding parts, Figure 1 is a view in side elevation of the recoil-check. Fig. 2 is a view in central longitudinal section of the main cylinder. Fig. 3 is a view in transverse section taken on the line $x x$, Fig. 2. Fig. 4 is a view in transverse section taken on the line $y y$, Fig. 2. Figs. 5, 6 and 7 are enlarged detail views of certain parts of the device.

In the drawings, A indicates the main cylinder of a recoil-check for gun-carriages, provided with trunnions $a a$, designed to be supported in bearings in the cheeks of the carriage. In this cylinder the piston-rod A' is designed to move, and arranged to surround its upper portion a packing-gland a is formed in the upper head a^2 to prevent the escape of the compressed fluid from the cylinder. To the upper end of this piston-rod A' a cross-head a^3 is secured, and is provided with suitable trunnions designed to support the gun attached to the same in the usual manner—as by resting in bearings in a band at the breech end of the gun, or by being mounted upon suitable elevating-levers, as desired. Within the chamber is a stationary cylindrical rod A^4 , which may be hollow to give lightness to the structure. This rod is adapted to be adjusted so as to open and close passages a^4 in a loose-fitting sleeve or collar a^5 . The piston-head A^3 is provided with passages a^6 , from below to above the piston-head. The cylindrical rod A^4 is adjustably secured in the lower head B of the main cylinder and has its lower portion somewhat smaller than the main cylinder of the same, and this smaller portion is screw-threaded a part of its length. This screw-threaded portion extends downward through the lower head B, and is covered by a suitable cap B' to hold the same in equilibrium, as this rod has to be operated under high pressure of compressed fluid caused by the descent of the piston in taking up the recoil of the gun. The screw-threads on the slide-rod are engaged by corresponding screw-threads of a nut b , which is turned by a bevel-gear b' , integrally formed therewith. The bevel-gear b' meshes with a corresponding gear b^2 on one end of a short rod or shaft b^3 . At the other end this rod or shaft b^3 carries a spur-wheel b^4 , meshing with a similar wheel b^5 on one end of a rod or shaft b^6 , which is provided at its other end with a bevel-gear b^7 , meshing with a corresponding bevel-gear b^8 on a screw-threaded rod b^9 , turning in a guide portion b^{10} , on which is mounted at its extreme end a crank b^{11} . The crank b^{11} is rigidly fixed upon the guide portion b^{10} , which is itself rigidly fixed upon and turns the rod b^6 , and the turning of this rod

b^6 revolves the wheel b^5 , and this communicates motion to the wheel b^4 , which then turns the rod b^3 , and this rod b^3 turns the gear-wheel b^2 , which, meshing with the gear b' , turns the same in the screw-threaded nut b , and the screw-threads of the nut taking into the screw-threads of the rod A^4 raises or lowers the rod according to the direction in which the crank-arm b^{11} is turned. The turning of the rod b^6 turns the bevel-gear b^7 , and the meshing of the bevel-gear b^7 with the gear b^8 turns the screw-threaded rod b^9 , carrying an internally-screw-threaded index-finger b^{12} , which travels over a suitable scale adjacent to the same, and this indicates the exact distance of travel of the cylindrical rod A^4 , the parts being so arranged and adjusted that movement of the same will correspondingly move the cylindrical rod A^4 . It will be understood that this adjusting mechanism may be held in equilibrium by stuffing-glands or the like, all as shown in Fig. 2 of the drawings.

When the cylindrical rod A^4 has been adjusted to a predetermined point—namely, to a position where the ports a^4 in the guide sleeve or collar a^5 and the passage a^6 in the piston-head will have slightly overtraveled the smaller portion of the rod, as in the position shown in Fig. 2 of the drawings—communication to above the piston-head is established, and this communication may be cut off by adjusting the position of the rod A^4 , so that the ports a^4 and the passages a^6 will be covered by the same.

In the lower head of the cylinder A is a main circular passage C, extending not quite around the main cylinder. At suitable distances apart in this circular passage are ports C' , regulated by non-return valves $c c$, leading into the space c' between the lower head of the main cylinder and the lower face of the piston-head A^3 . The space c' is caused by the piston-head not being allowed to come down flush with the upper face of the lower head of the main cylinder. Each of the valves c may be provided with a flat circular head having an annular flange adapted to confine a rubber packing-disk held permanently in place to close the ports C' by coil-springs on guide-collars of the valve-stems seated adjacent to the ports C' .

Adjacent to the main cylinder A, and suitably secured to the same and communicating with the circular passage C in the lower head of the same, through a passage C^2 , is an auxiliary cylinder or reservoir, the supply from any suitable source to which, by a passage C^4 , is regulated by a valve C^5 .

Communication between the circular passage C and the space below the piston-head is had through a small passage D, which is regulated by a by-pass valve D^2 . Now when the rod A^4 has been adjusted to open the ports a^4 and passages a^6 the passage D is opened to allow the fluid under pressure to rush from the receiving-chamber C^3 through

the passages C^2 and C to the space c' under the piston-head, and then through the ports a^4 and passages a^6 to above the piston-head. The fluid passing through the ports a^4 in the sleeve or collar a^5 enters the annular chamber A^2 around the slide-rod A^4 in the piston, partly or completely filling the same, as desired, while the fluid passing up through the passages a^6 in the piston-head enters and partly or completely fills the annular space E around the piston-rod in the cylinder. When these annular chambers A^2 and E contain the desired quantity of fluid, the slide-rod A^4 is adjusted to close the ports a^4 and the passages a^6 . The valve D^2 is then turned to close the passage D and the valve C^5 to close the passage C^4 . Then the fluid in the reservoir is raised to a tension which, when it is admitted under the piston-head by opening the passage D , will be sufficient to force the piston upward until the gun mounted thereon is elevated to battery. As the piston moves upward, the fluid in the space E at its top offers a certain amount of resistance, forming a positive elastic cushion in the nature of a buffer to take up any jar when the piston-head approaches the top of the cylinder A ; but as the pressure increases to a certain predetermined degree it overcomes the resistance offered by a spring check-valve e^8 , the lift of which is controlled by a regulating-screw e^2 at the top of a side pipe E' , located outside of and adjacent to the main cylinder, which side pipe connects the spaces above and below the piston-head and conveys the compressed fluid from near the top of the main cylinder, above the piston-head, to underneath the same, thus allowing the piston to complete its upward movement. Any portion of the fluid which is not forced out of the annular space E through this side pipe E' escapes by leakage around the piston-head into the space c' below the same until equilibrium is established. The fluid in the chamber A^2 also escapes by leakage into the hollow rod A^4 during the short lapse of time when the piston is being forced upward.

Upon the discharge of the gun, the energy of the recoil forces the piston-rod downward in its cylinder against the compressed fluid underneath the piston-head. The springs to close the non-return valves c are of such a tension that when a certain degree of pressure against them is reached they will allow the valves to open, and the compressed fluid rushes through these openings into the circular passage C , and thence through the passage C^2 into the reservoir C^3 . As the downward descent of the gun slackens slightly before the piston-head gets to its lowest position, the valves c are closed as the pressure against them decreases, and there will be a small quantity of air still remaining in the space c' under the piston-head. By the slight

overtravel of the ports a^6 through the cylindrical rod A^4 a portion of compressed fluid under the piston escapes into space E , whereupon an equilibrium pressure will be restored below the degree necessary to raise the piston, and at the same time the piston slowly settles until the gun thereon is at "rest" or in loading position.

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

1. In a recoil-check for gun-carriages, a main cylinder containing a piston, having passages, a chamber within the piston-rod, a rod passing within the piston-rod and having a guide-sleeve or collar provided with ports from below the piston-rod to the chamber within the piston rod, mechanism for adjusting the position of the rod, and means for conveying the fluid under pressure beneath the piston-head to force the piston upward, substantially as described.

2. In a recoil-check for gun-carriages, a main cylinder, containing a piston, a chamber within the piston-rod, a rod passing within the piston-rod and having a guide-sleeve or collar provided with ports, mechanism for adjusting the position of the rod, means for conveying the fluid under pressure beneath the piston-head to force the piston upward, and means for liberating the fluid under pressure from the chambers above the piston-head, substantially as described.

3. In a recoil-check for gun-carriages, a main cylinder, a piston-rod moving in the cylinder, an auxiliary chamber adjacent to the cylinder, connections between these chambers, means for controlling the connections, a chamber within the piston-rod, passages connecting to these chambers from below the piston, means for controlling these connections, and passages for conveying the compressed-fluid beneath the piston-head to force the piston upward, substantially as described.

4. A recoil-check for gun carriages, comprising a main cylinder provided with trunnions by which it is supported in position on the carriage, a piston rod adapted to move in the main cylinder and provided with a head having passages from below upward through the piston, a valve rod passing within the piston, a guide-collar or sleeve on the said rod having ports, the valve rod being adapted to slide over the ports to regulate the passage of the compressed-fluid through the same, mechanism for adjusting the position of the valve rod, and means for indicating the adjustment of the same, substantially as described.

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

HARRY A. SPILLER.

Witnesses:

DAVID H. MEAD,
F. B. KEEFER.