

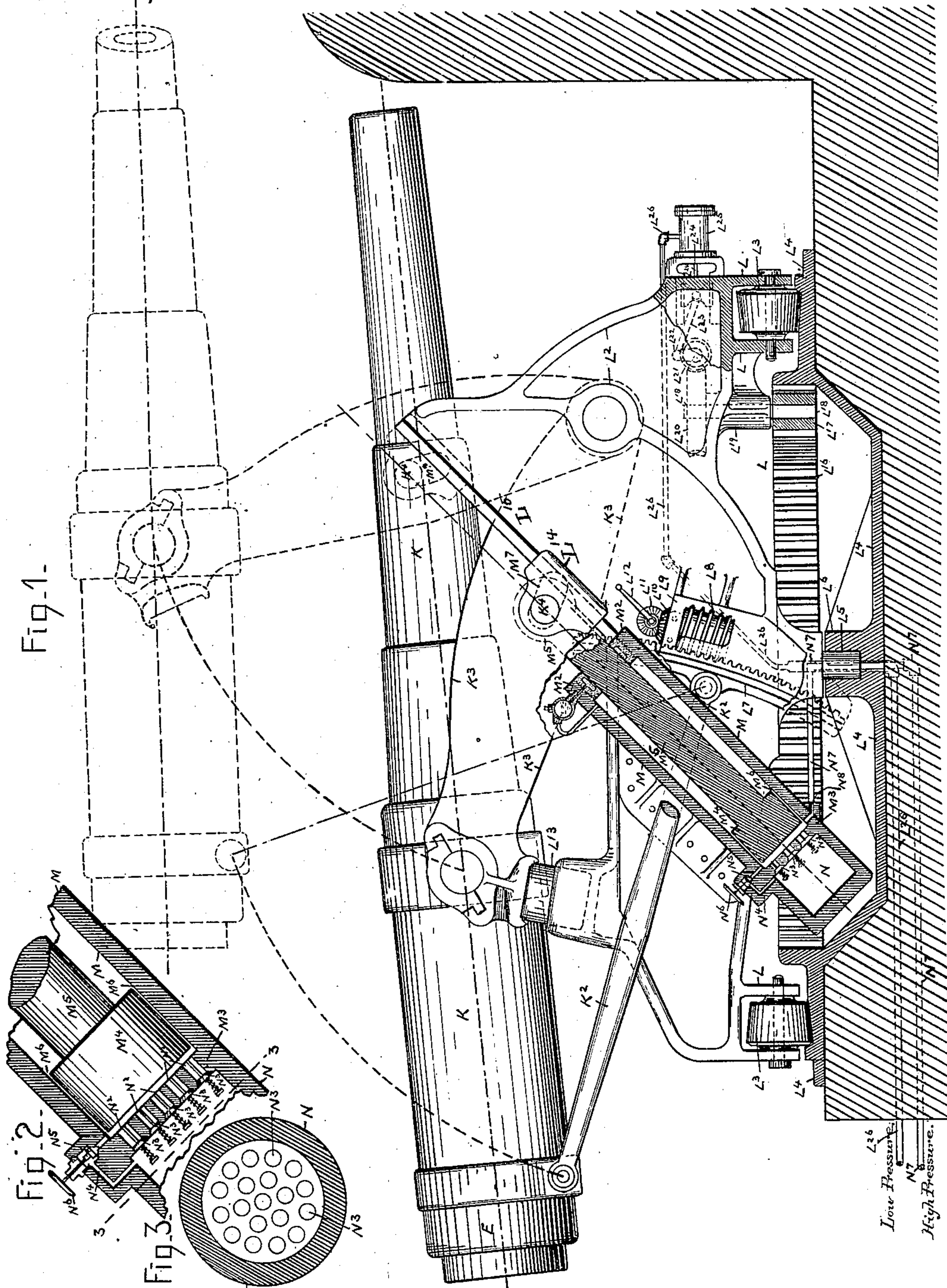
(No Model.)

H. A. SPILLER.

PNEUMATICALLY OPERATED GUN CARRIAGE.

No. 463,463.

Patented Nov. 17, 1891.



WITNESSES.
Edward Hamilton.

J. B. Keefe.

INVENTOR.
Harry A. Spiller
by
A. S. Spiller
his attorney

UNITED STATES PATENT OFFICE.

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

PNEUMATICALLY-OPERATED GUN-CARRIAGE.

SPECIFICATION forming part of Letters Patent No. 463,463, dated November 17, 1891.

Application filed October 3, 1889. Serial No. 325,862. (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 Pneumatic Depressing Recoil-Checks for Guns and Pneumatic Rotating Gun-Carriages, of which the following is a full, clear, and exact description.

This invention relates to heavy guns, and particularly to what are known as "disappearing gun-carriages," designed for the manipulation of such guns.

The object of the invention is to provide means whereby a gun may rapidly and easily be moved into battery, and whereby, also, the recoil and counter-recoil of a gun may automatically be taken up.

With this object in view the invention resides, essentially, in a disappearing gun-carriage comprising the usual pivoted beams, whereby the guns are moved into and out of battery and supported when in battery, and a cylinder designed particularly to receive compressed air, and a piston attached to one of the beams, the head of the piston being of slightly-less diameter than the interior of the cylinder in which it is to play to allow the passage of a portion of the air compressed during the movement of the piston-head.

Furthermore, the invention resides in a disappearing gun-carriage comprising the pivoted beams by which the gun is moved into and out of battery, a cylinder designed to receive compressed air, a piston-rod connected with one of the pivoted beams and having its piston-head arranged in and of slightly-less diameter than the air-cylinder, an air-chamber located contiguous to the cylinder, having a port or ports connecting the air-chamber and air-cylinder, and check-valves arranged in the ports, these valves being arranged to close when the pressure in the air-chamber exceeds that in the cylinder and to open when the conditions are reversed.

Furthermore, the invention resides in a disappearing gun-carriage comprising pivoted beams for moving a gun into and out of bat-

tery and for sustaining it when in battery, an air cylinder mounted contiguous to the gun, a piston-rod having a piston-head of slightly less diameter than the interior of the cylinder, the air-chamber having ports connecting with the air-cylinder, and a supplemental passage between the air-chamber and the air-cylinder, and a cock for opening and closing the same.

Furthermore, the object of the invention resides in a disappearing gun-carriage having a rotating base provided with a rack or the like, and a pneumatic engine connected with a pinion or the like engaging the carriage and imparting motion thereto.

Furthermore, the invention resides in various novel details of construction whereby the objects of the invention are attained.

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

Figure 1 is a side view of a disappearing gun-carriage embodying my invention, the air-cylinder, air-chamber, and movable portion of the base being shown in section. Fig. 2 is an enlarged sectional view showing the parts between the air-chamber and air-cylinder, and Fig. 3 is a sectional view on line 3 3 of Fig. 2.

In the drawings, K represents the gun, which is shown in Fig. 1 by dotted lines as in and by full lines as out of battery.

K² and K³ are two arms or links, each pivoted or journaled at one end to the gun, the link K² being the longer and the one nearer to the breech E of the gun K. The lower end of the link K³ is journaled or pivoted to the circular carriage L, carrying friction-rollers L³, and arranged to run on a circular and stationary way or bed-plate L⁴, and otherwise to rotate by its vertical axial spindle L⁵, set in a step-block L⁶, formed on the bed-plate L⁴. The link-beam K² is pivoted at its lower end to the vertically-running segmental toothed rack or gear L⁷, meshing with a vertical worm-cylinder L⁸, held on and turning and confined against lengthwise movement in a bearing-block L⁹, immovably held on the rotating or gun carriage L⁹, and adapted to be driven by meshing-worm gear-wheels L¹⁰ L¹¹, one carried

by the worm L^8 and the other by the bearing-block L^9 , and having a handle L^{12} for convenience in turning it.

The gun in battery is in a higher plane than out of battery, and it is placed in battery through the link-beams $K^2 K^3$, and its muzzle is raised or lowered by suitably operating the worm L^8 , and its line of direction, horizontally considered, is changed by rotating the gun-carriage L , which for supporting the gun out of battery has an immovable cushioned rest-block L^{13} for the rest of the gun link-beam K^8 , all as well known, and so far described neither as a whole nor as to the separate parts forming any part of this invention.

M represents an air-cylinder immovably held on the gun-carriage L and below the gun out of battery, in order at all times to be free from injury from an enemy's shots. With the gun out of the battery and its link K^3 resting on the rest-block L^{13} the axis of the air-cylinder is in line with the axis of the journal connection of said link and gun, and, furthermore, situated as stated, it is oblique to the vertical axis of rotation of the gun-carriage, and the lower head M^3 is toward the breech of the gun.

M^4 is a piston-head capable of moving forward and backward the whole length of air-cylinder M .

M^5 is the piston-rod, which extends through the upper head M^2 of the air-cylinder, suitably packed, and it is so placed as to be axially coincident with the axis of the piston-head. The piston-head is of a diameter slightly less than the internal diameter of the air-cylinder, thus leaving an annular open space M^6 entirely around and between it and the air-cylinder as it moves forward and backward thereon.

The piston-rod M^5 at its projecting end portion is hung by a slotted bearing M^7 upon a side and lateral projecting pin K^4 , held on gun link-beam K^3 , and the axis of this pin is coincident with a line through both end journals of the gun link-beam K^3 , and also coincident with the axial line of the air-cylinder when the gun is out of battery and at rest, as stated. The slotted bearing M^7 , attached to the gun, is axially coincident with a line running through the axes of the opposite end journals of the gun link-beam K^3 , and it is of a length suitable for the movements, as hereinafter appear, of the piston-rod and piston-head, and without strain on either or on the said hanging of the former. The pin K^4 of the link-beam K^3 engages and is free to turn on a slide-block L^{14} , held and free to move on and lengthwise of the guideway L^{15} at the lower side of and in a plane parallel with the oblique vertical plane of the axis of the air-cylinder and extending upward from the upper head of the air-cylinder toward the nozzle of the gun. The arrangement of the mechanism as just described, and also otherwise, is such that as the gun moves in and out of battery the piston-head moves from end to end

of and upward and downward through the air-cylinder, and the slide-block upward and downward on its guideway, and with the gun in battery the piston-head is at the upper head, and with the gun out of battery it is at the lower head of the air-cylinder.

N is an air-chamber below the lower head and preferably in continuation of the air-cylinder M , though obviously it may be made separate therefrom and made contiguous to the air-cylinder.

$N^2 N^2$ are a series of ports or passages leading through the lower head of air-cylinder M and making an air communication between the air-cylinder and air-chamber.

N^3 is a check-valve to each air-port N^2 , arranged automatically to open to the passage of air from the air-cylinder to the air-chamber, but to close to the passage of air from the air-chamber to the air-cylinder.

N^4 is a supplemental air-passage connecting air-chamber and air-cylinder and opening to the air-cylinder in close proximity to its lower head. This supplemental air-passage, for a purpose as hereinafter appears, furnishes communication between the air-chamber and air-cylinder separately and independently of the air-ports N^2 , and is opened or closed by a hand-valve N^5 , having a handle N^6 for convenience in operating it.

N^7 is an air-passage opening to and to be used for charging the air-cylinder with air under pressure, any suitable and well-known means being used therefor.

N^8 is a check-valve in air-passage N^7 to automatically close by the pressure of air in air-cylinder.

The air-cylinder and its piston-head, with an annular open space around and between it and the air-cylinder, and the piston-rod connected with the gun adapted to be placed in and out of battery, in combination with the air-chamber having air-ports and a supplemental air-passage of communication between it and the air-cylinder and severally controlled by valves, all substantially as has been described, constitute the mechanism of this invention, and by which, in co-operation with compressed air introduced into the air-cylinder and air-chamber, to place the gun in and out of battery and to support it in battery, and in firing or discharging the gun to resist recoil and counter-recoil of the gun. It is used and operates as follows: The supplemental air-passage being closed and gun out of battery, the air-cylinder and air-chamber are charged with air under pressure and in opening the supplemental air-passage N^4 the gun is raised and placed in battery, where it is supported by the air-pressure against the under side of the piston-head, the piston-head being at the upper end of the air-cylinder. The gun being in battery and thus supported and the supplemental air-passage N^4 closed, all as explained, and the gun fired or discharged, the gun in recoil forces the piston-head downward through the air-cylinder, and

thereby compresses the air in the cylinder at the under side of the piston-head and the air in the air-chamber, and also, but to a less degree, the air in the air-cylinder at the upper side of the piston-head, because of the escape of the air to the upper side of the piston-head. On the counter-recoil of the gun the air above the piston-head acts in resistance thereto, resulting in the return of the gun to position out of battery and at rest, with its link-beam K^3 resting on the cushioned rest-block L^{13} of the gun-carriage, ready to be again placed in battery on opening the supplemental air-passage N^4 , and thereby, as before, bringing the air confined in air-chamber N into action against the under side of the piston-head.

The upper and lower sides of the piston-head are of unequal superficial area, the lower side having an area in excess of the area of the upper side of the piston-head equal to the area of the upper side occupied by the piston-rod, and from this difference in area of upper and lower sides of the piston-head, air communication being had between upper and lower sides of the piston-head through the annular space M^6 around the piston-head, in the movements of piston-head in air-cylinder not only are the recoil and counter-recoil resisted by air in the air-cylinder under pressure, but following the counter-recoil the gun is finally brought by the air-pressure in air-cylinder to position out of battery.

L^{16} is an annular toothed rack concentrically encircling the rotating gun-carriage and having its teeth vertical and preferably on the inner side in order to be protected. L^{17} is a vertical gear or pinion wheel meshing annular rack L^{16} . This pinion-wheel L^{17} is held on and turns with a vertical stud L^{18} , held and turning in a fixed bearing-block L^{19} of the gun-carriage, and at its upper end has a horizontal gear-wheel L^{20} .

L^{21} is a vertical worm meshing the gear-wheel L^{20} , turning on a suitable bearing and support therefor of the gun-carriage.

L^{22} is a crank-arm turning with worm L^{21} and connected by pitman-rod L^{23} with the piston-rod L^{24} of the piston-head, (not shown,) arranged to move forward and backward in the piston-cylinder L^{25} of an air-engine of any suitable construction and arrangement.

The air-engine is supported and held on the gun-carriage or arranged contiguous thereto, and L^{26} is a pipe supplying air to the air-engine to work its piston-head, as well known. This air pipe or passage L^{26} connects the air-engine with a suitable air-supply of low pressure, and it, as also the air pipe or passage N^7 for the air-cylinder M , hereinbefore referred to and described, passes loosely through the axial spindle L^5 of the rotating gun-carriage, and also the step-bearing L^6 therefor, both of which are suitably bored out.

The air-engine in operation accomplishes the rotation of the gun-carriage on its way and

in either direction, according as may be desired for the position of the gun.

The air-cylinder is preferably held on the gun-carriage or other support for the gun, and the piston-rod is held on the gun or part moving therewith, all as has been herein particularly described; but, however and obviously, the air-cylinder and piston-head and its rod may be reversed in position—that is, the air-cylinder may be held on the gun or part moving therewith, and the piston-head and its rod may be on the gun-carriage or other support for the gun without material or substantial changes either in construction or relative arrangement of the parts, and this invention, broadly considered, is not to be limited in these respects. With the parts reversed, as above explained, and with the gun out of battery, the piston-head is then at the upper head of the air-cylinder instead of at its lower head, and again the air-chamber is at the upper head of the air-cylinder and in lieu of being at its lower head.

In conclusion, it will be observed that while air is the fluid especially mentioned as used for the operation of the mechanism of this invention as herein described, the invention is not limited in that respect, as steam, water, or gas may be used, if desired; and, again, that the relative construction and arrangement of air-cylinder, piston-head, and its rod, in combination with the air-chamber and independent of the special combination therewith of a gun and its support, all substantially as has been described, it is intended to embrace in a separate application for Letters Patent of the United States to be hereinafter made, and all rights so to are here reserved.

While I have particularly described in connection with my improved recoil-check a special form of gun-carriage, I do not wish to be understood as claiming the same herein, as it will form the subject-matter of another application for patent.

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

1. In a disappearing gun-carriage, the beams or links attached to the gun, the cylinder designed to contain compressed air or other aeriform fluid, and the piston having a link and slide-block connected with the gun, and a guideway for said block and having its piston-head of slightly less diameter than the interior of the cylinder, substantially as described.

2. In a disappearing gun-carriage, the pivoted beams or links attached to the gun, a cylinder designed to receive compressed air or other aeriform fluid, a piston-rod attached to the gun and having its head of slightly less diameter than that of the interior of the cylinder, and an air-chamber located contiguous to the cylinder and having a port or ports connecting the air-chamber and the cylinder, and automatically-operating check-valves located in the ports, substantially as described.

3. In a disappearing gun-carriage, the piv-
oted beams or links attached to the gun, a
cylinder located contiguous to the gun and
having its piston-rod attached to a slide-block
5 pivoted to said beams or links and mounted
upon a guideway, an air-chamber contiguous
to the cylinder, ports connecting the air-cham-
ber and cylinder, and check-valves in the
ports and so arranged as to close when the
10 pressure of air in the air-chamber exceeds
that in the cylinder and to open when the
conditions are reversed, substantially as de-
scribed.

4. A disappearing gun-carriage comprising
15 the pivoted links or beams attached to the

gun, the cylinder designed to contain com-
pressed air or other aeriform fluid, the piston
having a head of slightly less diameter than
the interior of the cylinder and attached to
the gun, the air-chamber communicating with 20
the cylinder, and the supplemental passage
having a cock and connecting the air-cham-
ber and cylinder, substantially as described.

In testimony whereof I have hereunto set
my hand in the presence of two subscribing 25
witnesses.

HARRY A. SPILLER.

Witnesses:

ALBERT W. BROWN,
HENRY F. MCKEEVER.