

D. F. ASBURY.
 COUNTERBALANCE FOR SWINGING BREECH MECHANISMS.
 APPLICATION FILED FEB. 23, 1916.

1,297,984.

Patented Mar. 25, 1919.
 3 SHEETS—SHEET 1.

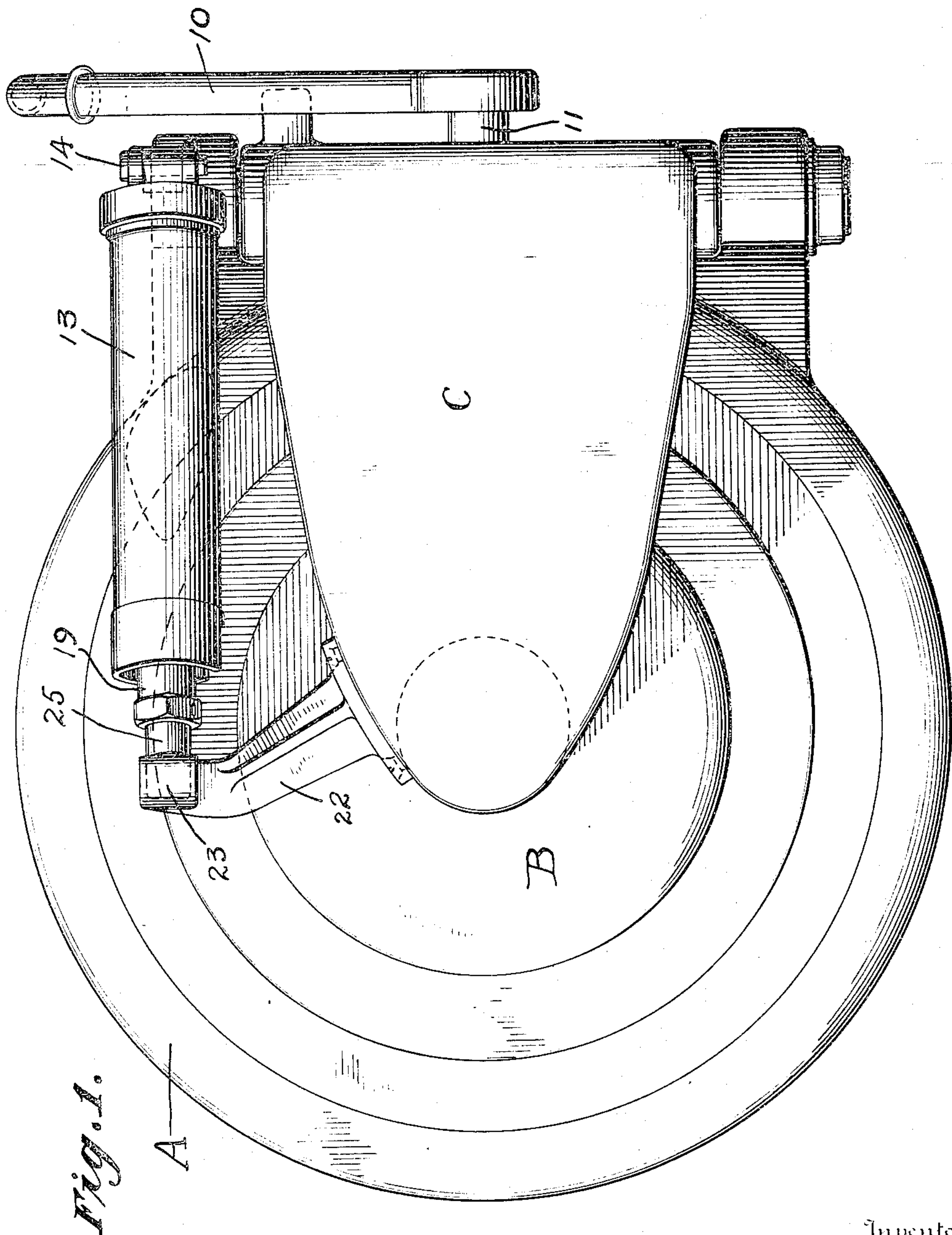


Fig. 1.

Witnesses

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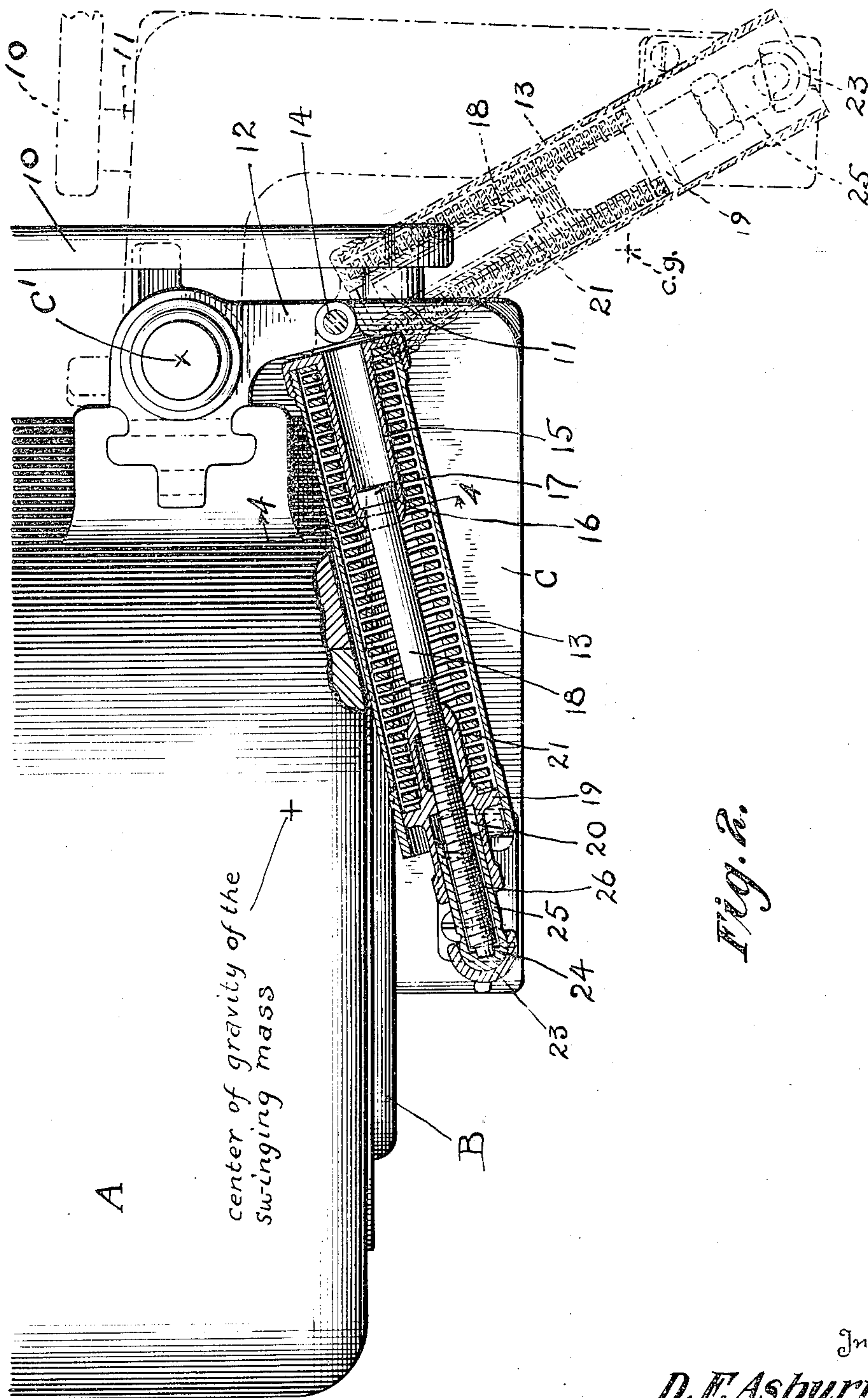


Fig. 2.

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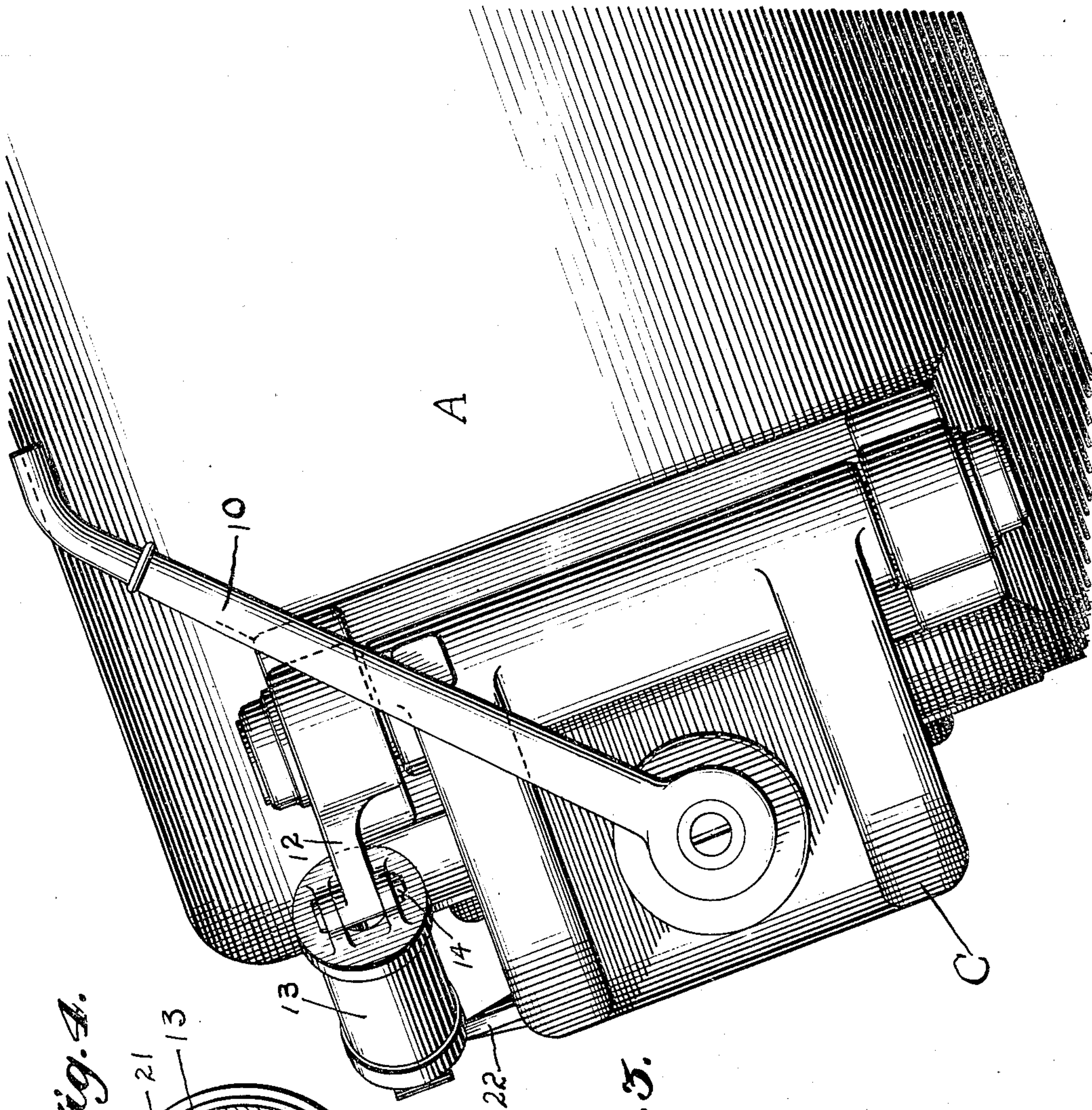


Fig. 4.

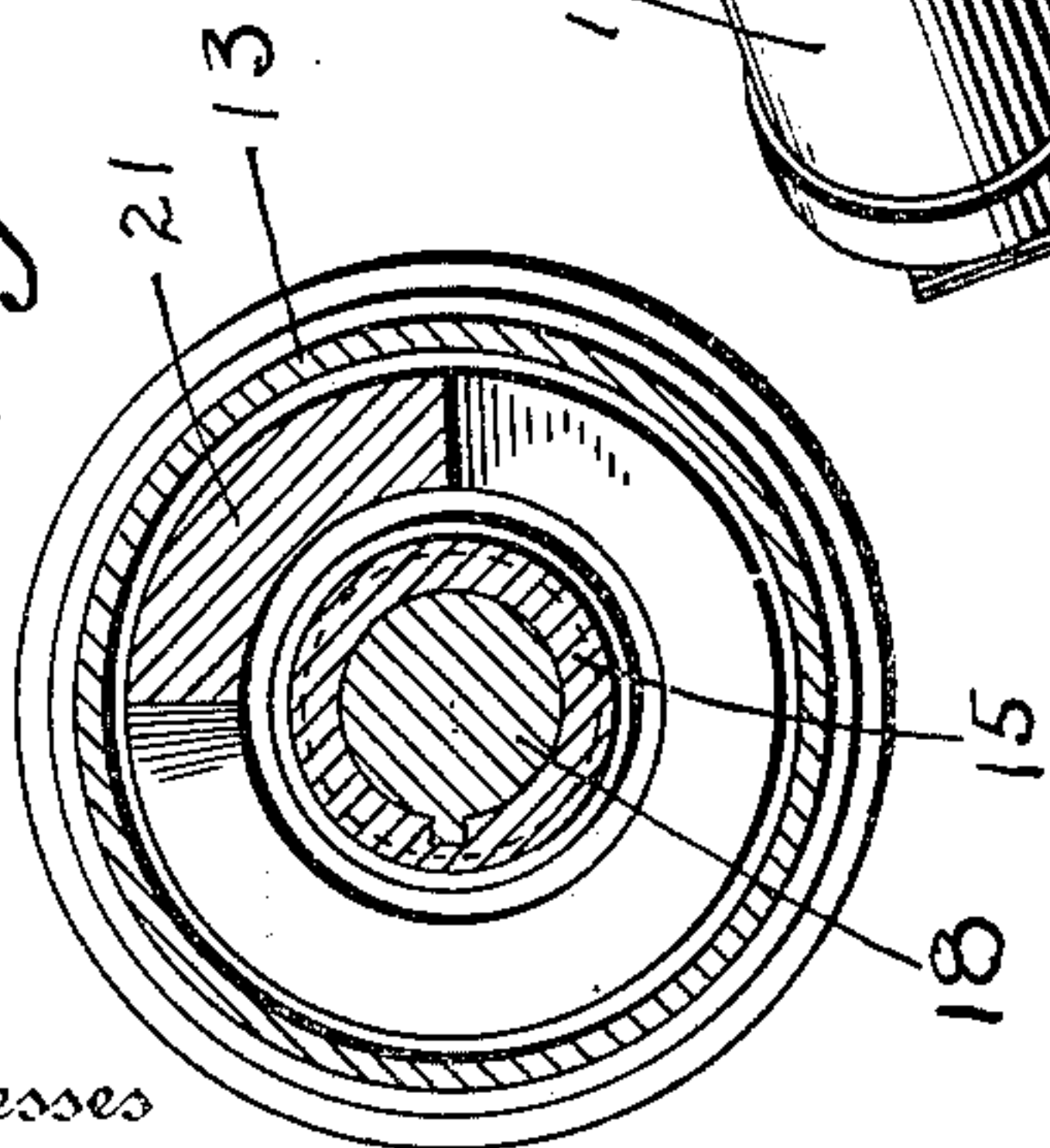


Fig. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

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COUNTERBALANCE FOR SWINGING BREECH MECHANISMS.

1,297,984.

Specification of Letters Patent.

Patented Mar. 25, 1919.

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To all whom it may concern:

Be it known that I, DORSEY F. ASBURY, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Counterbalances for Swinging Breech Mechanisms; 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.

My invention relates to a counterbalance for swinging breech mechanisms.

Howitzer guns are fired at high angles of elevation and it is therefore necessary to load them while elevated in order to avoid bringing the gun back to the level position. Generally the angle of elevation of the gun for loading is a fixed angle chosen to avoid the use of a complicated ramming mechanism. The preferred angle of elevation of the gun for loading is about twenty degrees, for when large guns are at this angle the ramming mechanism is practically on a level with the gun base surface and the shells can then be rolled on the rammer without lifting them bodily.

When operating breech mechanisms under the foregoing conditions it is essential that any means to balance the pendulum like swing of the breech mechanism would have to produce the largest moment when the breech mechanism is in its swung home position and no moment when the center of gravity of the breech mechanism is at its lowest position or in a vertical plane passed through the hinge axis of the mechanism, and a negative or outward acting moment when the breech mechanism is fully open or when the center of gravity thereof passes its lowest position.

It is therefore my purpose to provide a balance device for a side swinging mechanism between the gun and swinging parts that will be operated when the mechanism is swung open to store up energy to help swing the mechanism closed, the action of said device being positive and regular; to provide a device for balancing the outward acting moment of the mechanism produced by gravity by an inward acting moment pro-

duced by the device; to provide a spring device which tends to hold the mechanism closed when its line of force is on one side of the hinge axis of the mechanism and which acts to hold the mechanism open when its line of force passes to the other side of said hinge axis; to provide a spring reacting from the gun to balance the opening and closing movement of a side swinging breech mechanism when the gun is elevated to a predetermined angle; to provide a structure to balance a decreasing moment of the breech mechanism by an increasing force of a spring and vice versa; to provide means for decreasing the spring's leverage while the spring's force increases and vice versa; to provide a spring device whose force produces a moment about the hinge axis of the mechanism that will substantially vary with and equal and also act against the moment about the hinge axis produced by gravity acting against the mass of the mechanism when the gun is at a predetermined elevation; to provide means for increasing the force of the spring device to store up energy, while the mechanism is being opened to the side when the gun is elevated to be used to close the mechanism; said means also varying the spring's moment about the hinge so that it will substantially equal and counteract the swinging moment of the mechanism due to gravity if the gun is still elevated; and to provide means for varying the initial force of the spring device.

In the drawings chosen for the purpose of illustrating my invention, the scope whereof is pointed out in the claims,

Figure 1 is a rear elevation of a gun embodying my invention, the breech mechanism being shown in closed position;

Fig. 2, a plan view of what is shown in Fig. 1 partly in section and with the mechanism shown in open position in dotted lines.

Fig. 3, a side elevation of the gun with the mechanism closed and the gun shown at an elevation of twenty degrees; and

Fig. 4, a section on the line 4—4 of Fig. 2.

Referring to the drawings A indicates the gun, B the breech plug and C the swinging carrier which has its hinge axis at C'. The plug B and the carrier C are adapted to

be manually operated to open and closed positions through the medium of a handle 10 fixed on a crank shaft 11 rotatable in the carrier all as fully described in U. S. Letters Patent 1,020,849 granted to George L. Smith and myself March 19, 1912.

Engaged on the hinge pin of the carrier C and detachably interlocked with the gun A is a bracket 12 and pivoted to this bracket 10 for swinging movement is one end of a cylinder 13. The axis of the pivot connection of the cylinder 13 is at the rear of the axis C' and is effected through the medium of a removable pin 14. The end of the cylinder 15 13 adjacent the bracket 12 is provided with an inwardly directed tubular extension 15 having the inner end of its bore reduced to form a shoulder 16 the purpose of which will presently appear. Slidably mounted in the 20 bore of the extension 15 is the head 17 of a rod 18 which is adapted to engage the shoulder 16 to limit movement of said rod in one direction. Threaded on the rod 18 and movable in the cylinder 13 is a nut 19 the outer 25 end of which is reduced and provided with an axial recess 20. Disposed within the cylinder 13 and encircling the extension 15 and the rod 18 is a spring 21 one end of which bears against the end of the cylinder adjacent the bracket 12 and the other end against 30 the nut 19. Mounted on the carrier C is a bracket 22 the upper end of which terminates in a socket 23. Rotatably engaged in the socket 23 is the head 24 of a member 25 which extends into the recess 20 of the nut 19 and is provided with an axial recess 26 35 which receives the adjacent end of the rod 18.

With the parts in the position shown in Fig. 2 it will be observed that the head 17 40 is engaged with the shoulder 16 and under such conditions the force of the spring 21 is not exerted upon the pin 14 or socket 23 and I am thus enabled, if desired, in such status of the parts to easily remove the pin 45 14, swing the related end of the cylinder 13 slightly to the rear and then disengage the head 24 from the socket 23 and remove the entire counterbalancing device to permit the usual manual operation of the gun when the 50 latter is being loaded in a substantially level position. It will be further observed that by manipulating the nut 19 I can vary the initial tension of the spring 21 by which I mean the tension of the spring when the 55 mechanism of the gun is closed.

As the mechanism is operated to open position it will be apparent that, owing to the fact that the carrier C and the cylinder 13 swing on different pivots, relative longitudinal 60 movement will occur between the cylinder 13 and the nut 19 and effect compression of the spring 21. As the moment of the breech mechanism is greatest in its swung home position, when the gun is at an eleva-

tion, and constantly decreases as the mechanism opens and its center of gravity moves toward its lowest position it will be apparent that my device will act to balance such decreasing moment of the mechanism by an increasing force until the center of gravity 65 of the mechanism reaches its lowest position. When the center of gravity of the mechanism continues its movement beyond the lowest position the moment of the breech mechanism increases while the force of the 70 spring 21 decreases and acts outwardly through the nut 19 and associated parts against the socket 23 to hold the mechanism in the open position shown in dotted lines in Fig. 2. In closing the mechanism with 75 the gun at an elevation the moment of the mechanism decreases and the force of the spring increases until the center of gravity of the mechanism passes its lowest position when the moment of the mechanism in- 80 creases and the force of the spring decreases until the mechanism is closed. In other words during the opening and closing of the breech mechanism the spring 21 acts against 85 the mechanism with an increasing force while the mechanism opens and the line of force of said spring is on one side of the axis C' and with a decreasing force when 90 the line of force of said spring passes to the other side of said axis. It will also be apparent that by my arrangement and construction of counterbalancing device that the 95 force of this spring 21 during operation of the mechanism produces a moment about the hinge axis C' that will substantially vary 100 with and equal and also act against the moment about the hinge axis produced by gravity acting on the mass of the mechanism. The arrangement of my device also 105 enables me to vary the leverage of the spring 21, which is greatest when the parts are in the position shown in Fig. 2, so that such leverage will decrease while the spring's 110 force increases during opening swing of the mechanism, and increase during closing swing of the mechanism as the force of the spring decreases.

When the gun is fired at an elevation and the breech opened while the gun remains in such position and then brought back to level 115 position and loaded the mechanism can be closed by simply manually moving same toward closed position until the center of gravity of the moving mass passes to the gun side of the hinge axis C' when the device will automatically operate to impart the 120 remaining closing movement to the mechanism.

What is claimed is:—

1. In a gun, the combination of a swinging breech mechanism, and a spring device 125 between the gun and the mechanism tending to hold the mechanism closed when its line

of force is on one side of the hinge axis of the breech mechanism and acting to hold the mechanism open when its line of force passes to the other side of the hinge axis.

5 2. In a gun, the combination of a side swing breech mechanism adapted to be operated when the gun is elevated and its hinge axis substantially in a vertical plane, a spring between the mechanism and gun, and
10 means to vary the leverage of the spring so as to decrease its amount of inward acting moment substantially as the breech mechanism's amount of outward acting moment due to gravity decreases while the mechanism is being swung open, and vice versa
15 while the breech mechanism is being swung closed.

3. In a gun, the combination of a hinged breech mechanism having a decreasing moment about the hinge due to gravity as the mechanism is opened with the gun elevated, and a spring device between the gun and mechanism producing a decreasing moment during the opening of the mechanism as the
25 force of the device increases and its leverage decreases.

4. In a gun, the combination of a hinged breech mechanism having its greatest moment about the hinge when the mechanism is closed, and a spring device between the gun and mechanism producing an increasing moment in a closing direction during closing of the mechanism as the force of the device decreases and its leverage increases.

35 5. In a gun, the combination of a swinging breech mechanism, and a spring device between the gun and mechanism producing a decreasing moment with an increasing force of the device to balance the decreasing moment of the mechanism as the latter opens.
40

6. In a gun, the combination of a swinging breech mechanism, and a spring device between the gun and mechanism producing an increasing moment with a decreasing
45 force of the device to balance the increasing moment of the mechanism as the latter closes.

7. In a gun, the combination with a pivoted breech mechanism having its pivotal axis inclined to the vertical when the gun is being loaded, of a balancing spring device between the mechanism and gun exerting upon the mechanism a turning moment which will vary in accordance with the falling moment
55 of the mechanism due to gravity when said mechanism is operated.

8. In a gun, the combination of a swinging breech mechanism, and a spring device between the gun and the mechanism acting
60 against the breech mechanism with an increasing force while the mechanism opens and the line of force of said device is on one side of the hinge axis of the mechanism, and with a decreasing force when the line of

force of the device passes to the other side
65 of said hinge axis.

9. In a gun, the combination of a swinging breech mechanism, and a spring device between the gun and the mechanism acting with a decreasing moment against the
70 breech mechanism while the latter opens and the line of force of said device is on one side of the hinge axis of the breech mechanism, and with an increasing moment when the line of force of the device passes to the other
75 side of said hinge axis.

10. In a gun, the combination of a side swing breech mechanism adapted to be operated when the gun is elevated and its hinge axis substantially in a vertical plane, and a
80 spring device between the gun and the mechanism whose force during the operation of the mechanism produces a moment in a closing direction about the hinge axis that will substantially vary with, equal and act
85 against the moment about the hinge axis produced by gravity acting on the mass of the mechanism.

11. In a gun, the combination of a side swing breech mechanism, adapted to be operated when the gun is elevated and its hinge axis substantially in a vertical plane, a spring between the gun and mechanism, and means operated by the opening swing of the mechanism to decrease the spring's leverage while
90 the spring's force increases, and by the closing swing of the mechanism to increase the spring's leverage while its force decreases, to balance the moment of the breech mechanism due to gravity.
100

12. In a gun, the combination of a side swing breech mechanism adapted to be operated when the gun is elevated and when its hinge axis is substantially in a vertical plane, and a spring device between the gun
105 and the mechanism for balancing the latter, the mechanism and device during the operation of the former passing a position of no moment.

13. In a gun, the combination of a swinging breech mechanism, and a spring device between the gun and the mechanism acting on the latter, the mechanism and device during the operation of the former passing a position of no moment.
115

14. In a gun, the combination of a swinging breech mechanism, a cylinder having one end pivoted to the gun, an inwardly directed tubular extension on the pivot end of the cylinder, the inner end of said extension having its bore reduced to form a shoulder, a rod, having one end provided with a head slidable in the bore of the extension and adapted to engage the shoulder to limit the movement of the rod in one direction, a nut
120 threaded on said rod, a spring encircling the rod and extension and bearing against the pivot end of the cylinder and against the
125

nut, a socket bracket mounted on the mechanism, and a member having one end operatively connected with the socket bracket and the other end provided with a recess and receiving the adjacent end of the rod.

15. In a breech mechanism for ordnance loaded at high angles of elevation, the combination with a breech screw carrier having its pivotal axis inclined to the vertical when the gun is being loaded, of a balancing spring exerting upon the carrier a turning

moment which will vary substantially in accordance with the falling moment of the carrier during its opening and closing movements.

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

DORSEY F. ASBURY.

Witnesses:

HENRY T. BRIGHT,
EDITH STOWELL.