

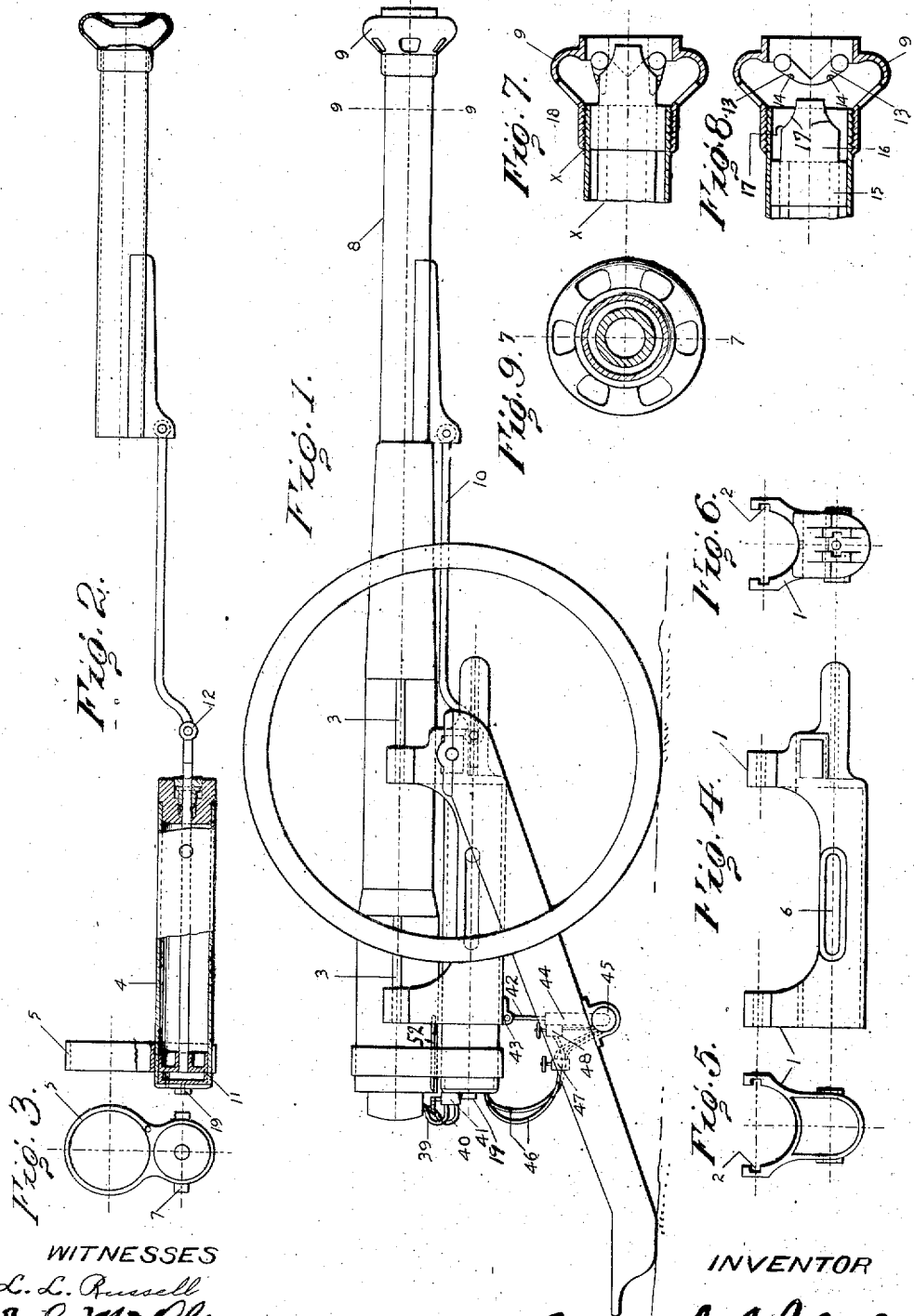
S. N. McCLEAN.
GUN.

APPLICATION FILED DEC. 26, 1900.

Patented Aug. 30, 1910.

3 SHEETS—SHEET 1.

968,678.



WITNESSES
L. L. Russell
S. N. McClean

INVENTOR

Samuel St. McClean

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3 SHEETS—SHEET 2.

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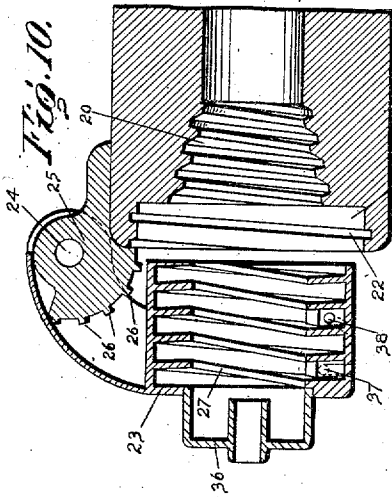


Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

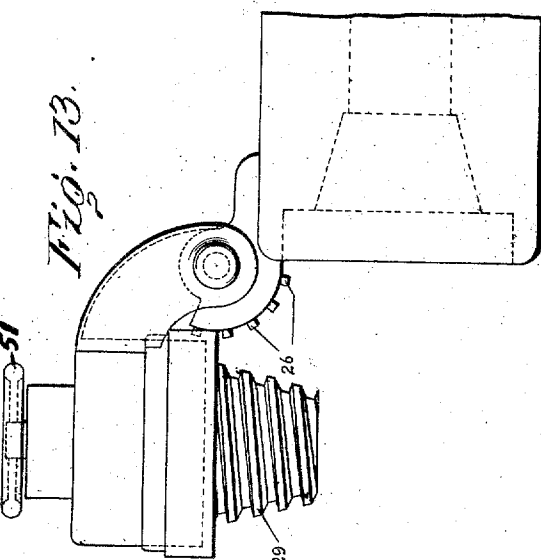
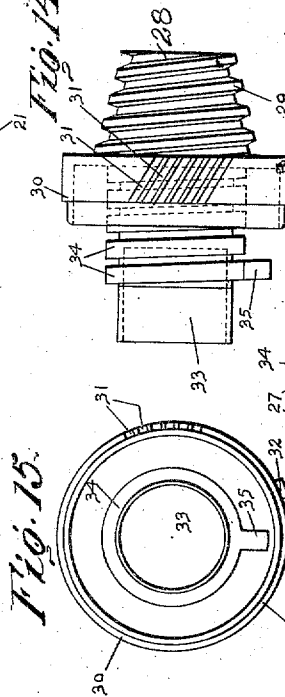
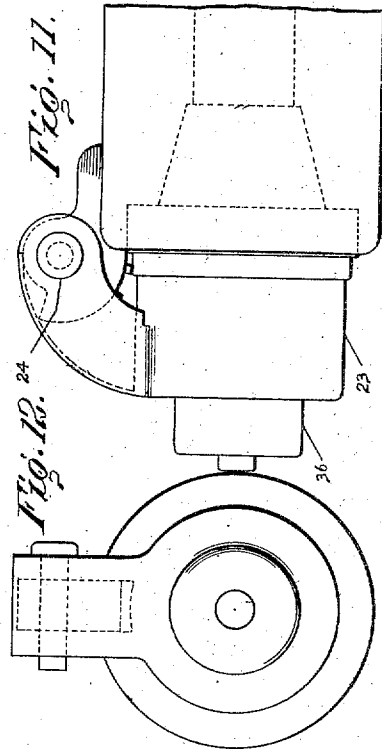
Fig. 17.

Fig. 18.

Fig. 19.

Fig. 20.

Fig. 21.



WITNESSES

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3 SHEETS—SHEET 3.

Fig. 17.

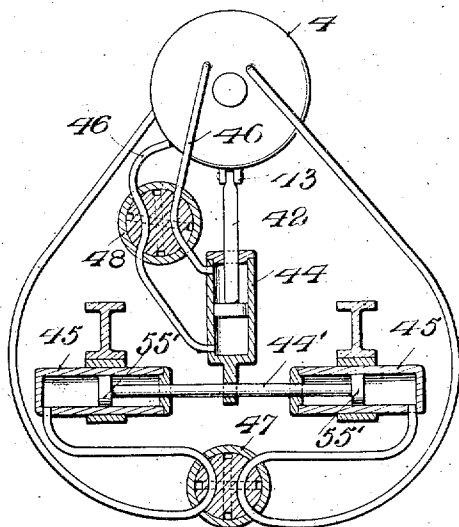
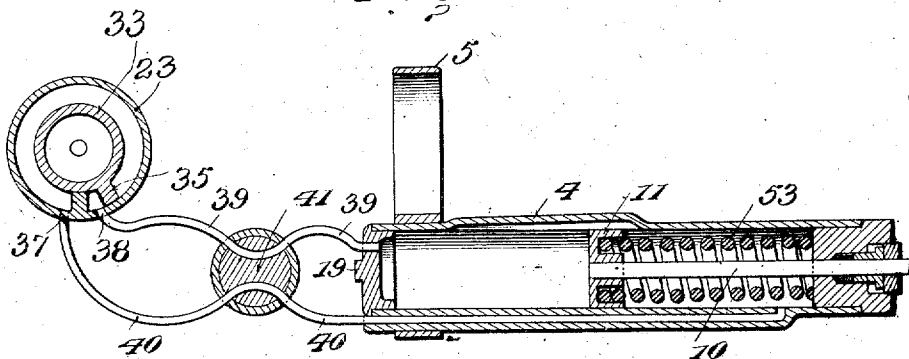


Fig. 18.



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UNITED STATES PATENT OFFICE.

SAMUEL N. McCLEAN, OF CLEVELAND, OHIO.

GUN.

968,678.

Specification of Letters Patent.

Patented Aug. 30, 1910.

Application filed December 26, 1900. Serial No. 41,035.

To all whom it may concern:

Be it known that I, SAMUEL N. McCLEAN, residing at Cleveland, Ohio, have made certain new and useful Improvements in Guns, of which the following is a specification.

My invention relates to guns, and more particularly to guns in which the operation of the breech closure is accomplished by power due to the force of discharge, and in which the recoil of the gun is opposed by the energy of the gases of discharge.

In my application filed Sept. 14, 1900, Sr. No. 30,042, I have shown a means for opposing a recoil part on a gun with a gas driven part and confining an elastic fluid medium between said parts, whereby the recoil of the gun is overcome by the energy of the gases of discharge; and in my application filed Dec. 24, 1900, Sr. No. 40,963, I have shown means whereby the energy of recoil is opposed by that of the gases of discharge and a portion of their combined energies utilized to actuate a motor for operating the breech mechanism, which, in the particular instance shown in said last-mentioned application, consists of a screw threaded breech block and a carrier therefor.

One object of the present invention is to simplify the means for opposing the energy of recoil with that of the gases of discharge and storing their combined energies to operate the breech mechanism; and a further object is to reduce the breech mechanism and its operating motor to the fewest number of parts to the end that its construction and operation may be simplified, its cost reduced and its reliability in action increased.

A further object is to so combine the breech mechanism with the recoil-checking and power-storing devices that such mechanism shall control the action of the recoil devices so that the gun shall be partially returned to battery upon the opening movements of the breech mechanism, and fully restored to battery upon the closing movements of such mechanism.

With these objects in view the invention consists in a cylinder and piston playing therein, one of which is attached to and recoils with the gun and the other is actuated by the gases of discharge, an elastic fluid medium, such as air, being compressed between one head of the cylinder and the piston when the gun is discharged, thereby opposing the energy of the gases of discharge to that of the recoil to check the recoil. The

elastic fluid medium thus interposed between the gas driven and recoil actuated parts may be and preferably is under suitable initial tension. During the recoil action of the parts an elastic fluid medium, as air, is drawn into the cylinder between the piston and the other head of the cylinder, which is compressed during the first portion of the counter recoil, thereby serving to govern or check the violence of the counter recoil of the device, and at the same time compress the fluid medium thus drawn into the cylinder, thereby storing the combined energies of the recoil and the gases of discharge to be utilized in operating the breech mechanism.

The invention further consists of a breech block and a breech block carrier so constructed and combined as to, themselves, constitute a motor for operating the breech mechanism for opening and closing the same. In the preferred embodiment of this part of the invention, a screw threaded breech block has its rear portion, or a rearward extension thereof embraced by a cylindrical carrier, one of said parts being provided with a motor way or groove and the other part with a wing or blade fitting in said way or groove. As herein illustrated the way or groove is arranged spirally on the interior of the carrier and the wing or blade is secured to the breech block and projects into said way, means also being provided for admitting motive fluid to the groove on one side of said wing or blade and venting it from the other, or vice versa. The motive fluid may be drawn from any suitable source of motive power and I have here shown a combination of the recoil check device and the breech block motor mechanism whereby I am enabled to utilize the combined energies of the recoil and the gases of discharge to operate the breech mechanism, and at the same time have the motor device of the breech mechanism act as a governing or controlling means for the recoil check, so that normally it is unable to return the gun to battery till the breech block is closed. This I accomplish by utilizing the fluid compressed during the recoil as the power by which the fluid drawn into the cylinder during recoil is placed under tension and then employ this last-mentioned fluid as the motive fluid for the breech mechanism. As this motive fluid is drawn from the recoil cylinder to and through the motor the tension of that

portion of the motive fluid remaining in the cylinder tends to rapidly decrease, which tendency however is largely overcome by the rearward pressure of the piston in the cylinder under the influence of the air or other fluid compressed during recoil. In this way I so combine the breech mechanism with the recoil check that the action of such mechanism regulates the recoil device during a portion of its movements, while the recoil device, on the other hand, not only furnishes the motive power for the breech mechanism, but also serves to maintain the pressure of the motive fluid at an approximately uniform tension. In addition to the operation of the breech mechanism the pressure is also employed to operate the gun in training and laying the same.

The invention further consists in certain details of improvement and construction of parts all of which will be hereinafter more fully described.

My inventive idea may receive various mechanical expressions one of which I have shown in the accompanying drawings, which are to be regarded as illustrative only and not as defining the limits of the invention.

In the accompanying drawings: Figure 1. shows a side elevation of a gun embodying my invention. Fig. 2. is a side elevation partly in section of the gas driven part and the cylinder actuated by the gun. Fig. 3. is a rear end elevation of Fig. 2. Fig. 4. is a side elevation of the cradle for the gun. Fig. 5. is a rear end elevation; and Fig. 6. is a front elevation of Fig. 4. Figs. 7 and 8. are detailed sectional views of the gas nozzle, and means for operating the valves therein. Fig. 9. is a rear end elevation of Fig. 7. Fig. 10. is a horizontal sectional view of the breech of the gun and the carrier with the breech block removed. Fig. 11. is a plan view of the same. Fig. 12. is a rear elevation of Fig. 11. Fig. 13. is a plan view of the breech end of the gun, the carrier and the block, showing the carrier as swung to one side to open the breech; Fig. 14. is a plan view of the breech block removed from the gun. Fig. 15. is a rear elevation of Fig. 14. Fig. 16. is a central sectional view through the breech block and carrier showing the firing mechanism. Fig. 17. is a diagrammatic view showing the connections between the recoil cylinder and the cylinders for effecting the elevation and depression and traversing of the gun, and the valves which control such connections; and Fig. 18. is a diagrammatic view showing the connection between the recoil cylinder and the breech mechanism, together with the valve for controlling said connection.

Referring to the drawings, 1. is a cradle pivoted at the forward end to any suitable supporting part of the gun carriage, which in the present instance is shown as an ordi-

nary field gun carriage. The cradle is provided with ways or grooves 2, engaging ribs 3, on the gun, whereby the gun is permitted to slide longitudinally within the cradle. 4 is a cylinder attached to the gun at the rear end, and in the present instance by means of a suitable band 5, shrunk on, or otherwise secured on the breech end of the gun and the cylinder while the forward end of the cylinder is suitably supported and guided in the cradle —1— within which it is free to reciprocate. I may, if desired provide the cradle with guide slots —6— and the cylinder with projecting lugs or parts —7— moving in said slots, though this is not necessary. The cylinder or sleeve —8— surrounds and is free to slide longitudinally upon the forward portion of the gun, and is provided with a nozzle —9— for receiving and controlling the gases of discharge, while the rear end of said cylinder is connected by a rod —10— to piston —11— fitting within the cylinder —4— the rod being preferably jointed at —12— and hinged to the cylinder —8— as shown. The gas nozzle —9— is screwed to and moves with the sleeve —8— and is provided with valves —13— mounted therein so as to swing under the influence of the gases of discharge and close the forward opening of the nozzle said valves being provided also with lugs —14— projecting laterally on each side thereof.

Mounted on a collar —15— surrounding and screwed to the muzzle end of the gun are two forwardly projecting arms or parts —16— provided with suitable cam surfaces —17— in the path of the lugs —14— on the valves —13—. The nozzle —9— is preferably in the form of an expanded chamber having vents and openings —18— upon the rear side thereof to permit a determined portion of the gases to escape therethrough, and being provided with an expanded surface against which the gases of discharge impinge and act to force the nozzle —9— together with its attached sleeve —8— and piston —11— forward upon the discharge of the gun. At the same time the recoil of the gun carries the cylinder —4— rearward thereby compressing between the forward head of the cylinder and piston —11— any suitable gas, preferably air confined in said cylinder. Upon the forward movement of the gas nozzle the valves are moved forward so that the lugs —14— on said valves are moved forward of the cams —17— attached to the muzzle of the barrel and the force of the gases of discharge acting to turn said valves to their closed position, as shown in Fig 8, when however the gun and nozzle return to their normal position under the influence of compressed air or gas in the cylinder the nozzle is moved rearward and the cams —17— engage with

the lugs —14— upon the valves to open said valves for the passage of the projectile upon the subsequent discharge of the gun. A suitable form of in-take valve —19— is provided on the rear end of the cylinder —4— and upon the forward movement of the piston in the cylinder, this valve opens and permits a supply of air to enter the cylinder at the rear end of the piston and upon the expansion of the air within the cylinder forward of the piston, the in-take valve —19— is closed and the air thus confined between the piston —11— and the rear of the cylinder is compressed.

15 Referring now to Fig. —10— —20— is a screw threaded breech block chamber formed in the breech end of the gun and here shown as of frusto-conical shape, the extreme rear portion of the breech of the gun being chambered out as at 21—. This chamber —21— has a female screw thread —22— of the same pitch as the screw threads in the breech chamber —20—. The carrier —23— is hinged to turn on pin —24— which passes through a segment shaped lug —25— rigidly fixed to the gun and provided with teeth —26— projecting radially therefrom as shown. The carrier is in the form of a cylinder closed at its rear end, and is provided with an inwardly projecting helical rib —27— on its interior surface, the pitch of the helix being identical with that of the screw threads in the chambers —20—21. The breech block —28— as here shown is frusto-conical in shape and is preferably continuously screw threaded on that portion —29— which enters the chamber —20— while immediately to the rear thereof it is provided with an annular rearwardly projecting flange or collar —30— which has a worm gear on a portion of its perimeter, and a lug —32— formed to fit into the screw thread —22— in chamber —21—. Projecting rearward from within the flange —30— and rigidly formed with the forward portion —29— is the cylindrical tail piece —33— having on its exterior surface a helical rib —34— having the same pitch as the helix —27— on the interior surface of the carrier —23— the width of the helical rib —34— being equal to the space between the turns of the helix —27— though the height of said rib —34— is much less than that of the helical rib —27— except at the rear end of said rib —34— where it is provided with a lug or extension —35— whose height exactly equals that of rib —27.

The diameter of the cylindrical tail piece —33— is the same as the internal diameter of the helix —27— and of a rearward projection —36— on the carrier; while the exterior diameter of the carrier —23— is the same as the internal diameter of the flange —30— on the breech block as shown in Fig. 16. The space between the helices

of the rib —27, is provided with ports —37—38, through which fluid under pressure may be permitted to enter and to exhaust. (See Fig. 10). When the breech block is in position in the breech the threads on the frusto-conical portion —29— engage the threads in chamber 20, the lug 32 enters into the female thread 22— in the chamber 21, and the helical rib 34— fits snugly between the turns of the helix 27, the lug 35 entirely filling said space and forming fluid tight contact with the interior surface of the carrier and the flange 30 extending over and closing the joint between the front end of the carrier and breech block as shown in Fig. 16. When it is desired to open the breech pressure is admitted through port 38 to the spiral channel between the turns of helix 27— and this pressure acts on and forces the lug —35—, to travel around said channel, thereby turning the block in a direction to open the breech, something less than two turns being sufficient, to disconnect the threads on the block from those in the breech chamber and the lug —32, from the thread —22— at which instant the worm 31— comes into engagement with the first tooth —26— on the segment —25— and the further rotation of the block operates to swing the carrier around said segment to the position shown in Fig. 13, where it may be caused to impinge upon any suitable stop to limit its further movement. A reversal of these movements and closing of the breech may be secured by admitting pressure to the channel between the spirals of helix —27— through port 37— and opening port —38— to exhaust. As a source of pressure for thus operating the breech mechanism I preferably connect the ports with the rear end of cylinder —4— by means of pipes 38 and 40, and provide any suitable valve —41— whereby pressure may be permitted to enter through one pipe and exhaust through the other. The hand wheel —51— as shown in Fig. 13, is attached to the breech bolt as a means for operating the bolt by hand.

For the purpose of elevating and depressing the gun a piston rod 42 is hinged to the cradle at 43, and this rod is attached to a piston playing in a substantially vertical cylinder 44 which is suspended between the sides of the trail by engagement with a horizontal piston rod 44', the opposite ends of which are attached to pistons 55' playing in cylinders 45 supported on the trail. Pipes 46 lead from the upper and lower ends of cylinder 44, and one of these pipes is connected to the front end of the recoil cylinder and the other to the rear end of the recoil cylinder. A valve 48 controls these pipes, and, as here shown, said valve is a four-way one which can be turned into register with said pipes to allow the

fluid to flow through the cylinder 44 in either direction. The reverse position of the valve is shown by dotted lines.

Cylinders 45 are for effecting the traversing movement of the gun, and each cylinder is provided with a pipe connection, one of said pipes leading to the front end of the recoil cylinder and the other of said pipes to the rear end of the recoil cylinder. A valve 47, similar in construction to valve 48, controls said pipes for admitting pressure to said cylinders to effect the traversing of the gun.

As shown in Fig. 18, the recoil cylinder is constructed with a by-pass for the fluid past the piston 11, and said piston, which is actuated by a spring 53, has a slight overrun or additional travel to permit the force of said spring to cause a slight additional movement of said piston, whereby the fluid is caused to flow through the breech-mechanism or the elevating or traversing devices when the gun is at rest, and when either the valves 47, 48 or 41, are turned into register with their communicating pipes.

In Fig. 18 the valve 41 is shown connected with the recoil cylinder at the rear end by pipe 39 and to the forward end of the recoil cylinder by pipe 40, and these pipes are connected with the breech-mechanism upon opposite sides of the abutment 35 against which the fluid acts in accomplishing the rotation of the breech-bolt.

The firing action comprises the spring pressed firing pin —49— and its retaining sear or trigger —50—. The firing pin is set or cocked by the terminal locking movement of the breech-block, thus rendering it impossible to discharge the arm in any other than the full locked position of the breech block.

The operation of the cylinder —4— and the gas driven piston —11— permits me to oppose the energy of the gun's recoil by the energy of the gases of discharge and the elasticity of the air interposed between the movement of the piston and the movement of the cylinder, allows the gas driven piston to acquire a sufficient velocity and power of movement to counteract the recoil through the resistance of the elastic quality of the air confined within the cylinder. It is thus apparent that these parts constitute an air-brake for resisting or counteracting the recoil and for storing up both the energy of the recoil and the energy of the gases of discharge. It is also apparent that the movement of the piston —11— will operate as a suction pump to draw in a motor fluid through the valve —19— during the forward movement of the piston. The counter recoil movement of these parts will operate to close the valve 19— and the flow of the motor fluid into and through the breech

action will operate the same in the manner hereinbefore described. It is thus apparent that the primary action of the parts controls the recoil of the gun and utilizes the energy of the gases of discharge to compress the air within the cylinder and to draw a suitable motor fluid into the cylinder; and it is also apparent that these parts control the counter-recoil of the gun by forcing the motor fluid from the cylinder into and through both the breech action of the gun or when desired or required into and through the training and traversing device of the gun, thus allowing the passage of the motor fluid into and through the breech action to both operate the breech action and control the counter-recoil of the gun and the return of the gun to its battery position by means of the flow of the motor fluid both into and out of the cylinder of the engine in the manner described.

The flow of the motor fluid into and through the breech action is automatically controlled by the valve 41— and cam 52—, the cam 52— engaging with the valve 41, to swing it into connection with the pipes 39 and 40 to govern the opening movements of the breech action. It is thus apparent that by means of the gas driven sleeve 8— the rod 10— the piston —11— and cylinder —4— I convert the gun into a gas engine which utilizes, stores and transmits both the energy of the gas and the energy of the recoil for operating and handling the gun, and it is also apparent that by forming the breech block as a motor I attain an exceedingly simple breech action comprising two elements, the breech block and its retaining tray or carrier.

Having thus described my invention I claim:

1. In a breech loading gun, the combination of a breech block and carrier co-acting as a motor to open and close the breech.

2. In a breech loading gun, the combination of a breech block and carrier co-acting as a motor whereby the block is revolved, and a worm gear connection between the block and a fixed part of the gun to swing the carrier.

3. In a breech loading gun, the combination of a carrier having a way or channel therein, a breech block having a wing or part fitting in said channel, and means admitting pressure to said channel on either side of said wing or part.

4. The combination of a breech loading gun and a frusto-conical breech block having screw thread engagement therewith, of a carrier having a way or channel therein, a wing or part on the block fitting into said channel, and means admitting a motor fluid to said channel on either side of said wing or part.

5. The combination of a breech loading

gun, a screw threaded breech block with a carrier having a helical way or channel therein, a wing or part on the block fitting into said channel, and means admitting

5 pressure to said channel.

6. The combination of a breech loading gun, and a breech block and a carrier therefor co-acting as a motor, with a recoil check, and pressure conveying connections between

10 said recoil check and motor.

7. The combination of a breech loading gun, and a breech block and carrier co-acting as a motor, with a recoil check controlled by said motor.

15 8. The combination of a breech loading gun, a breech block and a carrier with a recoil check controlled by said block and carrier.

9. The combination of a breech loading gun, a breech block and a carrier coacting as a motor, with means actuated by the gases of discharge to check the recoil and store the energy of said gases and recoil, and devices conveying said stored energy to said

25 motor to operate the breech block and carrier.

10. The combination of a breech loading gun, a breech block and a carrier coacting as a motor, with a recoil check consisting of a

30 part attached to the gun and an opposing part actuated by the gases of discharge, and means transmitting pressure therefrom to the block and carrier.

11. The combination of a breech loading

35 gun, and a breech block and carrier co-acting as a motor, with a recoil cylinder attached to the gun, a piston therein actuated by the discharge of gases and means transmitting pressure from said cylinder to said

40 block and carrier.

12. The combination of a breech loading

gun, a breech block and carrier co-acting as a motor, a recoil actuated part, a gas actuated part, means compressing a fluid by the

45 action of said parts, and means transmitting said compressed fluid to the block and carrier.

13. The combination of a breech loading

gun, a breech block and carrier co-acting as a motor, a pressure device resisting and storing the energy of recoil and means transmitting said stored energy to the said

50 motor.

14. The combination of a breech loading

55 gun, a breech block and carrier co-acting as a motor, a cylinder attached to and recoiling with the gun, a piston in said cylinder actuated by the gases of discharge, means admitting and retaining air in said cylinder upon

60 the recoil of the gun, whereby the gun is retained in its recoiled position, and a vent for said cylinder through said motor, whereby the breech mechanism is operated and the movement of the gun to battery is controlled.

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15. In a breech-loading gun, the combination of a rotary breech block and a carrier co-acting as a motor to open and close the breech.

16. In a breech-loading gun, the combination of a rotary breech block and a carrier coacting as a motor, and a worm gear connection between the block and a fixed part of the gun to swing the carrier.

17. The combination of a breech-loading gun, and a rotary breech block and a carrier therefor co-acting as a motor, with a recoil check, and pressure conveying connections between said recoil check and motor.

18. The combination of a breech-loading gun, and a rotary breech-block and a carrier co-acting as a motor, with a recoil check controlled by said motor.

19. The combination of a breech-loading gun, and a rotary breech block and a carrier, with a recoil check controlled by said block and carrier.

20. The combination of a breech-loading gun, a rotary breech-block and a swinging carrier coacting as a motor, with a recoil check, and pressure conveying connections between said recoil check and motor.

21. The combination of a breech-loading gun, a rotary breech-block and a swinging carrier coacting as a motor, with a recoil-actuated part, a gas-actuated part, means confining an elastic fluid medium between said parts, and connections conveying said fluid medium to said motor.

22. The combination of a breech-loading gun, a rotary breech block and a swinging carrier coacting as a motor, a pressure device resisting and storing the energy of recoil, and means transmitting said stored energy to said motor.

23. In a breech loading gun, the combination with the gun, of a rotary swinging breech plug provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with means engaging the breech of the gun to positively effect the swinging movement of the breech plug.

24. In a breech loading gun the combination with the gun, of a rotary swinging breech plug provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with a cam engagement with the breech of the gun to positively effect the swinging movement of the breech plug.

25. In a breech loading gun the combination with the gun, of a rotary swinging breech plug provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with a series of cams engaging the breech of the gun to positively effect the swinging movement of the breech plug.

26. In a breech loading gun the combination

130

breech, of a conical rotary swinging breech plug provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with a cam engaging the rack to positively effect the swinging movement of the breech plug.

43. In a breech loading gun the combination with the gun having a rack on its breech, of a conical rotary swinging breech plug provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with a cam engagement with the rack to positively effect the swinging movement of the breech plug.

44. In a breech loading gun the combination with the gun having a rack on its breech, of a conical rotary swinging breech plug provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with a flange of enlarged diameter provided with a cam engagement with the rack to positively effect the swinging movement of the breech plug.

45. In a breech loading gun the combination with the gun having a rack on its breech, of a conical rotary swinging breech plug provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with a series of cams engaging the rack to positively effect the swinging movement of the breech plug.

46. In a breech loading gun the combination with the gun having a rack on its breech, of a conical swinging breech plug provided with means engaging the breech of the gun to lock and release the breech plug, and also provided near its rear end with a series of cams engaging the rack to positively govern the swinging movement of the breech plug.

47. In a breech loading gun the combination with the gun having a rack on its breech, of a conical rotary swinging breech plug provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with a flange of enlarged diameter provided with a series of cams engaging the rack to positively effect the swinging movement of the breech plug.

48. In a breech loading gun the combination with the gun, of a conical rotary swinging breech plug provided with means engaging the breech of the gun to lock and release the breech plug, said gun breech and plug being also provided with a plurality of cam and pin engagements whereby the swinging movement of the breech plug is positively effected.

49. In a breech loading gun the combination of the gun, of a conical rotary swinging breech plug provided with means engaging the breech of the gun to lock and release

the breech plug, said gun breech and plug being also provided with a plurality of cam and pin engagements, whereby the swinging movement of the breech plug is positively effected.

50. In a breech loading gun the combination of the gun, of a rotary conical swinging breech plug provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with a flange of enlarged diameter and a plurality of cam engagements between said flange and gun breech, whereby the swinging movements of the plug is positively effected.

51. In a breech loading gun the combination of the gun having locking surfaces with a screw-thread pitch formed in its breech, of a rotary swinging breech plug provided with locking means formed on a screw-thread to engage the locking means in the breech, said plug being also provided with means comprising a cam groove having a pitch greater than the pitch of the locking lugs, and a pin on the breech of the gun for engaging said cam groove to positively effect the swinging movement of the breech plug.

52. In a breech loading gun the combination of the gun having locking surfaces with a screw-thread pitch formed in its breech, of a rotary swinging breech plug provided with locking means formed on a screw-thread to engage the locking means in the breech, said gun breech and plug being also provided with means comprising a pin and a cam, for positively controlling the opening and closing movement of the breech plug.

53. In a breech loading gun the combination with the gun having locking surfaces with a screw-thread pitch formed in its breech, of a rotary swinging breech plug provided with locking means formed on a screw-thread to engage the locking surface in the breech, and a plurality of pin and cam groove engagements between the gun breech and plug, one of said engagements corresponding with the pitch of the locking surfaces, and the other engagement having a greater pitch than the pitch of the locking surfaces, whereby the opening and closing movement of the breech plug is positively effected.

54. In a breech loading gun the combination of the gun having locking surfaces with a screw-thread pitch formed in its breech, of a conical rotary swinging breech plug provided with locking means formed on a screw-thread to engage the locking means in the breech, said gun breech and plug being also provided with means comprising a pin and a cam, for positively controlling the opening and closing movement of the breech plug.

55. In a breech loading gun the combination with the gun having locking surfaces with a screw-thread pitch formed in its breech, of a conical rotary swinging breech plug provided with locking means formed on a screw-thread to engage the locking surface in the breech, and a plurality of pin and cam groove engagements between the gun breech and plug, one of said engagements corresponding with the pitch of the locking surfaces, and the other engagement having a greater pitch than the pitch of the locking surfaces, whereby the opening and closing movement of the breech plug is positively effected.

56. In a breech loading gun the combination with the gun having locking surfaces with a screw-thread pitch formed on its breech, of a conical rotary swinging breech plug provided with locking surfaces formed on a screw-thread to engage the locking surfaces in the breech and also provided with a flange of enlarged diameter, said flange and gun breech having a pin and cam groove engagement, which engagement has a pitch greater than the pitch of the locking surfaces for positively effecting the opening and closing movement of the breech plug.

57. In a breech loading gun the combination with the gun having locking surfaces with a screw-thread pitch formed in its breech, of a conical rotary swinging breech plug provided with locking surfaces engaging the locking surfaces in the breech, said gun breech and plug having a plurality of cam engagements one of which has a pitch corresponding with the pitch of the locking surfaces and the other of which has a greater pitch than the pitch of the locking surfaces to positively effect the opening and closing movement of the breech plug.

58. In a breech loading gun the combination of the gun having locking surfaces with a screw-thread pitch formed in its breech, of a conical rotary swinging breech plug provided with locking surfaces formed on a screw-thread to engage the locking surfaces in the breech, said gun breech and plug having a plurality of cam groove and pin engagements, one of which has a pitch corresponding with the pitch of the locking surfaces and another of which has a greater pitch than the pitch of the locking surfaces, thereby affording a positive engagement between the plug and the breech of the gun to positively effect the opening and closing movement of the breech plug.

59. In a breech loading gun the combination of a gun having cam locking surfaces formed in its breech, of a conical rotary swinging breech plug provided with cam locking surfaces formed on a screw-thread pitch to engage the locking surfaces in the breech and also provided near its rear end with means comprising a cam engagement

with the breech, said engagement having a pitch corresponding with the pitch of the locking surfaces and a second cam engagement of greater pitch than the pitch of the locking surfaces for engaging the breech of the gun to positively effect the opening and closing movement of the breech plug.

60. In a breech loading gun the combination of the gun having cam locking surfaces formed in its breech, of a conical rotary swinging breech plug provided with locking surfaces formed on a screw-thread pitch to engage the locking surfaces in the breech and also provided with a flange of enlarged diameter provided with means comprising a cam engagement with the gun breech, said engagement having a pitch corresponding with the pitch of the locking lugs and a plurality of cam engagements with the gun breech having a greater pitch than the pitch of the locking surfaces for engaging the breech of the gun to positively effect the opening and closing movement of the breech plug.

61. In a breech loading gun the combination of the gun having cam locking surfaces formed in its breech, of a conical rotary swinging breech plug provided with locking surfaces formed on a screw-thread pitch to engage the locking surfaces in the breech, and also provided with a cam groove and pin engagement with the breech, said groove having a pitch corresponding with the pitch of the locking surfaces for engaging the pin to positively control the opening and closing movement of the breech plug.

62. In a breech loading gun the combination of the gun having cam locking surfaces formed in its breech, of a conical rotary swinging breech plug provided with locking surfaces formed on a screw-thread pitch to engage the locking surfaces in the breech and also provided with a flange of enlarged diameter having a cam groove and pin engagement with the gun breech, said groove having a pitch corresponding with the pitch of the locking surfaces to positively control the opening and closing movement of the breech block.

63. In a breech loading gun the combination of the gun having cam locking surfaces formed in its breech, of a conical rotary swinging breech plug provided with locking surfaces formed on a screw-thread pitch to engage the locking surfaces in the breech, and also provided with means comprising a cam groove and pin engagement with the gun breech, said groove having a pitch corresponding with the pitch of the locking surfaces, said plug also having a series of cam engagements with the gun breech of greater pitch than the pitch of the locking surfaces to positively effect the swinging movement of the breech plug.

64. In a breech loading gun the combination with the gun, of a carrier having a hinged connection with the gun, a breech plug carried by the carrier and adapted to rotate and to have longitudinal movement therein, provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with means engaging the breech of the gun to positively effect the swinging movement of the carrier carrying the breech plug. 70
65. In a breech loading gun the combination with the gun, of a carrier having a hinged connection with the gun, a breech plug carried by the carrier and adapted to rotate and to have longitudinal movement therein, provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with a cam engaging the breech of the gun to positively effect the swinging movement of the carrier carrying the breech plug. 75
66. In a breech loading gun the combination with the gun, of a carrier having a hinged connection with the gun, a breech plug carried by the carrier and adapted to rotate and to have longitudinal movement therein, provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with a series of cams engaging the breech of the gun to positively effect the swinging movement of the breech plug. 80
67. In a breech loading gun the combination with the gun, of a carrier having a hinged connection with the gun, a breech plug carried thereby and having a screw threaded connection therewith to permit the breech plug to rotate and to have longitudinal movement in the carrier, the breech plug being provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with means engaging the breech of the gun to positively effect the swinging movement of the carrier carrying the breech plug. 85
68. In a breech loading gun the combination with the gun, of a carrier having a hinged connection with the gun, a breech plug carried thereby and having a screw threaded connection therewith to permit the breech plug to rotate and to have longitudinal movement in the carrier, the breech plug being provided with locking lugs formed on a screw-thread to engage the breech of the gun, the screw-threads connecting the breech plug and carrier corresponding in pitch with the screw-thread on which the locking lugs are formed, the breech plug being also provided with means engaging the breech of the gun to positively effect the swinging movement of the carrier carrying the breech plug. 90
69. In a breech loading gun the combination with the gun, of a carrier having a hinged connection with the gun, a breech plug carried thereby and having a screw threaded connection therewith to permit the breech plug to rotate and to have longitudinal movement in the carrier, the breech plug being provided with means engaging the breech of the gun to lock and release the breech plug, and also provided with means comprising a cam groove for engaging the breech of the gun to positively control the swinging movement of the carrier carrying the breech plug, the pitch of the cam groove corresponding with the pitch of the screw connection between the breech plug and the carrier. 95
70. In a breech loading gun, the combination of a hinged arm or carrier, a breech block rotatably supported by the carrier and coacting with the carrier to constitute a motor to rotate the breech block, and means for supplying motor fluid to the motor. 100
71. In a breech loading gun, the combination of a hinged arm or carrier, a breech block supported by the carrier and arranged to rotate and to have longitudinal movement in the carrier, and coacting with the carrier to constitute a motor to actuate the breech block, and means for supplying motor fluid to the motor. 105
72. In a breech loading gun the combination of a hinged arm or carrier, a breech block rotatably supported by the carrier and coacting therewith to constitute a motor to rotate the breech block, and means operated by the discharge of the gun for supplying motor fluid to the motor. 110
73. In a breech loading gun the combination of a hinged arm or carrier, a breech block rotatably supported by the carrier and coacting therewith to constitute a motor to rotate the breech block in one direction to lock it and in the reverse direction to release it, and means for supplying fluid to the motor to rotate the breech block first in one direction and subsequently in the other direction. 115
74. In a breech loading gun the combination of a hinged arm or carrier, a breech block rotatably supported by the carrier and coacting therewith to constitute a motor to rotate the breech block in one direction to lock it and in the reverse direction to release it, and means operated by the discharge of the gun for supplying fluid to the motor to rotate the breech block first in one direction and subsequently in the other direction. 120
75. In a breech loading gun the combination of a hinged arm or carrier, a breech block rotatably supported by the carrier and coacting therewith to constitute a motor to rotate the breech block, and means for supplying motor fluid to the motor comprising a cylinder, connections between the cylinder and the motor, and a piston in the cylinder to force the motor fluid through the motor. 125

76. In a breech loading gun, the combination of a hinged arm or carrier, a breech block rotatably supported by the carrier and acting therewith to constitute a motor to rotate the breech block, and means for supplying motor fluid to the motor comprising cylinder, connections between the cylinder and motor, and a piston in the cylinder operated upon the discharge of the gun to force the motor fluid through the motor.

77. In a breech loading gun a breech-mechanism-actuating motor comprising a motor chamber, a rotary member within the chamber, an inlet channel communicating with the chamber on one side of the rotary member, an outlet channel leading from the chamber on the other side of said rotary member, and means for forcing fluid through the inlet and outlet channels.

78. In a breech loading gun a breech-mechanism-actuating motor comprising a non-rotary member having a chamber formed therein, a rotary member provided with a radial wing, an inlet channel leading to the chamber on one side of the rotary member, an outlet channel leading from the chamber on the other side of said rotary member, and means for supplying motor fluid to the chamber.

79. In a breech loading gun the combination of a hinged arm or carrier, a breech block rotatably supported by the hinged arm or carrier and coacting therewith to constitute a motor to rotate the breech block,

and means whereby the rotation of the breech block locks and releases it and swings the hinged arm or carrier to and from closed position.

80. In a breech loading gun a rotary motor arranged to rotate the breech block, said motor being pivotally connected to the breech of the gun, and the means for supplying motor fluid to the motor.

81. In a breech loading gun provided with a recoil cylinder, a breech-mechanism-actuating motor comprising a rotary and a non-rotary member and connections between the recoil cylinder and the motor to supply the motor fluid from the recoil cylinder to the motor.

82. In a breech loading gun a breech-mechanism-actuating motor comprising a non-rotary member hinged to the breech of the gun and a rotary member, a breech block carried by the non-rotary member and connected with the rotary member.

83. In a breech loading gun a breech mechanism actuating motor comprising a non-rotary member having a chamber formed therein hinged to the breech of the gun, a rotary member arranged in the chamber, a breech block carried by the non-rotary member and means connecting the breech block with the rotary member of the motor.

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