J. T. THOMPSON.

BUFFER.

APPLICATION FILED APR. 28, 1920.

1,351,141.

Patented Aug. 31, 1920.

2 SHEETS—SHEET 1.

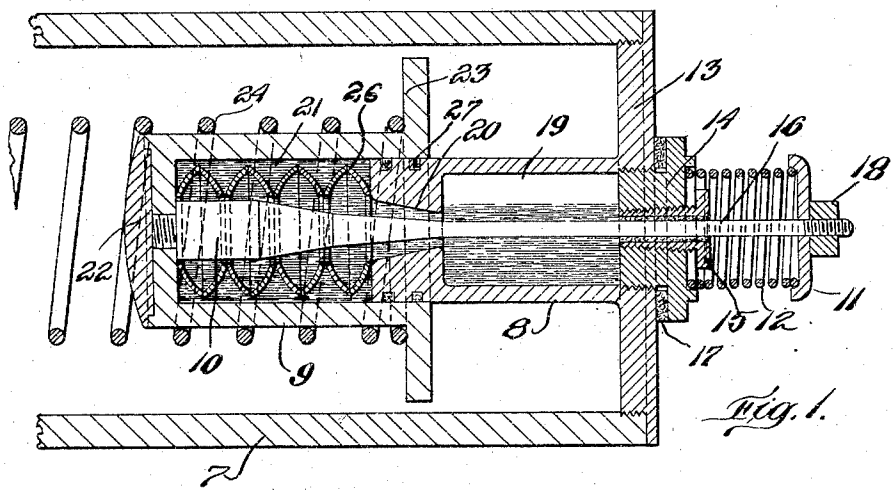

Fig. 1.

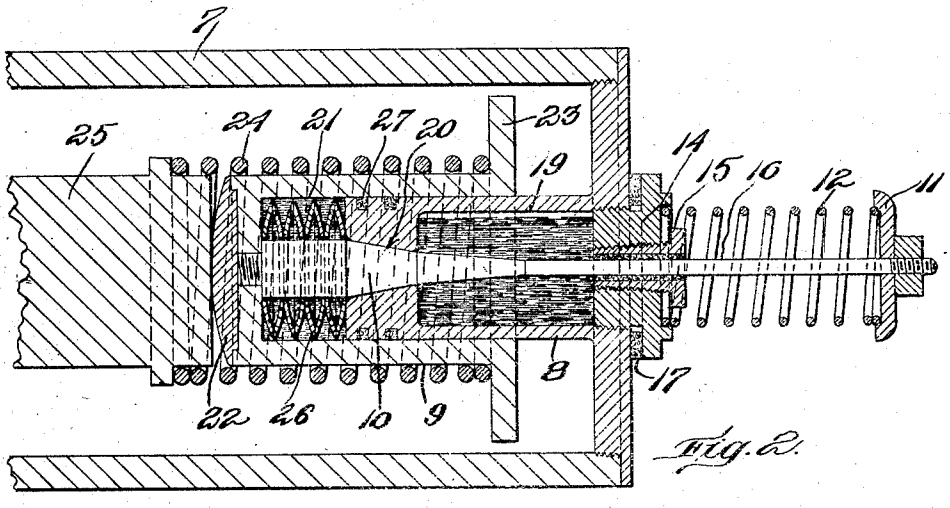

Fig. 2.

Inventor:
John T. Thompson,
by Roberts Roberts & Cushman
his Attorneys.

J. T. THOMPSON.

BUFFER.

APPLICATION FILED APR. 28, 1920.

1,351,141.

Patented Aug. 31, 1920.

2 SHEETS—SHEET 2.

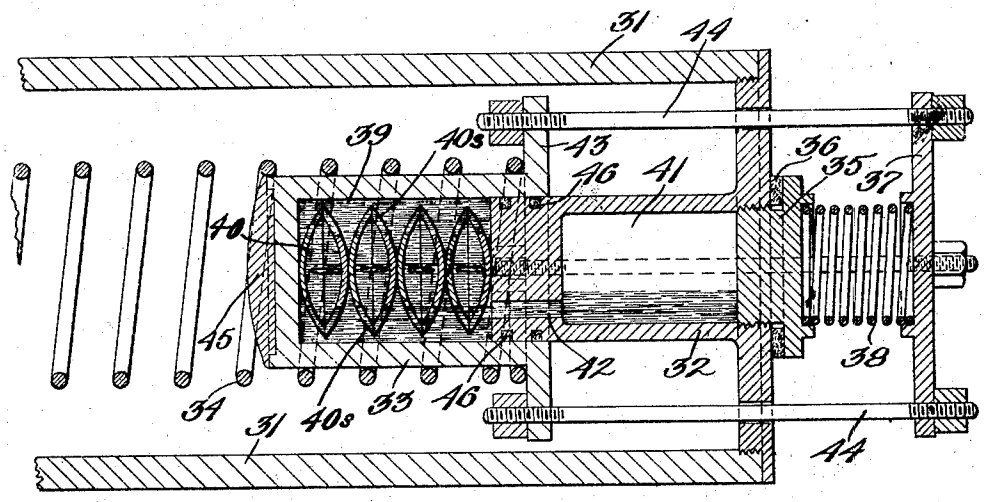

Fig. 3.

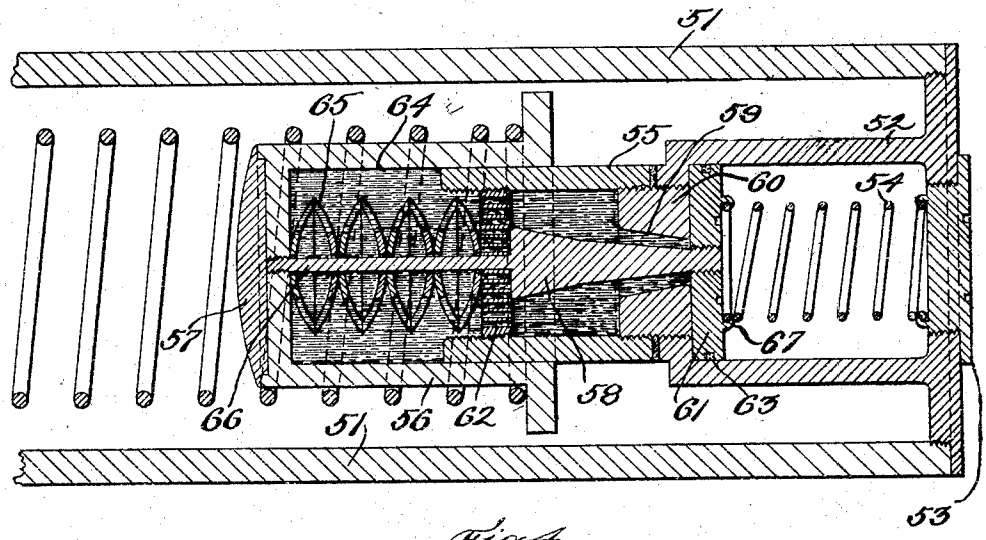

Fig. 4.

Inventor:
John T. Thompson,
by Roberts Robertson & Cushman
his Attorneys.

UNITED STATES PATENT OFFICE.

JOHN TALIAFERRO THOMPSON, OF NEWPORT, KENTUCKY, ASSIGNOR OF ONE-HALF TO THOMAS F. RYAN, OF NEW YORK, N. Y.

BUFFER.

1,351,141. Specification of Letters Patent. Patented Aug. 31, 1920.

Application filed April 28, 1920. Serial No. 377,185.

To all whom it may concern:

Be it known that I, JOHN TALIAFERRO THOMPSON, a citizen of the United States of America, and resident of Newport, in the county of Campbell and State of Kentucky, have invented new and useful Improvements in Buffers, of which the following is a specification.

My invention relates to an improved buffer adapted to cushion shocks and absorb surplus energy, which is more specifically described herein in connection with an embodiment particularly adapted for use as a recoil buffer with firearms of the automatic or semi-automatic types.

Substantially all such types of arms now in use are provided with a bolt or similar breech closure which reciprocates. The reciprocation is caused in some guns directly by the breech pressure, in others by gas pressure and in various manners in other types. Regardless of the method of accomplishing this movement of the breech block, it is accomplished at an exceedingly rapid linear velocity, and the stopping of the member at the end of its opening stroke, due to the inertia of the member, is ordinarily accomplished only at the expense of a sharp jar. This jar or jolt is detrimental to all the working parts of the gun in that it is a source of wear and breakage and, moreover, it renders accuracy of fire extremely difficult, especially with the lighter types of guns adapted to be fired from the hip or the shoulder.

The breech closures are forced rearwardly either directly or indirectly by the explosion of the cartridge and are returned to closed position usually by some spring means, the spring means having the necessary energy stored therein by the opening movement of the breech. In order to form this spring means of adequate capacity to stop the rearward motion gradually and without heavy shock, it must either offer excessively heavy resistance or be of a length such as to preclude its use in small arms. If sufficiently heavy to reduce the bolt pressure with a short travel, its reaction is sharp and quick and the breech is closed with substantially as heavy and detrimental a jolt as that which has been eliminated at the end of the recoil.

It is an object of my invention to provide a recoil buffer which effectively eliminates recoil shocks due to reciprocating breech closures or the like, and which does not return the breech closure to closed position with exessive velocity. It is an object to provide a buffer of the character described which is light in weight and small in size and which may be fitted in the usual receivers or recoil housings without the necessity of unusual space or length. It is also an object to provide a buffer providing a gradual and progressive stop for the reciprocating parts and to provide in connection therewith counter recoil means to prevent a sudden or jarring counter recoil movement. It is an object to provide means of the character described which are strong in construction, relatively inexpensive to manufacture, and which will require little attention in use. Other and further objects will appear as the description proceeds.

I accomplish these desired objects by a buffer which supplements the usual recoil spring and continues to act in bringing the breech closure to rest and in absorbing surplus energy after that spring has been fully compressed, and by counter recoil means adapted to prevent too sudden return of the buffer to its normal length.

I have shown certain preferred embodiments of my invention in the accompanying drawings in which—

Figure 1 is a longitudinal section of one form of my device in the normal position;

Fig. 2 is a view similar to Fig. 1 but showing the device in the compressed position;

Fig. 3 is a view similar to Fig. 1 but of a modified form of the device; and

Fig. 4 is a view similar to Fig. 3 but of a different modified form of the device.

The form of the device in Figs. 1 and 2 is shown fitted into the rear end of a receiver 7 and comprises a fixed member 8, movable member 9, piston 10, counter recoil cap 11 and counter recoil spring 12. The

fixed member 8 has a cylindrical body and has a circumferential flange 13 which is threaded into the rear of the receiver. The rear of the cylindrical portion 8 is fitted with the plug 14 into which is screwed the packing bushing 15 surrounding the rear of the piston stem 16. The plug 14 is formed with a flange 17 and between this flange and the flange 13 is fitted the packing washer 17. The counter recoil cap 11 is held on the end of the piston stem 16 by the nut 18.

The fixed member 8 is formed with the cylindrical cavity 19 and the frusto-conical opening 20 through its forward end. The movable member 9 has the cylindrical cavity 21 therein of such size as to make a snug sliding fit with the exterior of the fixed member. The large forward end of the piston 10 is threaded into the movable member at the base of the cavity 21, the intermediate portion of the piston being frusto-conical in form upon varying angles, this portion of the piston interfitting with the opening 20 to vary its effective size during the movement of the movable member.

The front of the movable member is fitted with the impact buffer 22 which may be formed of rubber, leather or similar material, and its rear end is formed with a circumferential flange 23 against which bears the rear end of the recoil spring 24. As shown in Fig. 2 the front end of the recoil spring is fitted to the rear of the breech closure or similar member 25. The portion of the piston within the movable member 9 is surrounded by a series of Belleville springs 26, one end of the series contacting with the base of the cavity 21 and the other end of the series bearing against the head of the fixed member 8. The cavities in the two members have oil placed therein in such amount that when the buffer is compressed the cavities are substantially filled as shown in Fig. 2. The forward portion of the outer surface of the fixed member 8 is fitted with packing rings 27 to prevent leakage of the oil. The Belleville springs have axial openings somewhat larger than the piston 10 through which the oil is squirted and sucked as the springs are compressed and expanded.

The form of the device shown in Fig. 3 comprises the receiver 31, fixed member 32, movable member 33, recoil spring 34, closure plug 35, packing 36, counter recoil cap 37, and counter recoil spring 38. The movable member 33 has the internal cylindrical cavity 39 making a sliding fit with the fixed member, the cavity containing the Belleville springs 40. The Belleville springs are provided with slots 405 at spaced intervals in their peripheries whereby oil is forced into and out of the semi-inclosed space between the sets of opposed springs as they are expanded and compressed. The cavity 39 is connected to a similar cavity 41 in the fixed member by the port 42 located adjacent the lower portion of the two cavities. The rear flange 43 of the movable member is connected to the counter recoil cap by the rods 44. The movable member is provided with the impact buffer 45 similar to that of Figs. 1 and 2, and the fixed member with the packing rings 46. Oil is placed in both cavities, the amount being substantially equivalent to the space remaining when the buffer is in the compressed position.

As shown in Fig. 4 the device comprises the receiver 51, fixed member 52, closure plug 53, counter recoil spring 54, guide member 55, movable member 56, impact buffer 57, and piston 58. The fixed member 52 and guide member 55 are rigidly connected by the sleeve 60 having the frusto-conical opening 59 therein. The rearward conical portion of the piston passes through the opening 59 and its rear end carries the solid piston head 61. Its forward end passes through the perforated head or spider 62. The piston head 61 is fitted with the packing ring 63.

Fitting in the cavity 64 in the movable member 56, is the series of Belleville springs 65, which are retained in position by the reduced forward portion 66 of the piston 58, the forward end of which is threaded to the movable member. The space between the rear face of the movable member and the piston head 61 is substantially filled with oil. The counter recoil spring is held in place by the hooks 67, and acts as a tension spring.

Considering first the form of my device shown in Figs. 1 and 2, in operation the spring 24 is compressed by the breech closure which then strikes the impact buffer 22 and forces the movable member upon the fixed member. The recoil spring 24 may be made somewhat lighter than would be required if the buffer were not used. The force of the moving breech closure transmitted through the spring 24 to the movable member is preferably sufficient, however, so that the buffer member has started to move before the breech closure comes in contact with it. This movement may be slight but the fact that it is in motion materially diminishes the meeting shock of the two parts.

As the movable member is forced over the fixed member the Belleville springs are compressed and the oil in the movable member is forced through the orifice 20 into the fixed member. The relation between this orifice and the piston 10 is such that the effective opening is reduced as the members move together. Since the amount of oil to be forced through the orifice is substantially the same for each even increment of linear motion of the movable member it follows that the oil velocity through the orifice must be increased, if the linear velocity is to

be maintained. However, the kinetic energy of the breech closure is decreased by the amount used in forcing the oil through the orifice and the oil velocity preferably is not increased. The most effective relation of the parts for stopping the bolt without jar, is that where the decrease in the orifice is such as to correspond to the decreased speed of the bolt so that the oil velocity is substantially constant and its resistance substantially uniform. The compression of the air trapped above the oil in the fixed member also adds to the resistance of the buffer. When the buffer is compressed the counter recoil spring 12 is in substantially its normal position.

When the breech closure has ceased its rearward motion, the energy stored in the recoil spring and buffer forces it forward again to closed position. While this motion should be sufficiently rapid to cause the closure to carry with it a cartridge and to operate the breech locking means, it should not be so excessively rapid as to impart a shock to the gun. The fact that the spring 24 is less powerful than would be required without the buffer is an important factor in decreasing the closing speed. The relative effective return speed of the buffer is materially less than that of the recoil spring, so that the closure is started in its closing movement by the recoil spring without substantial direct action upon the closure by the buffer.

The buffer is retarded in its return to normal position by the fact that the Belleville springs are relatively slow in action, by the necessity for the oil in the buffer to pass through a small orifice during the initial portion of the return movement, and by the counter recoil spring 12 which is compressed by the counter recoil cap 11.

The action of the form of the device shown in Fig. 3 is essentially the same as that just described. The main difference is that there is no provision for varying the size of the orifice between the oil chambers in the movable and fixed members and that the orifice is placed lower in the buffer to minimize the possibility of the air in the fixed member passing into the movable member.

The form of the device shown in Fig. 4, differs from those of the other figures in that the chamber in the fixed member increases in size as that in the movable member decreases, this being caused by the fact that the piston head 61 is rigidly connected to the movable member and moves therewith. This piston head 61 is equal in size to the interior of the movable member. The spider 62 serves as a guide for the piston rod and as an abutment for the Belleville springs. The counter recoil spring 54 acts by tension in this form of the device and is entirely inclosed by the receiver.

In all forms of the device shown the heavy Belleville springs are entirely covered by the oil in the buffer and while this is not absolutely essential to my invention, I have found it a very desirable combination. The Belleville springs, due to their opposed cup formation have a squirting and sucking effect on the oil not found in other types of springs and this action is important both in cushioning shocks and in retarding recoil.

While I have generally referred to the liquid in my buffer as oil, it may obviously be any suitable liquid. Should it be desired to vary the action of the buffer somewhat in different types of guns oils or liquids of varying viscosity may be used. Hydroline or a similar oil such as used in ordnance is particularly suitable for use in my buffer. The action of the buffer may be changed in an individual gun by varying the adjustment of the counter recoil cap, and consequently the action of the counter recoil spring.

While the embodiment of my invention which has been specifically described herein is particularly adapted for use as a recoil buffer in firearms, it is to be understood that the essential features of my invention are broadly applicable wherever means are desired to progressively cushion shocks and absorb surplus energy and where counter recoil or rebound is to be retarded. To enumerate another specific application, my invention is also peculiarly fitted for use as a shock absorber or buffer in automobiles.

I claim:

1. A buffer for firearms or the like comprising recoil cushioning means and mechanical means independent of the cushioning means to retard the reaction of said cushioning means.

2. A buffer for firearms or the like comprising recoil cushioning means adapted to be reduced in length in cushioning recoil shocks, and mechanical means independent of the cushioning means to retard the return of said cushioning means to normal length.

3. A buffer for firearms or the like comprising a fixed member, and a movable member, means between said members adapted to cushion recoil shocks, and mechanical counter recoil means independent of the cushioning means associated with the movable member and adapted to retard the reaction of the cushioning means.

4. A buffer for firearms or the like comprising a fixed member and a movable member, spring cushioning means between said members, a bath of oil filling the space about said springs, and a restricted orifice for egress of said oil upon compression of said springs.

5. A buffer for firearms or the like comprising a fixed member and a movable mem-

ber, Belleville springs between said members, a bath of oil filling the space about said springs, a chamber in the fixed member and a restricted orifice between the spring space and the chamber.

6. A buffer for firearms or the like comprising a fixed member and a movable member, spring cushioning means inclosed by the movable member and bearing against the fixed member and a bath of oil filling the space about said springs.

7. A buffer for firearms or the like comprising a fixed member and a movable member, spring cushioning means between said members, and a bath of oil filling the space about said springs, and counter recoil means associated with said movable member.

8. A buffer for firearms or the like comprising a fixed member and a movable member, Belleville springs between said members, a bath of oil filling the space about said springs, a chamber in the fixed member and a restricted orifice between the spring space and the chamber, and a counter recoil spring operatively associated with the movable member.

9. A buffer for firearms or the like comprising a fixed member and a movable member, Belleville springs between said members, a bath of oil filling the space about said springs, a coil spring, and means connecting said spring to the movable member in such manner that the coil spring acts in opposition to the Belleville springs.

10. A buffer for firearms or the like comprising a fixed member, a movable member, a closed space formed between said members adapted to be filled with oil, an orifice in the wall of said space adapted to permit the discharge of oil therefrom upon compression of the buffer, and means operated by movement of the movable member associated with the orifice and adapted to progressively vary the effective size thereof.

11. A buffer for firearms or the like comprising a fixed member, a movable member, a closed space formed between said members adapted to be filled with oil, an orifice in the wall of said space adapted to permit the discharge of oil therefrom upon compression of the buffer, and means operated by movement of the movable member associated with the orifice and adapted to diminish the effective size thereof as the buffer is compressed.

12. A buffer for firearms or the like comprising a fixed member having a chamber therein, a movable member adapted to telescope upon the fixed member, a closed space formed between the two members and adapted to be filled with oil, an orifice in the head of the fixed member connecting the space and the chamber, and means associated with the movable member adapted to vary the effective size of the opening during movement of the member.

13. A buffer for firearms or the like comprising a fixed member having a chamber therein, a movable member adapted to telescope upon the fixed member, a closed space formed between the two members and adapted to be filled with oil an orifice in the head of the fixed member connecting the space and the chamber, and a piston connected to the movable member and so associated with the orifice as to diminish the effective size thereof as the buffer is compressed.

14. A buffer for firearms or the like comprising a fixed member having a chamber therein, a movable member adapted to telescope upon the fixed member, a closed space formed between the two members and adapted to be filled with oil, an orifice in the head of the fixed member connecting the space and the chamber, a piston connected to the movable member and so associated with the orifice as to diminish the effective size thereof as the buffer is compressed, and spring means operatively connected to the piston and adapted to retard the counter recoil movement of the movable member.

15. A buffer for firearms or the like comprising a fixed member having a chamber therein, a movable member adapted to telescope upon the fixed member, a closed space formed between the two members, Belleville springs in said space and oil filling the space about said springs, an orifice in the head of the fixed member connecting the space and the chamber, and means associated with the movable member adapted to vary the effective size of the opening during movement of the member.

16. A buffer for firearms or the like comprising a fixed member having a chamber therein, a movable member adapted to telescope upon the fixed member, a closed space formed between the two members, Belleville springs in said space and oil filling the space about said springs, an orifice in the head of the fixed member connecting the space and the chamber, and a piston extending from the movable member and passing through the Belleville springs and the orifice, and adapted to vary the effective size of the orifice during the movement of the movable member.

17. A buffer for firearms or the like comprising a fixed member having a chamber therein, a movable member adapted to telescope upon the fixed member, a closed space formed between the two members, Belleville springs in said space and oil filling the space about said springs, an orifice in the head of the fixed member connecting the space and the chamber, a piston extending from the movable member and passing through the

Belleville springs, and the orifice, and adapted to vary the effective size of the orifice during the movement of the movable member, and spring means operatively connected to the piston and adapted to retard the counter recoil movement of the movable member.

18. Recoil cushioning means for guns comprising a recoil spring, a buffer having cushioning means therein, and means associated with the buffer adapted to retard the reaction of the buffer cushioning means.

19. Recoil cushioning means for guns comprising a recoil spring and a buffer having a movable and a fixed member and resilient means therebetween, one end of the recoil spring bearing against the movable member and the other end being adapted to receive the recoil thrust from the breech closure of the gun, the recoil spring and buffer being so associated as to permit a breech closure to contact with the movable member during a portion of its recoil travel.

20. Recoil cushioning means for guns comprising a recoil spring and a buffer having a movable and a fixed member and resilient means therebetween, one end of the recoil spring bearing against the movable member and the other end being adapted to receive the recoil thrust from the breech closure of the gun, the recoil spring and buffer being so associated as to permit a breech closure to contact with the movable member during a portion of its recoil travel, and means associated with the buffer adapted to retard its counter recoil movement and thus to minimize the contact between buffer and breech closure during counter recoil.

21. Recoil cushioning means for guns comprising a recoil spring and a buffer having a movable and a fixed member, a space formed between said members, Belleville springs therein and oil surrounding the springs, the space having a restricted orifice, one end of the recoil spring bearing against the movable member and the other end being adapted to receive the recoil thrust from the breech closure of the gun, the recoil spring and buffer being so associated as to permit a breech closure to contact with the movable member during a portion of its recoil travel whereby the Belleville springs are compressed and a portion of the oil forced through the restricted orifice.

22. Recoil cushioning means for guns comprising a recoil spring and a buffer having a movable and a fixed member, a space formed between said members, Belleville springs therein and oil surrounding the springs, the space having a restricted orifice, one end of the recoil spring bearing against the movable member and the other end being adapted to receive the recoil thrust from the breech closure of the gun, the recoil spring and buffer being so associated as to permit a breech closure to contact with the movable member during a portion of its recoil travel whereby the Belleville springs are compressed and a portion of the oil forced through the restricted orifice, and a counter recoil spring operatively associated with the movable member whereby counter recoil of the buffer is retarded.

Signed by me at New Canaan, Connecticut, this twenty-fourth day of April, 1920.

JOHN TALIAFERRO THOMPSON.