United States Patent [19]

Zouck

[11] **3,884,119**

[45] **May 20, 1975**

[54] **LOADING DEVICE FOR GUNS**

[75] Inventor: **Robert L. Zouck,** Pikesville, Md.

[73] Assignee: **AAI Corporation,** Cockeysville, Md.

[22] Filed: **May 2, 1955**

[21] Appl. No.: **505,311**

[52] **U.S. Cl.** **89/45**

[51] **Int. Cl.** **F41d 11/14;** F41f 9/00

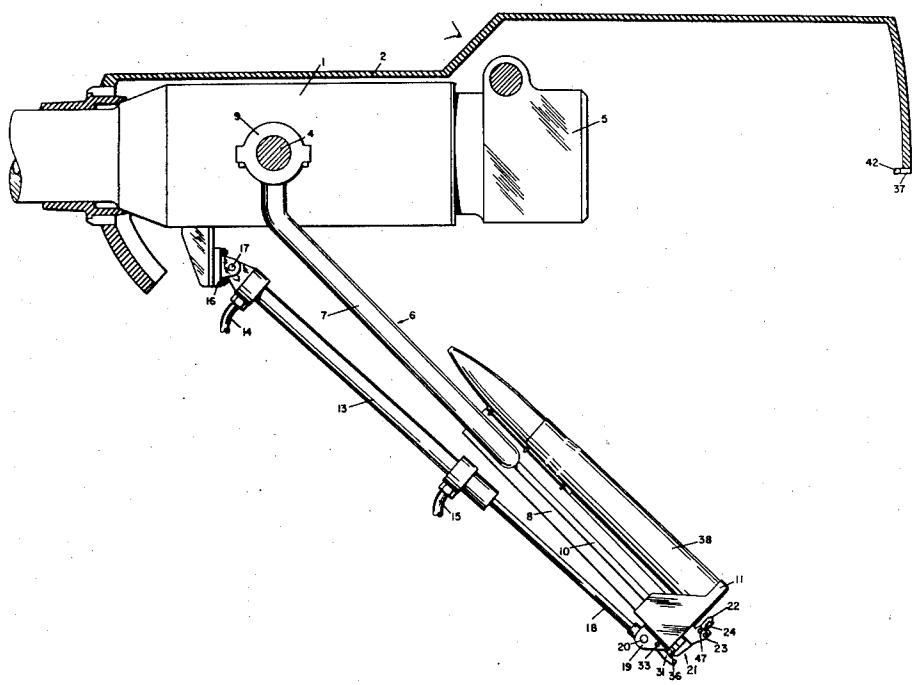
[58] **Field of Search** 89/45, 47

Primary Examiner—Benjamin A. Borchelt
Assistant Examiner—Charles T. Jordan
Attorney, Agent, or Firm—Reginald F. Pippin, Jr.

EXEMPLARY CLAIM

1. A loader for a gun, comprising an arm pivoted at one end for swinging motion with respect to said gun, a carriage supported by said arm for reciprocating motion thereon, a telescoping member pivoted at one end for swinging motion with respect to said gun, said telescoping member being pivotally connected at its other end to said carriage, said telescoping member being operable to be retracted and extended, latching means carried by said carriage for latching said carriage to said arm for preventing motion of said carriage with respect to said arm, and latching means carried by said arm for unlatching the first said latching means and simultaneously latching said arm against swinging motion with respect to said gun.

6 Claims, 10 Drawing Figures



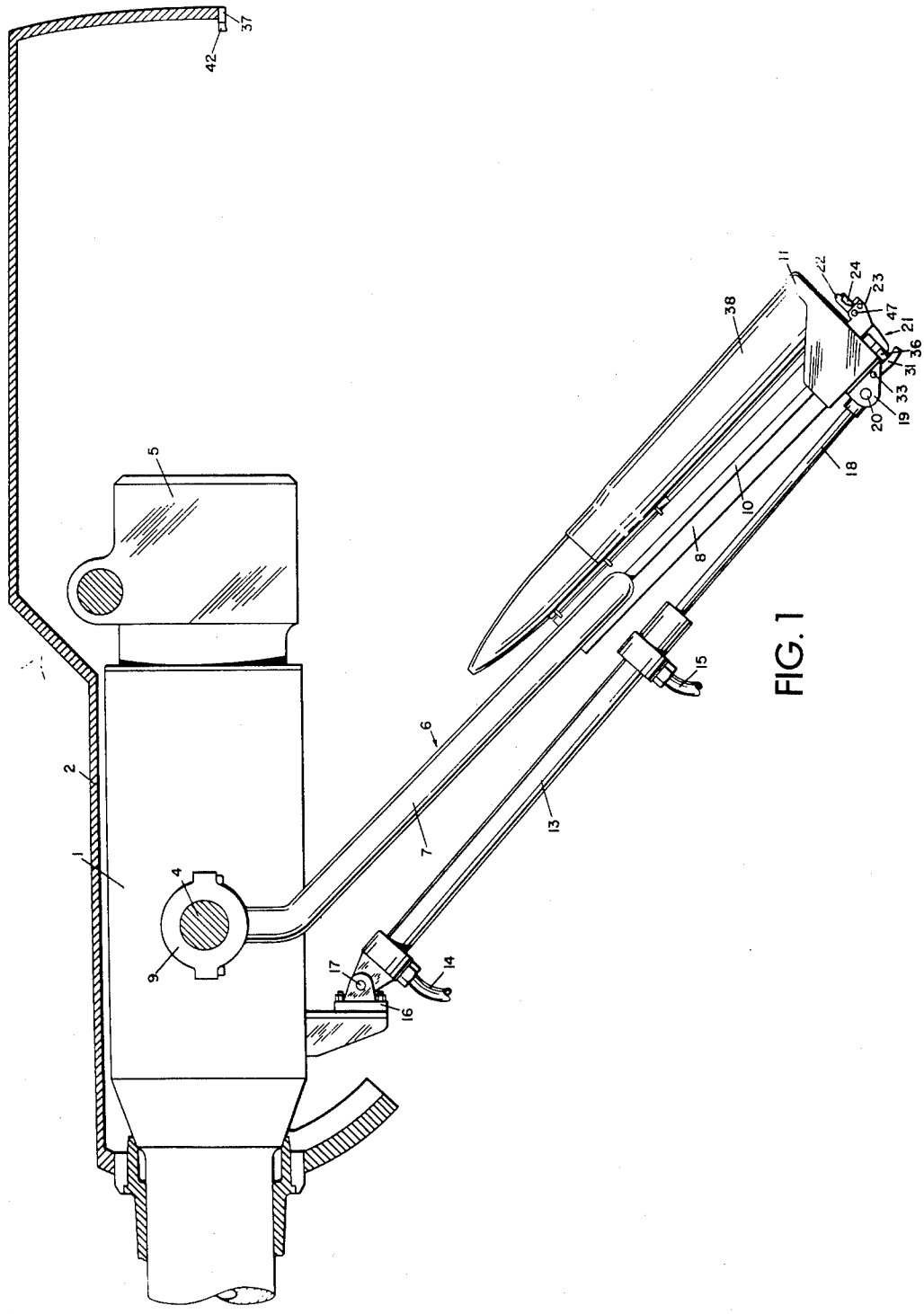


FIG. 1

ROBERT L. ZOUCK
INVENTOR.

BY Thomas J. Holden
ATTORNEY

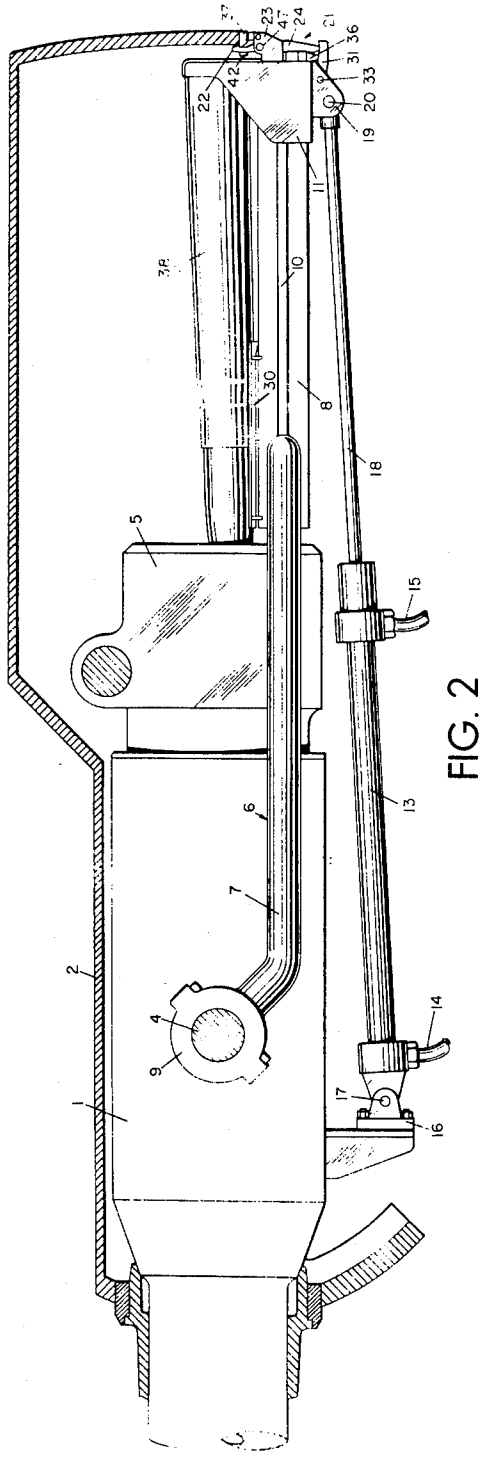


FIG. 2

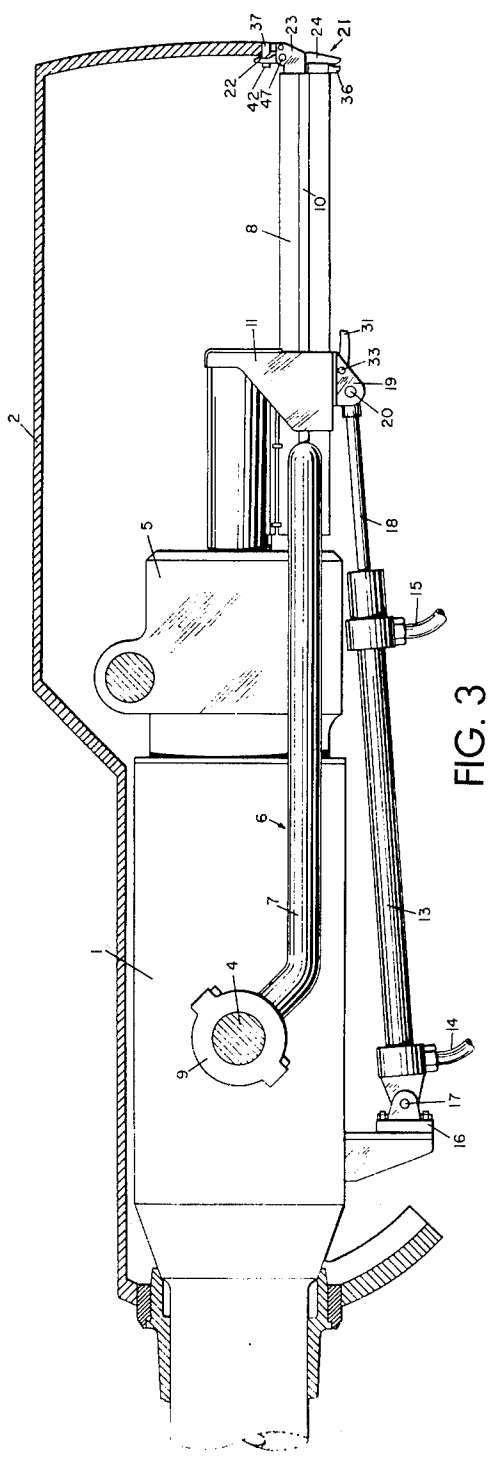


FIG. 3

ROBERT L. ZOUCK
INVENTOR.

BY Thomas J. Holden
ATTORNEY

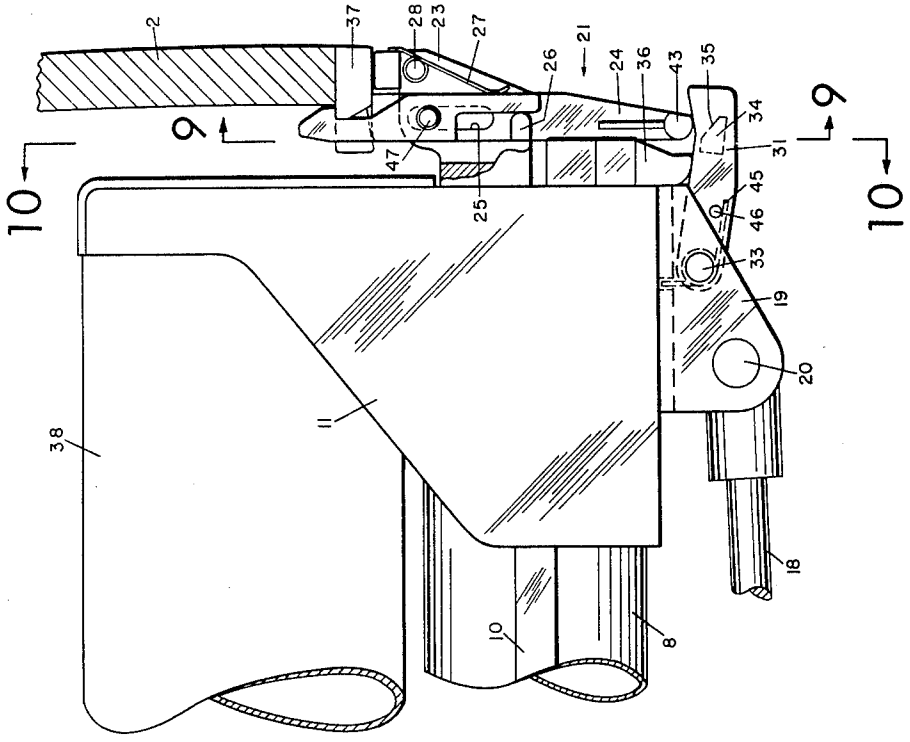


FIG. 5

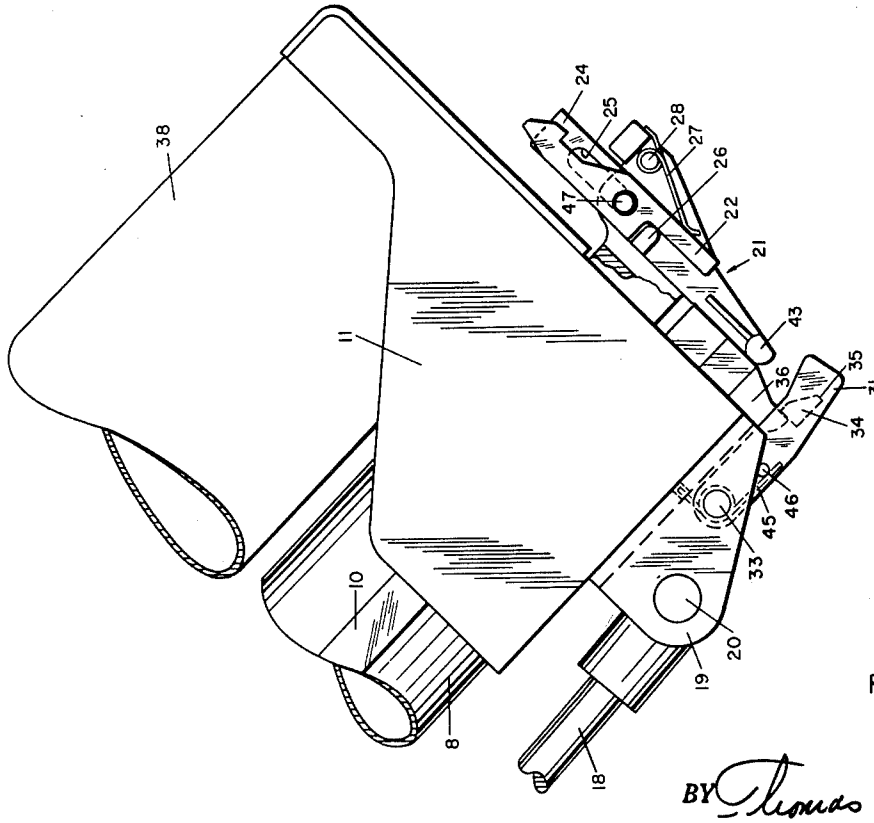


FIG. 4

ROBERT L. ZOUCK
INVENTOR.

BY Thomas J. Holden
ATTORNEY

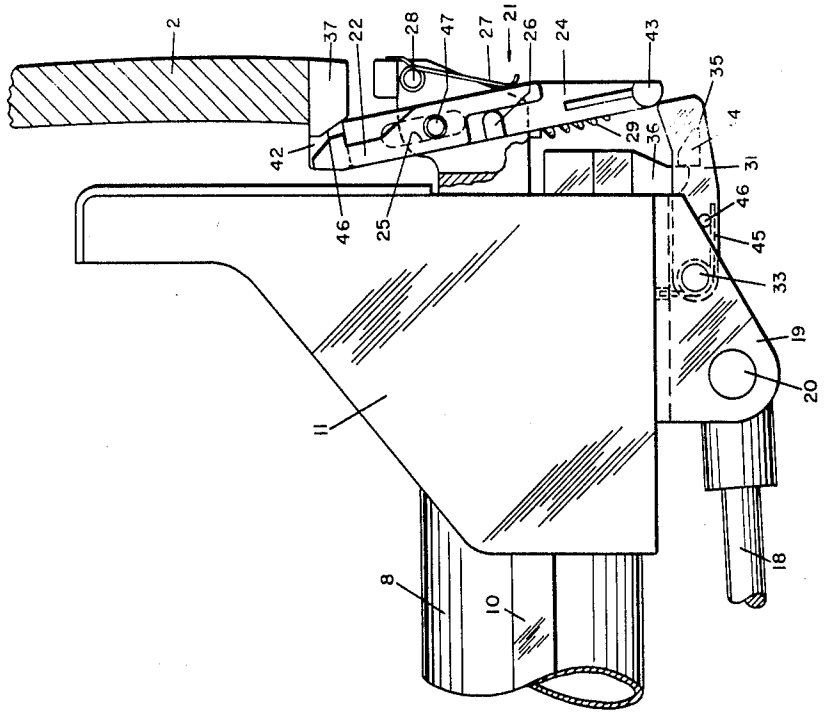


FIG. 7

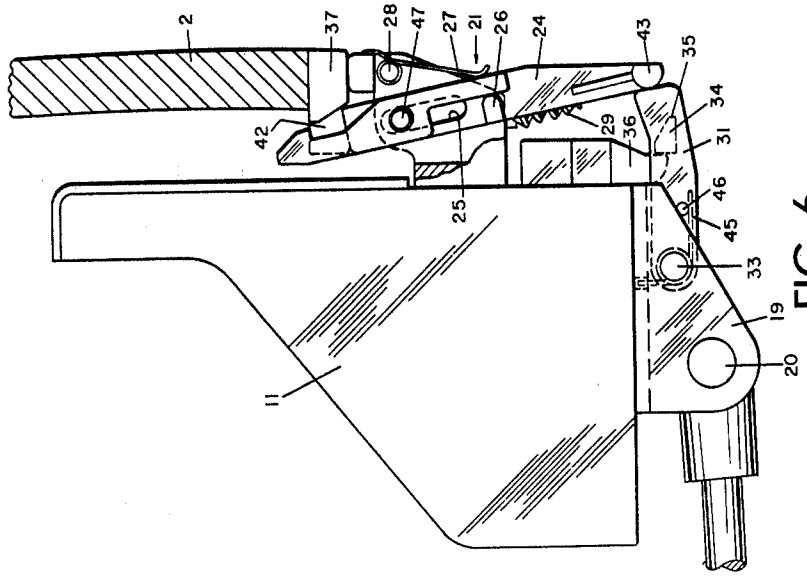


FIG. 6

ROBERT L. ZOUCK
INVENTOR.

BY Thomas J. Holden
ATTORNEY

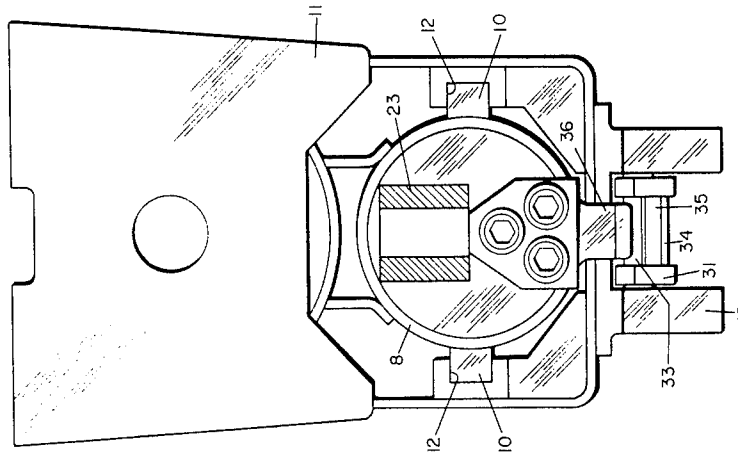


FIG. 10

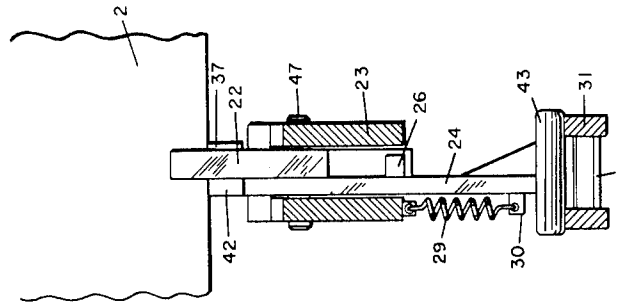


FIG. 9

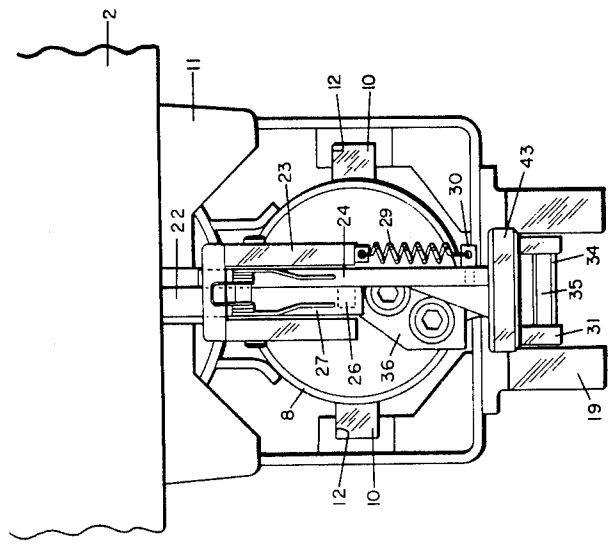


FIG. 8

ROBERT L. ZOUCK
INVENTOR.

BY Thomas J. Holden
ATTORNEY

LOADING DEVICE FOR GUNS

This invention relates to semi-automatic loaders for artillery pieces and particularly to loaders for guns mounted in tanks or other armored vehicles where space is limited and rapid loading is desirable.

Because of the configuration of various types of armored vehicles, it is difficult and impractical for a handler to lift and insert a relatively heavy shell in the breech of the gun carried by the vehicle. It becomes necessary, therefore, to provide mechanical means, accessible to the handler, upon which the shell can be placed, and which will lift and insert and shell into the breech of the gun to load it for firing.

It is the object of this invention therefore, to provide a new and improved loader for rapid firing guns which is simple, efficient, and rapid in operation.

The unique configuration contemplated by this invention utilizes a sliding loading tray which is arranged in conjunction with a single hydraulic cylinder for lifting the shell, inserting it in the breech of the gun, and returning it to the loading position. As will be hereinafter more fully described, this is accomplished by mounting the loading tray on a swinging arm upon which the tray is allowed to slide. A member adapted to be extended or retracted by a conventional hydraulic cylinder is pivoted at one end to the gun structure and at the other end to the tray. After a round has been placed in the tray, the member is extended to swing the arm and tray into loading position at the breech of the gun. A latching arrangement locks the arm in position so that subsequent retraction of the member is effective to slide the tray toward the breech to insert the round into the gun. Reextension of the member then slides the tray to the end of the arm, at which point the tray is latched in place on the arm and the arm is simultaneously unlatched, so that retraction of the member returns the arm to loading position.

In the drawing:

FIG. 1 is a view of the breech of a gun equipped with the loader of this invention, showing the loader in position to begin the loading cycle.

FIG. 2 is a view showing the loader latched in position behind the gun breech at the beginning of the ramming stroke.

FIG. 3 is a view showing the position of the loader at the end of the ramming stroke.

FIG. 4 is a detail view showing the position of the latch elements with the loader in the position shown in FIG. 1.

FIG. 5 is a detail view of the latch elements with the loader latched into position behind the gun breech as shown in FIG. 2.

FIG. 6 is a detail view showing the position of the latch elements at the end of the return stroke from the ram position shown in FIG. 3.

FIG. 7 is a detail view of the latch elements during the beginning of the downward swing of the loader arm from behind the gun breech to the load position shown in FIG. 1.

FIG. 8 is a view looking at the rear of the loader when in the position shown in FIG. 2 and showing the details of the latching arrangement.

FIG. 9 is a cross sectional view taken along line 9—9 of FIG. 5.

FIG. 10 is a cross-sectional view taken along line 10—10 of FIG. 5.

The loading device of the present invention is shown in the drawings in conjunction with a conventional gun 1 fixedly carried by a gun cradle 2. The cradle shown is for convenience in illustration only and is not essential to operation of the loading device, any convenient type of gun mounting being suitable for use with the device herein described.

The gun 1 is provided with a pair of journals 4 fixed to opposite sides of the gun and which serve as pivots for swinging arm 6. Arm 6 is composed of a yoke portion 7 and a rearwardly extending slide tube 8. Each arm of yoke portion 7 terminates in a bearing 9 carried on one of the journals 4 so that arm 6 may swing about the journals. Slide tube 8 carries a pair of slides 10 affixed one to each side of the tube as shown in FIGS. 8 and 10. A shell carriage 11 is slidably carried on slide tube 8 by means of slots or ways 12 which engage the slides 10, as best shown in FIG. 8, so that carriage 11 is adapted for reciprocating motion along slide tube 8. A conventional hydraulic cylinder 13 of the type having an internal piston contained within the cylinder for reciprocating motion therein in response to hydraulic pressures introduced into the cylinder by means of hydraulic lines 14 and 15 is connected to bracket 16 extending from the underside of the gun breech 5, by means of pivot pin 17. Piston rod 18 is attached to the internal piston and may be extended or retracted within cylinder 13 by suitably controlling the hydraulic pressure. Rod 18 is attached, by means of pivot pin 20, to bracket 19, which is carried by the underside of carriage 11. A latching mechanism 21, the function of which will be more fully described hereinafter, is affixed to the rearward end of slide tube 8.

Referring to FIG. 5, it may be seen that the latching mechanism 21 comprises a latch arm 22 pivoted by means of pin 47 in a bifurcated bracket 23 which is fixed to the end of slide tube 8. A detent lug 37 fixed to cradle 2 is adapted to be engaged by latch arm 22 to retain swinging arm 6 in the upper position shown in FIG. 2. A striker arm 24 having a longitudinal slot 25 formed therein is also carried by pivot pin 47, the slot 25 allowing vertical motion of striker arm 24 with respect to bracket 23. A lug 26 extends from the side of striker arm 24 and engages the lower portion of latch arm 22 upon counter-clockwise rotation of arm 24 as viewed in FIG. 6. Torsion spring 27, which is carried by pin 28 in bracket 23, exerts a force against the lower end of latch arm 22 tending to rotate the arm 22 in a clockwise direction against lug 26. A tension spring 29, as shown in FIG. 9, is connected between bracket 23 and lug 30 on the striker arm 24 and serves to urge the arm 24 to the upper limit of the travel allowed by slot 25. A swinging bifurcated yoke 31 is pivoted to bracket 19 by pin 33. Torsion spring 45, also carried by pin 33, acts against pin 46 carried by the yoke 31 to urge the yoke in a counter-clockwise direction. A latch bar 34 having a sloping upper surface 35 extends between the arms of yoke 31. Detent lug 36 is fixed to the end of slide tube 8 and is adapted to engage latch bar 34 as will be hereinafter described, to prevent motion of carriage 11 toward gun breech 5.

Beginning at the position depicted in FIG. 1, the complete loading cycle may now be described. A round of ammunition 38 is placed in position with its rear end in the carriage 11, the forward end of the round being supported by tray 30 which is affixed to the upper side of slide tube 8. To initiate the loading cycle, hydraulic

cylinder 13 is actuated to extend piston rod 18, thereby swinging arm 6 about journal 4 upward into the ram position shown in FIG. 2 and bringing round 38 into alignment with the chamber of the gun 1. As arm 6 swings into alignment with the chamber, the upper end of striker arm 24 engages stop 42 which is fixed to the side of detent lug 37, so that striker arm 24 is forced downwardly against the action of spring 29 to the limit of the travel allowed by slot 25. A cross bar 43 carried by the lower end of striker arm 24 engages the yoke 31 upon downward motion of striker arm 24, swinging the yoke downward to disengage latch bar 34 from detent lug 36. Simultaneously, latch arm 22 slides past detent lug 37, being deflected against the action of spring 27 by the lug and then snapping back into latch position as shown in FIG. 5. At the same time hydraulic cylinder 13 begins its return stroke, retracting piston rod 18. Since arm 6 is now latched in its upper position and yoke 31 has been disengaged from detent lug 36, retraction of piston rod 18 is effective to slide carriage 11 forward along slide rod 8, carrying round 38 forward into the gun chamber. Retraction of the piston rod 18 is terminated at the position shown in FIG. 3, the inertia of round 38 being sufficient to carry it the remaining distance into the chamber of gun 1. At this point hydraulic cylinder 13 again extends piston rod 18, moving carriage 11 back along the slide rod 8. As the carriage approaches the rearmost position, yoke 31 engages cross-bar 43, swinging striker arm 24 counterclockwise to the position shown in FIG. 6. Lug 26, which is abutting the lower end of latch arm 22, rotates the latch arm to disengage it from detent lug 37. At the same time the upper end 41 of striker arm 24 is disengaged from the lower surface of detent lug 37 and is slid upward by action of spring 29 against the underside of stop 42. Simultaneously with the above related action, the sloping surface 35 of latch bar 34 strikes detent lug 36, deflecting the yoke 31 downward against the action of spring 45 to allow latch bar 34 to pass the detent lug 36 and be snapped into latched position behind the lug by the action of spring 45 when carriage 11 reaches its rearmost position.

Retraction of piston rod 18 begins again at this point, and since the carriage 11 is now latched against forward motion on slide bar 8 and latch arm 22 is unlatched from detent lug 37, as shown in FIG. 6, retraction of the rod 18 is effective to swing arm 6 downward toward the load position. As arm 6 begins its downward motion, striker arm 24 is maintained in position against the underside of stop 42, by action of spring 29, and slides with respect to latch arm 22 until yoke 31 releases the cross bar 43. FIG. 6 shows the position of the latch elements just before yoke 31 has released the cross bar 43. As arm 6 continues to swing downward, striker arm 24 is held against the underside of stop 42 until pivot pin 47 reaches the lower end of slot 25, striker arm 24 then moving downward so that its upper end, which has, until this point, been constrained from movement by the sloping face 46 of detent 37, is free, thus allowing striker arm 24 and latch arm 22 to be rotated about pivot pin 47 by action of spring 27 to the position shown in FIG. 4. When piston rod 18 is fully retracted, arm 6 will have again assumed the loading position so that the cycle may be repeated.

Because of the positive action of the latching arrangement and the relative simplicity of the loading device, the loading action is extremely rapid, so that the rate of fire is limited only by the rapidity with which the handler can lift a round of ammunition from a rack and place it in the loading tray.

This unique design of a loading device provides a simple, rugged and efficient arrangement for lifting a round of ammunition to the breech of a gun, and ramming the round with the use of but a single hydraulic cylinder.

while but one embodiment of the present invention has been shown and described, it is to be understood that many changes and modifications may be made without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A loader for a gun, comprising an arm pivoted at one end for swinging motion with respect to said gun, a carriage supported by said arm for reciprocating motion thereon, a telescoping member pivoted at one end for swinging motion with respect to said gun, said telescoping member being pivotally connected at its other end to said carriage, said telescoping member being operable to be retracted and extended, latching means carried by said carriage for latching said carriage to said arm for preventing motion of said carriage with respect to said arm, and latching means carried by said arm for unlatching the first said latching means and simultaneously latching said arm against swinging motion with respect to said gun.

2. A loader for a gun, comprising an element pivoted at one end for swinging motion with respect to said gun, ammunition supporting means slidably carried by said element for reciprocating motion thereon, an extensile element pivoted at one end for swinging motion with respect to said gun and pivotally attached at its other end to said ammunition supporting means, latching means for latching said ammunition supporting means against motion with respect to said element, and second latching means responsive to upward motion of said element to unlatch the first said latching means and to latch said element against swinging motion with respect to said gun, said second latching means being also responsive to motion of said ammunition supporting means toward the free end of said element to unlatch said element for swinging motion with respect to said gun.

3. A loading device for a gun, comprising means forming a track, said track means being pivoted at one end to a point fixed with respect to said gun to allow swinging motion from a first position substantially parallel to the bore of said gun to a second position angularly spaced therefrom, carriage means carried by said track means for motion therealong, extensile means pivoted at one end thereof to a point fixed with respect to said gun and pivotally connnected at the other end thereof to said carriage means, latch means for latching said track means into said first position, whereby retraction and subsequent extension of said extensile means will move said carriage means along said track toward and away from said gun, and second latch means for latching said carriage means to said track means, whereby extension and subsequent retraction of said extensile means when said track means is unlatched will swing said track means between said first and said second positions.

4. A loading device for a gun, comprising carriage means for supporting a round of ammunition, an arm carrying said carriage for sliding motion therealong,

and pivoted at one end for swinging motion with respect to said gun from a loading position to a position aligning said carriage with the bore of said gun, extensile means pivoted at one end for swinging motion with respect to said gun and pivotally connected at the other end to said carriage means, means for latching said carriage in place at the free end of said arm, so that extension or retraction of said extensile means will be effective to swing said arm between said loading position and said position aligning said carriage with the bore of said gun respectively, latch means effective when said arm is swung to said aligned position to unlatch said carriage and latch said arm against swinging motion whereby retraction of said extensile means is effective to advance said carriage along said arm toward the breech of said gun and subsequent extension of said extensile means will move said carriage back along said arm to the end thereof, said latch means being responsive to such motion of said carriage to unlatch said arm and latch said carriage in place on said arm whereby subsequent retraction of said extensile means is effective to swing said arm to said loading position.

5. A loading device for a gun, comprising a swinging arm pivoted at one end to said gun, an ammunition carriage carried by said arm for reciprocating motion between fore and aft positions thereon, means forming a link connected at one end to said gun and at the other end to said carriage, said link incorporating means for varying the length thereof, and latch means comprising, a detent carried by said swinging arm, yoke means pivotally carried by said carriage for engaging said detent to prevent motion of said carriage along said arm, a second detent fixed with respect to said gun, a latch arm pivotally carried at the free end of said swinging arm for engaging said second detent upon upward swinging motion of said swinging arm to latch said swinging arm in position behind said gun, said yoke means being engageable by said latch arm upon upward swinging motion of said swinging arm to be disengaged from the first said detent, so that a decrease in the length of said link will move said carriage to its fore position on said swinging arm, and subsequent increase in the length of said link will return said carriage to its aft position on said swinging arm, said latch arm being engagable by said yoke means upon return of said carriage to its aft position to be disengaged from said second detent, said yoke simultaneously re-engaging the first said detent whereby subsequent reduction in length of said link will be effective to swing said first said arm downward.

6. A loader for a gun, comprising an arm pivoted at one end for swinging motion with respect to said gun between a lower and an upper position, a carriage supported on said arm for reciprocating motion between a fore and an aft position thereon, a telescoping member pivoted at one end to said gun and at the other end to said carriage, first latching means comprising a detent carried at the free end of said pivoted arm and a yoke pivoted on said carriage for enngaging said detent, second latching means carried by said arm and including a first and a second element pivoted on a common axis on said arm for limited rotation with respect thereto, said first element having freedom for limited end-wise motion with respect to said pivoted arm and said second element, spring means for urging said first element to the upper limit of its end-wise motion, said second latch means being positioned to engage said yoke upon subsequent swinging motion of said pivoted arm whereby to disengage said yoke from said lug, so that retraction of said telescoping member will move said carriage forwardly along said pivoted arm and subsequent expansion of said telescoping member will move said carriage rearwardly along said pivoted arm, said first element being engageable by said yoke upon such rearward motion of said carriage to be rotated in a direction to disengage said second element from said lug, said yoke simultaneously engaging said second lug to latch said carriage against motion along said pivoted arm so that subsequent rotation of said telescoping member will swing said pivoted arm downward into said lower position.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,884,119

DATED : May 20, 1975

INVENTOR(S) : Robert L. Zouck

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, Line 12, change "and" (third occurrence) to ---the---.

Column 3, Line 59, After "detent" insert ---lug---.

Column 4, Line 9, Change "while" to ---While---.

Column 6, Line 18, change "enngaging" to ---engaging---.

Signed and Sealed this

Seventeenth Day of *March 1981*

[SEAL]

Attest:

RENE D. TEGTMEYER

Attesting Officer *Acting Commissioner of Patents and Trademarks*

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,884,119

DATED : May 20, 1975

INVENTOR(S) : Robert L. Zouck

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, Line 12, change "and" (third occurrence) to ---the---.

Column 3, Line 59, After "detent" insert ---lug---.

Column 4, Line 9, Change "while" to ---While---.

Column 6, Line 18, change "enngaging" to ---engaging---.

Signed and Sealed this

Seventeenth Day of *March 1981*

[SEAL]

Attest:

RENE D. TEGTMEYER

Attesting Officer

Acting Commissioner of Patents and Trademarks