Jan. 29, 1957 D. W. MOLINS ET AL 2,779,243

APPARATUS TO REMOVE EJECTED SHELLS FROM TURRET

Filed Oct. 1, 1951 5 Sheets-Sheet 1

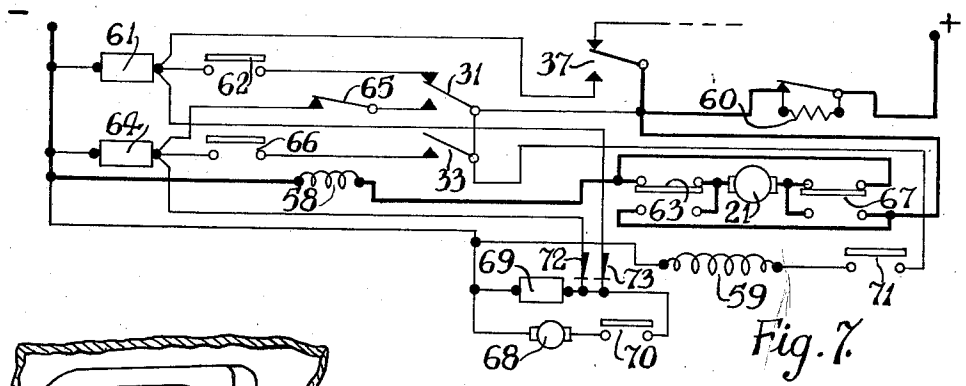


Fig. 7.

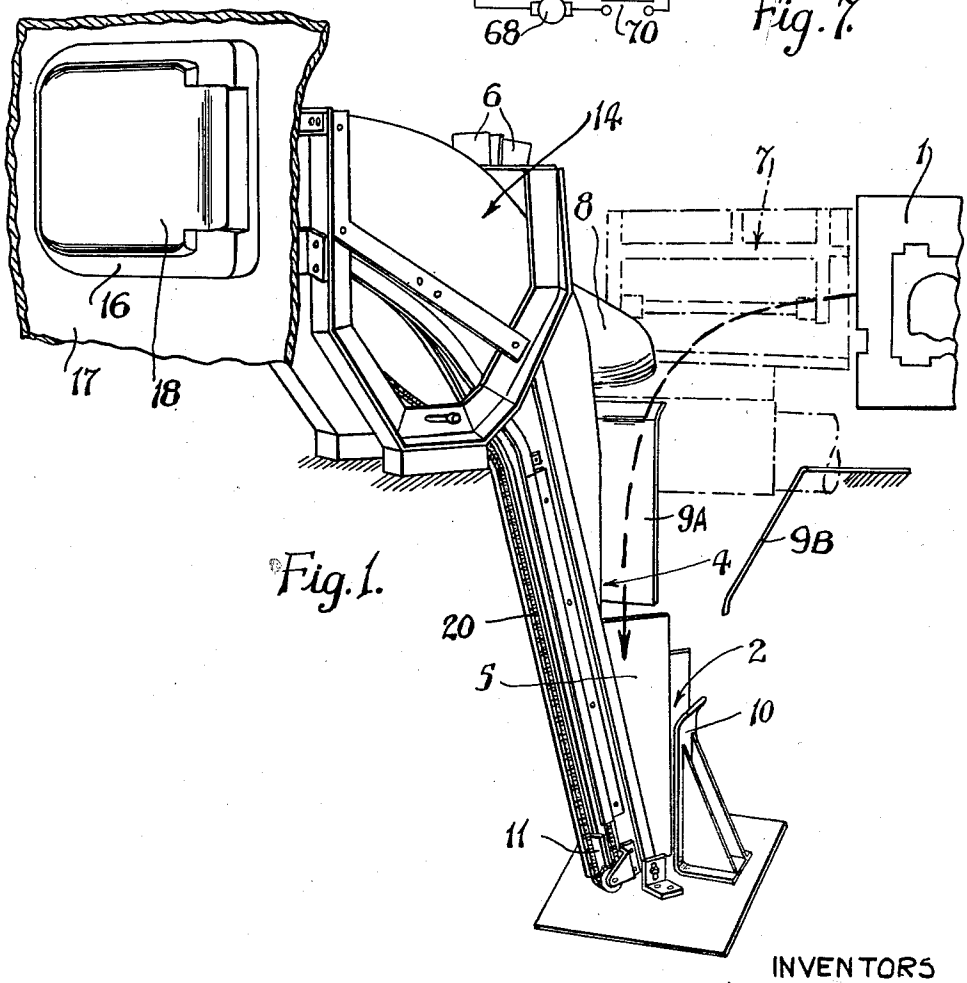


Fig. 1.

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APPARATUS TO REMOVE EJECTED SHELLS FROM TURRET

Filed Oct. 1, 1951 5 Sheets-Sheet 2

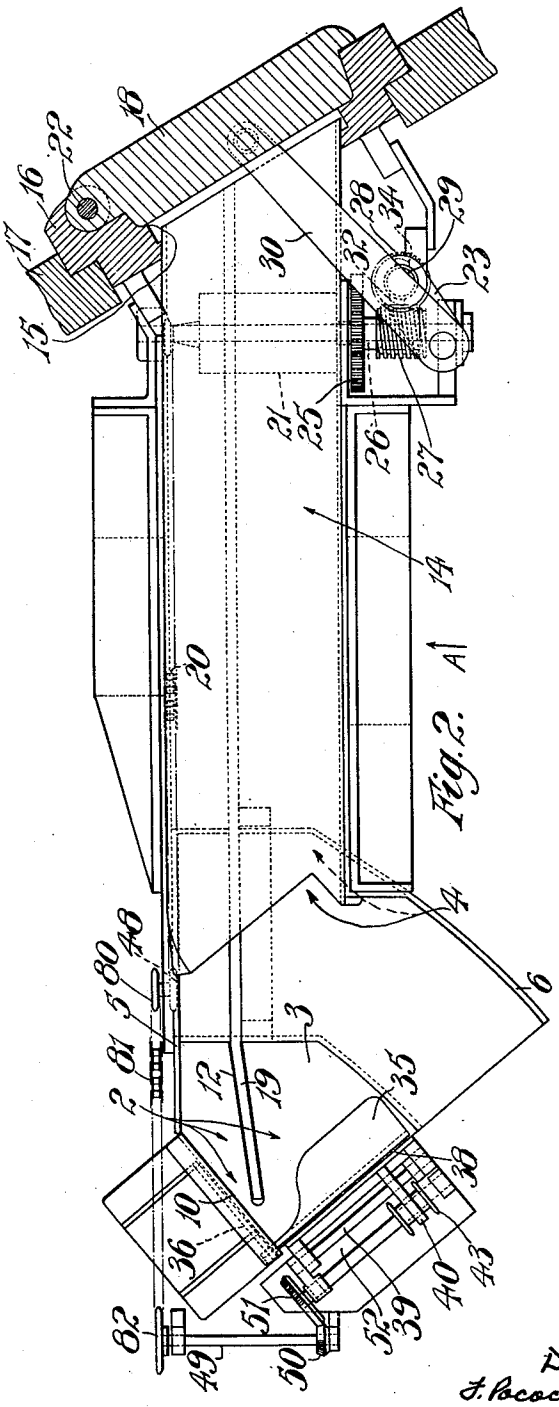


Fig. 2.

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APPARATUS TO REMOVE EJECTED SHELLS FROM TURRET

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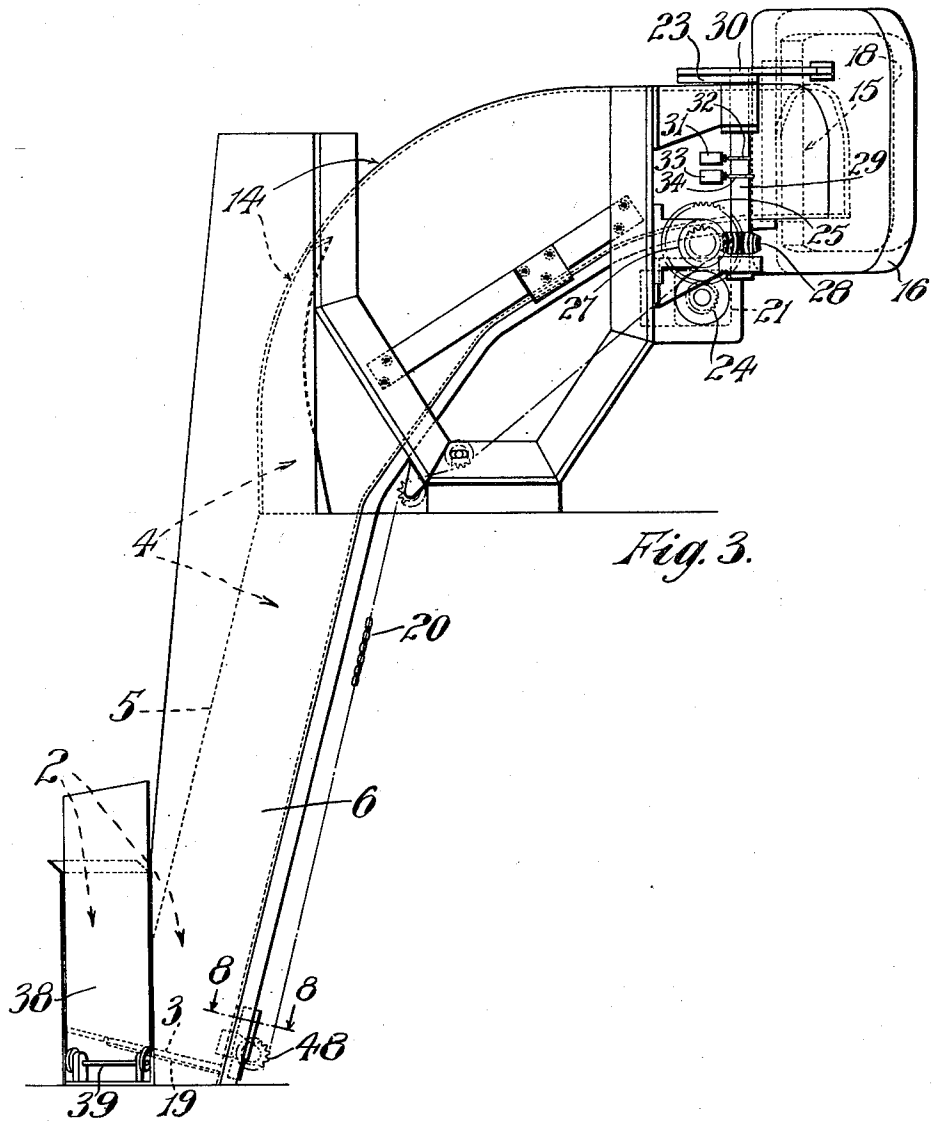


Fig. 3.

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APPARATUS TO REMOVE EJECTED SHELLS FROM TURRET

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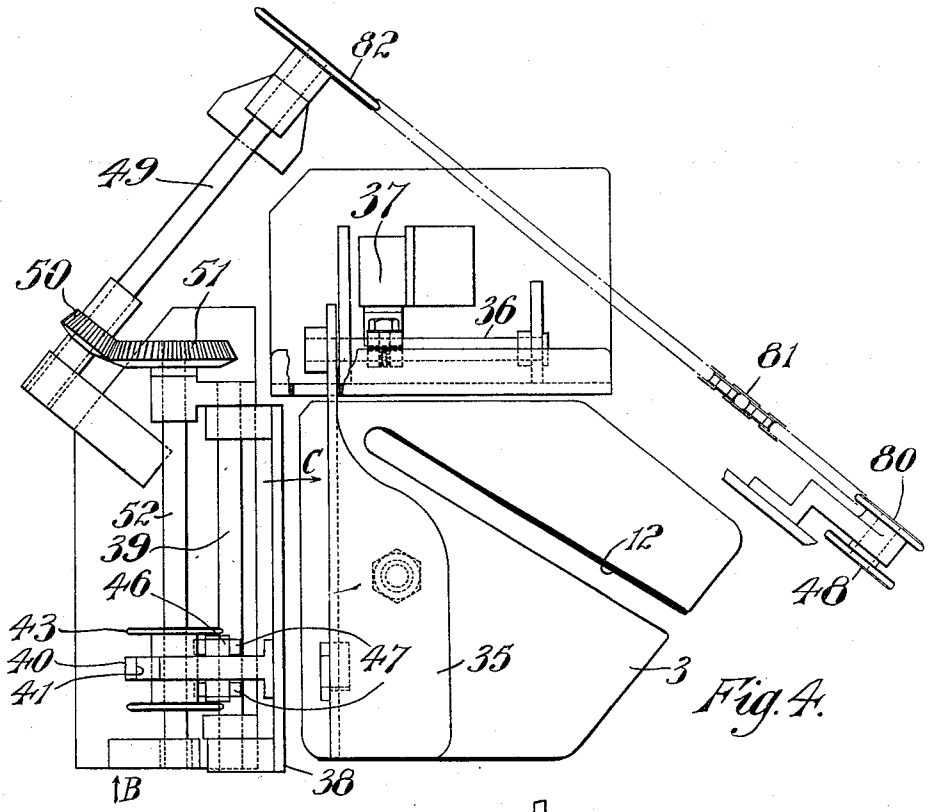


Fig. 4.

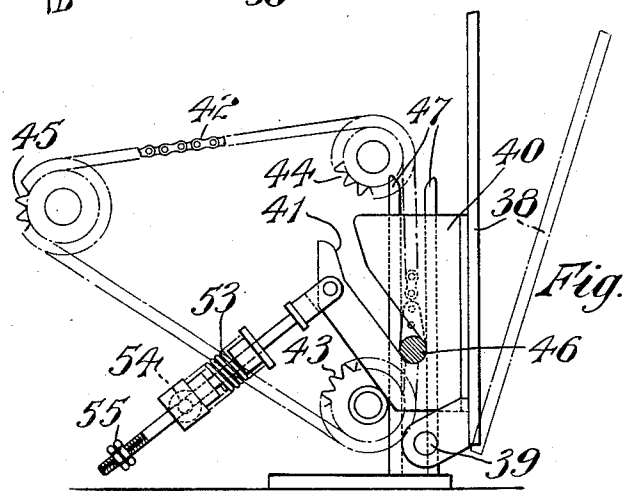


Fig. 5.

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APPARATUS TO REMOVE EJECTED SHELLS FROM TURRET

Filed Oct. 1, 1951 5 Sheets-Sheet 5

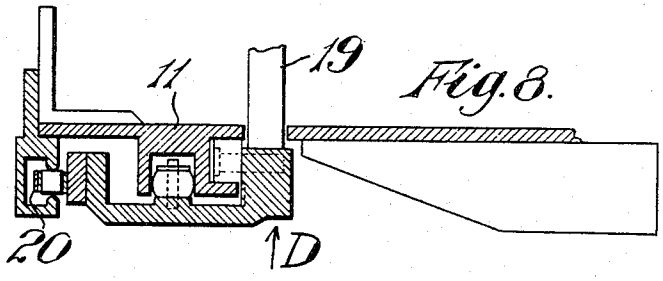


Fig. 8.

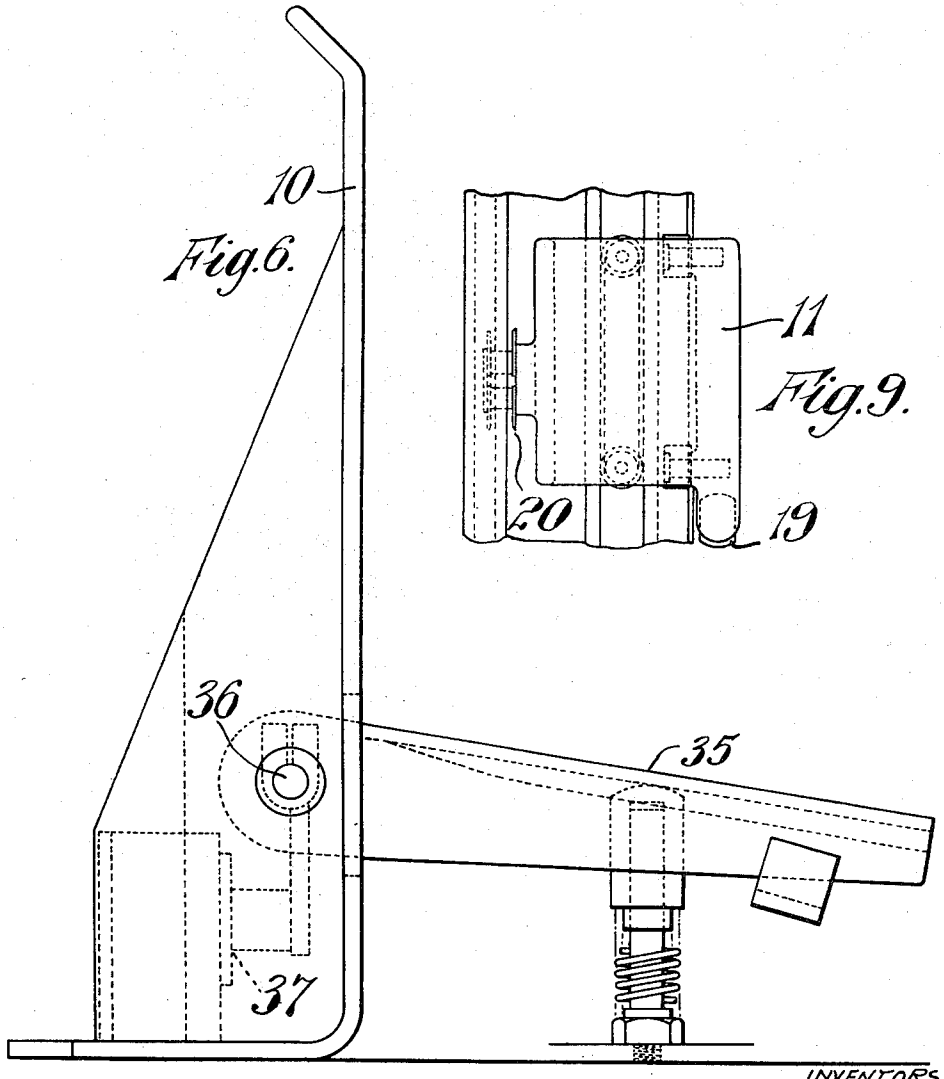


Fig. 6.

Fig. 9.

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United States Patent Office 2,779,243 Patented Jan. 29, 1957

2,779,243

APPARATUS TO REMOVE EJECTED SHELLS FROM TURRET

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Application October 1, 1951, Serial No. 249,048

Claims priority, application Great Britain October 5, 1950

15 Claims. (Cl. 89—33)

This invention concerns improvements in or relating to ordnance, and relates to ordnance mounted in a turret which traverses with the gun but in which the gun is elevated in the turret. Such ordnance is referred to herein as a gun as specified.

When a gun of large calibre is to be operated in a confined space, such as a turret, the problem arises of removing spent cartridge cases from the turret as they are ejected from the gun after firing. As it is desirable to eject such cases from the turret through a small aperture in the turret, difficulties may occur in arranging for the spent cases to be directed to such an aperture.

For convenience the closed rear end of an ejeceted cartridge case will be referred to herein as the "base," and the open front end of the case will be referred to as the "open end." Thus a cartridge case on ejection from the breech of a gun travels base first out of the breech.

According to the present invention there is provided for a gun as specified, a device for disposing of spent cartridge cases, comprising a receptacle positioned rearwardly of the breech to receive a case base first as the case is ejected from the breech at all angles of elevation of the gun, means to move the case open end first out of the receptacle, and guide means to guide the case so moved so as to cause it to move in a desired direction for disposal.

The said guide means may comprise a chute having an open mouth adjacent the receptacle and positioned to receive a case being moved from the receptacle. The means to move the case out of the receptacle may comprise a rammer adapted to engage the case (e. g. to engage the base of the case) and to ram it into and through the said chute open end first. Means may be provided to cause a case received in the receptacle to be so oriented therein that its open end points towards the said chute.

The receptacle may be so positioned that an ejected case falls downwardly into the receptacle and the chute may be positioned above the level of the receptacle so that the case is moved upwardly from the receptacle into the chute.

Where the case is ejected through the turret wall it is desirable that the aforesaid aperture in the turret should remain open only when needed for the disposal of a cartridge case and further according to the invention there is provided a movable member for opening and closing said aperture, ejecting means to move an article towards and through said aperture, and control means operable automatically in timed relationship with the said ejecting means to move the member to open the aperture as the ejecting means causes an article to move towards the aperture and to cause said member to close the aperture after ejection of the said article.

The ejecting means may comprise a rammer operated by driving means which also actuate the control means to move the member to open and close the aperture. Means may be provided automatically to stop and restart the said driving means after the rammer reaches the end of an ejecting stroke and the aperture is fully opened, so as to cause the rammer to move automatically in a reverse stroke, and to close the aperture after an article has been ejected.

The driving means may comprise an electric motor and the stopping and restarting means may comprise an electric switch device including switches to reverse the motor. A further switch may be provided for automatically stopping the motor when the rammer reaches the end of a reverse stroke and the aperture is closed. The said switches may be adapted to be actuated by engagement with a part movable with the rammer or with the control means.

The control means may comprise a crank-operated arm connected to the movable member, the said arm being arranged to lie over the centre of the crank when the movable member is closing the aperture in order to lock the movable member against outward movement.

In a preferred form the whole device may be made wholly automatic in its operation and further according to the invention there is provided for a gun as specified, a device for disposing of spent cartridge cases, comprising a receptacle positioned rearwardly of the breech to receive a case ejected from the breech at all angles of elevation of the gun, ejecting means to move the case out of the receptacle, guide means to guide the case so moved in a desired direction for disposal, and an actuating member disposed within the receptacle and adapted to be engaged by a case moving into the receptacle, and arranged on such engagement automatically to cause the said ejecting means to be operated.

The said actuating member may comprise a movable (e. g. hinged) element arranged to be moved on engagement by a case, to actuate a switch to start an electric motor by which the ejecting means is operated.

The said guide means may include a guide which is movable inwardly to engage and press against the side of a case to guide the case in a desired direction while the latter is being moved out of the receptacle. The said guide may be pivoted and arranged to be swung about its pivot by means operable in timed relationship with the operation of the ejector means. The pivoted guide may comprise a slotted part which is arranged to co-operate with an element which is movable into and out of the slot in a line oblique to the axis of the slot, so as to cause the guide to move about its pivot. The movable element may comprise a pin or the like carried by a reversible carrier-means (e. g. a pair of chains) operated by the driving means (e. g. an electric motor) for the ejecting-means. The said carrier-means and the ejecting-means may be driven through suitable gearing so that the effective movement of the conveyor system occurs during the beginning of the movement of the ejecting-means, whereby the guide is swung inwardly during the beginning of the ejection of a cartridge case.

Apparatus according to the present invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a perspective view of the apparatus and also shows part of a gun and a turret wall.

Figure 2 is a plan view of the apparatus, partly in section.

Figure 3 is an elevation looking in the direction of the arrow A Figure 2.

Figure 4 is an enlarged view of part of Figure 2.

Figure 5 is an elevation of part of Figure 4 looking in the direction of the arrow B.

Figure 6 is is view of part of Figure 4 looking in the direction of the arrow C.

Figure 7 is a circuit diagram.

Figure 8 is a section of Figure 3 on the line 8—8 drawn to a large scale.

Figure 9 is a view of Figure 8 looking in the direction of the arrow D.

Referring to the drawings the device is intended for use in connection with a gun mounted in the turret of a tank and the breech of the gun is shown in Figure 1 and marked 1. A short distance behind the breech 1 of the gun is a receptacle 2 to receive spent cartridge cases as they are ejected from the gun. The receptacle has a flat, inclined bottom 3, see Figure 3, which is only slightly larger than the base of a cartridge case, and which is so inclined that a case whose base is resting on the bottom is somewhat tilted so that its open end points towards the open mouth of a guide passage or chute 4 which is arranged above and to one side of the receptacle. The level of the bottom of the receptacle is below that of the breech. The receptacle has a fixed side wall 10, a movable side wall 38 referred to later and side walls 5 and 6 which slope or curve outwardly and upwardly from the bottom so as to provide guiding surfaces for a cartridge case as the latter falls into or is moved out of the receptacle. The wall 6 is high and forms the main guide for the falling case. The path of the projectile from breech to receptacle is indicated by the dotted arrow in Figure 1.

In the embodiment being described the gun has a loading tray device shown in chain lines 7, Figure 1, and guides 8 and 9A and 9B are provided to assist in directing the case into the receptacle 2. The guide 8 is fixed to the loading tray and swings with it because a fixed guide in this position would be in the way of the moving tray but as the tray is still when the gun fires the guide is stationary at such times as it is required for use. The arrangement is such that a case which is ejected from the breach relatively slowly can fall base first into the receptacle, being guided by the guides 8 and 9 and the side walls 5 and 6 in its fall so that its base can be located on the bottom of the receptacle. Further this arrangement ensures that the empty cartridge cases will fall base first into the receptacle at the various angles of elevation of the gun.

The guide passage or chute 4 referred to above is suitably curved at its upper part marked 14 so as to lead upwardly towards an opening 15, Figure 2, in the turret through which the spent cases can be ejected. The opening is formed in a door frame 16 fixed to the turret wall 17 and a door 18 is provided which is opened and closed as described in detail later. If desired the chute may lead to a suitable compartment in the tank for disposal of the cases. The open mouth of the chute is adjacent a side wall of the receptacle 2 and is so arranged as to provide, together with the said wall, a substantially continuous guiding surface for a case which is being moved out of the receptacle into the chute.

A rammer is provided to move a case open end first out of the receptacle 2 and into and through the chute 4—14. The rammer comprises a suitably shaped pusher piece 19 fixed on a sprocket chain 20 by means of a carriage 11 shown in detail in Figures 8 and 9 and moved by the chain from the bottom of the receptacle upwardly through the chute in a ramming stroke and downwardly in a return stroke. The rammer is operated from an electric motor 21, as described in detail later, in one direction for a ramming stroke and in the opposite direction for a return stroke. At the end of a return stroke the pusher piece 19 stops just below the bottom of the empty receptacle 2, see Figure 3, in a position to engage part of the base of a freshly ejected cartridge case when the latter falls into the receptacle. The receptacle 2 is slotted at 12 to permit the pusher 19 to pass through.

Suitable mechanism is provided to operate the apparatus at a desired time after the gun has been fired and the ejected case has fallen into the receptacle, and to actuate the rammer motor so as to move the case upwardly into and through the chute, and then to reverse the motor to return the rammer. This can be arranged so that the operations occur in automatic sequence when the operator presses a starter switch or the like at a suitable time after a case is ejected from the gun.

A movable member comprising the door 18 is provided in the side 17 of the turret at the outlet end of the chute, this door being hinged at 22 to the door frame 16. Control means are provided to open and close the door so as to permit a case to be ejected from the turret. For this purpose the control means comprise a crank 23 which is driven through suitable reduction gearing by the rammer motor 21. As seen best in Figure 2 the motor 21 has a gear wheel 24 on its spindle which engages a larger gear wheel 25 on a shaft 26 to which is also fixed a worm 27. This worm drives a wormwheel 28 fixed to a vertical shaft 29 at the upper end of which is the crank 23. The crank is coupled to the door by a connecting rod 30 so as to push the door outwardly as the crank is turned in one direction and inwardly as it turns in the reverse direction. When the door is closed the connecting rod lies over the centre of rotation of the crank, see Figure 2, and thus locks the door against outward movement when the crank is stationary.

The motor controls are fully discussed later with reference to Figure 7 and the following description is given merely so that the general idea is understood.

A micro-switch 31, Figure 3, is adapted to be engaged by a cam 32 on the vertical shaft 29 so as to actuate the switch when the door has opened fully and the rammer is at the end of its forward or ejecting stroke. Actuation of this switch causes the motor 21 to be reversed, so that the rammer is retracted and the door is simultaneously swung to its closed position. If desired, a suitable time lag can be arranged between opening and closing of the door so as to make sure that the case is ejected before the door starts to close. A further micro-switch 33 is engaged by a cam 34 when the door is closed and the rammer has returned, and the operation of this switch stops the motor. The rammer is then ready to eject from the turret the next case to be ejected from the breech of the gun, and until that occurs the ejection door in the side of the turret is locked in its closed position as described above.

At the bottom of the receptacle 2 is an actuating member in the form of a hinged actuating plate 35 which is hinged at 36 and so arranged as to be engaged and depressed by the base of a case which falls into the receptacle. This plate when depressed actuates a micro-switch 37 which starts up to the motor 21. It will be seen that this plate which is for automatic working is the equivalent of a foot pedal which could be used for manually controlled working. The rammer 19, which is also located at the bottom of the receptacle, thereupon engages the base of the case and starts to move it upwardly.

A guide plate 38 is pivotally mounted at 39 beside the bottom of the receptacle 2 and is automatically moved inwardly at the commencement of the operation of the ejecting means, so as to engage and press against the side of the case as it is ejected, and to guide it in the desired direction. The operation of this pivoted guide plate is as follows: Fixed to and projecting edgewise from the back of the guide plate 38 is a plate 40 which is provided with an oblique slot 41 extending from its upper edge so as to slope inwardly and downwardly towards the back of the guide plate, see Figure 5. Behind the plate is arranged carrier means consisting of a pair of chains 42 running over three pairs of sprockets 43, 44 and 45. The two chains carry between them a pin 46 which can enter the oblique slot when moved downwardly in a vertical run of the chains. As the pin enters the slot and moves downwardly therein, it presses against one side of the slot and thereby causes the guide plate 38 to swing backwardly or outwardly. When the movement of the chains is reversed, the pin moves upwardly in the slot and thereby swings the guide plate inwardly, see the broken lines in Figure 5. Rigid guide

members 47 are arranged at each side of the pin in the region at which it moves in the slot so as to constrain it to move in a straight vertical path against the pressure of the slotted plate. The driving sprockets for the chains are arranged to be driven through suitable gearing from the motor which operates the ejecting rammer. This gearing is best shown in Figure 4. The rammer chain 20 runs over a sprocket wheel 48 at its lower end and to this wheel is fixed a further sprocket wheel 80 which drives a horizontal chain 81. This chain passes over another sprocket wheel 82 fixed to a shaft 49 on which a bevel gear wheel 50 is mounted. The wheel 50 drives a larger bevel gear wheel 51 on a shaft 52 on which the pair of sprocket wheels 43 are fixed.

When the device is at rest, the rammer being at the bottom of the receptacle ready to eject a cartridge case, the pin 46 is in the bottom of the slot and the pivoted guide plate is in its outward position, see Figure 5. When a case falls from the breech of the gun into the receptacle, it strikes the hinged actuating plate 35 and depresses it, thus causing the micro-switch 37 to be actuated and the motor to start. Ramming of the cartridge case commences immediately, and at the same time the pin moves upwardly in the slot, forcing the pivoted guide plate to swing rapidly inwardly so as to engage and press against the side of the case during the commencement of its upward movement, and thus to ensure that the case is properly oriented for ejection. After a relatively short movement the pin leaves the slot and thereafter is carried by the chains in an idle movement during the remainder of the ramming stroke. When the motor is reversed the pin is carried in the reverse direction and finally re-enters the slot, forcing the guide plate to swing outwardly as it does so.

At its lower end the slot may have a small vertical extension in which the pin lodges at the end of its return movement, so as to lock the guide plate against undesired movement.

A compression spring 53 is secured at one end to the slotted plate and at the other end at 54 to a fixed part of the apparatus, and is so arranged as to urge the guide plate 35 inwardly against the restraint of the pin in the slot. This arrangement tends to ensure a free inward movement of the plate when the pin is moved upwardly in the slot, and also holds the plate in its inward position after the pin has left the slot, and thus by means of locknuts 55, which act as a stop against member 54 it is ensured that slot 41 is in a position ready to receive pin 46 on its return movement.

The chains carrying the pin have a relatively long run during the ramming or ejecting stroke of the rammer, and the effective movement of the pin in the slot, which occupies only a very small part of the whole movement of the pin, is thus very rapid and causes the guide plate to be moved in quickly, the whole movement occurring during the very beginning of the ejection of a case.

It will be appreciated that a device of the character with which the invention is concerned must necessarily occupy the minimum space and it is therefore advantageous to be able to use a single motor for the various operations to be performed. The arrangement described makes it possible to perform automatically the two operations of ejecting a spent case, and simultaneously swinging in the guide plate so as to guide the case during the beginning of its upward movement, in a very simple and effective fashion, both operations being performed by means of a single motor.

Referring now to Figure 7 the motor used is a compound motor, its armature being marked 21, to agree with the previous general designation of the motor, its series field 58 and its shunt field 59. A positive lead from a suitable source of supply, such as a battery, is connected through a cut-out 60 to a switch arm 37 which is the case-operated switch previously referred to. As shown, the arm is feeding to a line leading to a circuit for operating gun loading gear as described in Serial No. 248,291, now Patent No. 2,708,391, issued May 17, 1955. When a case strikes the plate 35 which operates the switch 37, the switch arm moves down and feeds to a contactor 61. Its bars 62 and 63 change over and 62 forms a "hold-on," making a circuit through an arm 31, the "up" limit switch previously mentioned. The movement of bar 63 starts the motor 21 and the case is carried up the chute by the rammer. The motor movement starts opening the door 18 by means of the crank and connecting rod and the switch 31 eventually changes over under the action of its cam. The contactor 61 is de-energised and its bars move back so the armature of the motor is short-circuited and the motor is stopped by dynamic braking. For this purpose the shunt field is maintained in the following manner. 68 is a small permanent magnet motor having a flywheel on its armature spindle. It is driven when the contactors are energised, as described below, and when the applied current ceases its continues to rotate for some while under the momentum of the flywheel and generates current. The motor is in circuit with a relay 69 having contacts 70 and 71. As a contactor 61 or 64, is energised there is a feed parallel to the contactor coil through a half wave rectifier, 72 and 73 respectively to the relay coil so the contacts 70 and 71 change over. Thus the normal shunt field supply is assured and when the particular contactor disengages and the motor is switched off, the relay coil 69 is still energised by the motor 68 (now generating) and the shunt field is held on by continued engagement of the contact 71.

As soon as the "up" limit switch 31 changes over, a contactor 64 is energised, subject to control by a switch 65 described presently. Assuming for the moment that this switch is engaged, the motor will start again through the bars 66 and 67 of the contactor 64, the "hold-on" bar 66 making a circuit for the contactor 64 as soon as "down" limit switch 33 is engaged by its cam.

When the sharft 29 has rotated far enough to change the "down" limit switch back again the motor will stop under dynamic braking. The switch 65 is operated by a small lever located at the bottom side of the chute a few inches from the door 18. The switch is normally closed but is opened by a passing case which presses on the lever. Thus until the case is out of the chute the rammer cannot start its downward movement so the door is held open until the case is out.

It will be seen from the above description that the device according to the invention makes its unnecessary for the cartridge case to be ejected from the breech with any great force, since all that is necessary is that the case shall leave the breech fast enough to enable it to fall down into the receptacle. A further advantage is that it is unnecessary to provide chutes or passage-ways with sharp angles or curves, since the disposal of the case is effected in two distinct movements, in which the case first moves downwardly base first into the receptacle and then moves upwardly open end first in a desired direction for disposal. Further, by guiding the ejected case into a desired position in the receptacle and then ramming the case into and through the chute, it is possible to control the movement of the case from the time it leaves the breech and moreover to move the case positively so as to ensure that it is disposed of in the desired manner.

It will moreover be seen that by means of the arrangement whereby the spent case falls downwardly from the breech into the receptacle, it is possible to guide a case into the receptacle at all angles of elevation by means of fixed guides, without any need for articulated chutes.

What we claim as our invention and desire to secure by Letters Patent is:

1. In combination with a gun mounted in a turret which traverses with the gun but in which the gun is elevated relative to the turret, said gun having a breech and ejector means to throw a spent cartridge case lengthwise base first clear of the breech-block into the turret, a receptacle having an open mouth at its upper end, support means

for a cartridge case at its lower end, and side walls extending upwardly from said lower end, said receptacle being fixedly mounted in said turret for traversing movement with the latter and positioned rearwardly of and below the level of the breech, means to intercept the trajectories of spent cartridge cases at all angles of elevation of the gun and to cause the said cases to fall base first into the receptacle, and means to engage each case in the receptacle and to convey said case, open end first, upwardly out of the receptacle in a desired direction.

2. In combination with a gun mounted in a turret which traverses with the gun but in which the gun is elevated relative to the turret, said gun having a breech and ejector means to throw a spent cartridge case lengthwise base first clear of the breech-block into the turret, a receptacle having an open mouth at its upper end, support means for a cartridge case at its lower end, and side walls extending upwardly from said lower end, said receptacle being fixedly mounted in said turret for traversing movement with the latter and positioned rearwardly of and below the level of the breech, means to intercept the trajectories of spent cartridge cases at all angles of elevation of the gun and to cause the said cases to fall base first into the receptacle, a chute fixed relatively to said turret and to said receptacle and having an open mouth adjacent and above the level of the receptacle, and means to engage each case in the receptacle and to convey said case, open end first, upwardly out of the receptacle into and through the said chute.

3. In combination with a gun mounted in a turret which traverses with the gun but in which the gun is elevated relative to the turret, said gun having a breech and ejector means to throw a spent cartridge case lenghwise base first clear of the breech-block into the turret, a receptacle having an open mouth at its upper end, support means for a cartridge case at its lower end, and side walls extending upwardly from said lower end, said receptacle being fixedly mounted in said turret for traversing movement with the latter and positioned rearwardly of and below the level of the breech, means to intercept the trajectories of spent cartridge cases at all angles of elevation of the gun and to cause the said cases to fall base first into the receptacle, a chute fixed relatively to said turret and to said receptacle and having an open mouth adjacent and above the level of the receptacle, and a rammer adapted to engage the base of each case in the recepetacle and to ram the said case open end first upwardly out of the receptacle into and through the said chute.

4. In combination with a gun mounted in a turret which traverses with the gun but in which the gun is elevated relative to the turret, said gun having a breech and ejector means to throw a spent cartridge case lengthwise base first clear of the breech-block into the turret, a receptacle having an open mouth at its upper end, support means for a cartridge case at its lower end, and side walls extending upwardly from said lower end, said receptacle being fixedly mounted in said turret for traversing movement with the latter and positioned rearwardly of and below the level of the breech, means to intercept the trajectories of spent cartridge cases at all angles of elevation of the gun and to cause the said cases to fall base first into the receptacle, a chute, fixed relatively to said turret and to said receptacle and having an open mouth adjacent and above the level of the receptacle, means to cause each case received in the receptacle to be so oriented therein that its open end points toward the said open end of the said chute, and means to engage each case in the receptacle and to convey said case, open end first, upwardly out of the receptacle into and through said chute.

5. In combination with a gun mounted in a turret which traverses with the gun but in which the gun is elevated relative to the turret, said gun having a breech and ejector means to throw a spent cartridge case lengthwise base first clear of the breech-block into the turret, a receptacle having an open mouth at its upper end, support means for a cartrdige case at its lower end, and side walls extending upwardly from said lower end, said receptacle being fixedly mounted in said turret for traversing movement with the latter and postioned rearwardly of and below the level of the breech, means to intercept the trajectories of spent cartridge cases at all angles of elevation of the gun and to cause the said cases to fall base first into the receptacle, a chute fixed relatively to said turret and to said receptacle and having an open mouth adjacent and above the level of the receptacle, means to cause each case received in the receptacle to be so oriented therein that its open end points towards the said open end of the said chute, and a rammer adapted to engage the base of each case in the receptacle and to ram the said case open end first upwardly out of the receptacle into and through the said chute.

6. For a gun mounted in a turret which traverses with the gun but in which the gun is elevated relative to the turret, said gun having a breech and ejector means to throw a spent cartridge case lengthwise base first clear of the breech-block into the turret, a receptacle having an open mouth at its upper end, support means for a cartridge case at its lower end, and side walls extending upwardly from said lower end, said receptacle being fixedly mounted in said turret for traversing movement with the latter and positioned rearwardly of and below the level of the breech, means to intercept the trajectories of spent cartridge cases at all angles of elevation of the gun and to cause the said cases to fall base first into the receptacle, a chute fixed relatively to said turret and to said receptacle and having an open mouth adjacent and above the level of the receptacle, an aperture in a wall of said turret, towards which aperture said chute leads, a movable member for opening and closing said aperture, ejecting means to engage each case in the receptacle and to convey said case, open end first, upwardly out of the receptacle into and through said chute and through said aperture, driving means to actuate said ejecting means, and to actuate said movable member, in timed relationship with the actuation of said ejecting means, to open the aperture as the ejecting means causes a case to move towards the aperture and to close the aperture after ejection of said case from the turret.

7. A device as claimed in claim 6 wherein the means to actuate said movable member comprises a crank-operated arm connected to the movable member, the said arm being arranged to lie over the centre of the crank when the movable member is closing the aperture in order to lock the movable member against outward movement.

8. For a gun mounted in a turret which traverses with the gun but in which the gun is elevated relative to the turret, said gun having a breech and ejector means to throw a spent cartridge case lengthwise base first clear of the breech-block into the turret, a receptacle having an open mouth at its upper end, support means for a cartridge case at its lower end, and side walls extending upwardly from said lower end, said receptacle being fixedly mounted in said turret for traversing movement with the latter and positioned rearwardly of and below the level of the breech, means to intercept the trajectories of spent cartridge cases at all angles of elevation of the gun and to cause the said cases to fall base first into the receptacle, a chute fixed relatively to said turret and to said receptacle and having an open mouth adjacent and above the level of the receptacle, an aperture in a wall of said turret, towards which aperture said chute leads, a movable member for opening and closing said aperture, a rammer to engage each case in the receptacle and to ram said case, open end first, upwardly out of the receptacle into and through said chute and through said aperture, driving means to actuate said rammer, and to actuate said movable member, in timed relationship with the actuation of said rammer, to open the aperture as the rammer causes a case to move towards the aperture and to close the aperture after ejection of said case from the turret.

9. A device as claimed in claim 8 comprising means

automatically to stop and restart the said driving means after the rammer reaches the end of an ejecting stroke and the aperture is fully opened, so as to cause the rammer to move automatically in a reverse stroke, and to close the aperture after an article has been ejected.

10. A device as claimed in claim 9 wherein the driving means comprises an electric motor and the stopping and restarting means comprises an electric switch device including switches to reverse the motor and a further switch for automatically stopping the motor when the rammer reaches the end of a reverse stroke and the aperture is closed.

11. In combination with a gun mounted in a turret which traverses with the gun but in which the gun is elevated relative to the turret, said gun having a breech and ejector means to throw a spent cartridge case lengthwise base first clear of the breech-block into the turret, a receptacle having an open mouth at its upper end, support means for a cartridge case at its lower end, and side walls extending upwardly from said lower end, said receptacle being fixedly mounted in said turret for traversing movement with the latter and positioned rearwardly of and below the level of the breech, means to intercept the trajectories of spent cartridge cases at all angles of elevation of the gun and to cause the said cases to fall base first into the receptacle, ejecting means to engage each case in the receptacle and to convey said case, open end first, upwardly out of the receptacle in a desired direction, and an actuating member disposed within the receptacle and adapted to be engaged by each case moving into the receptacle, and arranged on such engagement automatically to cause the said ejecting means to be operated.

12. An automatic device as claimed in claim 11, wherein said actuating member comprises a movable element arranged to be moved on engagement by a case, to actuate a switch to start an electric motor by which the ejecting means is operated.

13. For a gun mounted in a turret which traverses with the gun but in which the gun is elevated relative to the turret, said gun having a breech and ejector means to throw a spent cartridge case lengthwise base first clear of the breech-block into the turret, a receptacle having an open mouth at its upper end, support means for a cartridge case at its lower end, and side walls extending upwardly from said lower end, said receptacle being fixedly mounted in said turret for traversing movement with the latter and positioned rearwardly of and below the level of the breech, means to intercept the trajectories of spent cartridge cases at all angles of elevation of the gun and to cause the said cases to fall base first into the receptacle, ejecting means to engage each case in the receptacle and to convey said case, open end first, upwardly out of the receptacle in a desired direction, guide means to guide the case so moved in said desired direction, said guide means including a pivoted guide and means operable in timed relationship with the operation of the ejector means to cause said guide to swing about its pivot so as to engage the side of a case to guide the case while the latter is being moved out of the receptacle, and an actuating member disposed within the receptacle and adapted to be engaged by each case moving into the receptacle, and arranged on such engagement automatically to cause the said ejecting means to be operated.

14. An automatic device as claimed in claim 13 wherein the said guide comprises a slotted part which is arranged to co-operate with an element which is movable into and out of the slot in a line oblique to the axis of the slot, so as to cause the guide to move about its pivot.

15. An automatic device as claimed in claim 14 wherein the movable element comprises a pin carried by a reversible carrier-means operated by the driving means for the ejecting-means said carrier-means and the ejecting-means being driven through suitable gearing so that the effective movement of the conveyor system occurs during the beginning of the movement of the ejecting-means, whereby the guide is swung inwardly during the beginning of the ejection of a cartridge case.

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