

March 27, 1951

G. WEBB ET AL

2,546,804

CARTRIDGE FEEDING DEVICE FOR AUTOMATIC FIREARMS

Filed April 19, 1944

3 Sheets-Sheet 1

Fig. 1

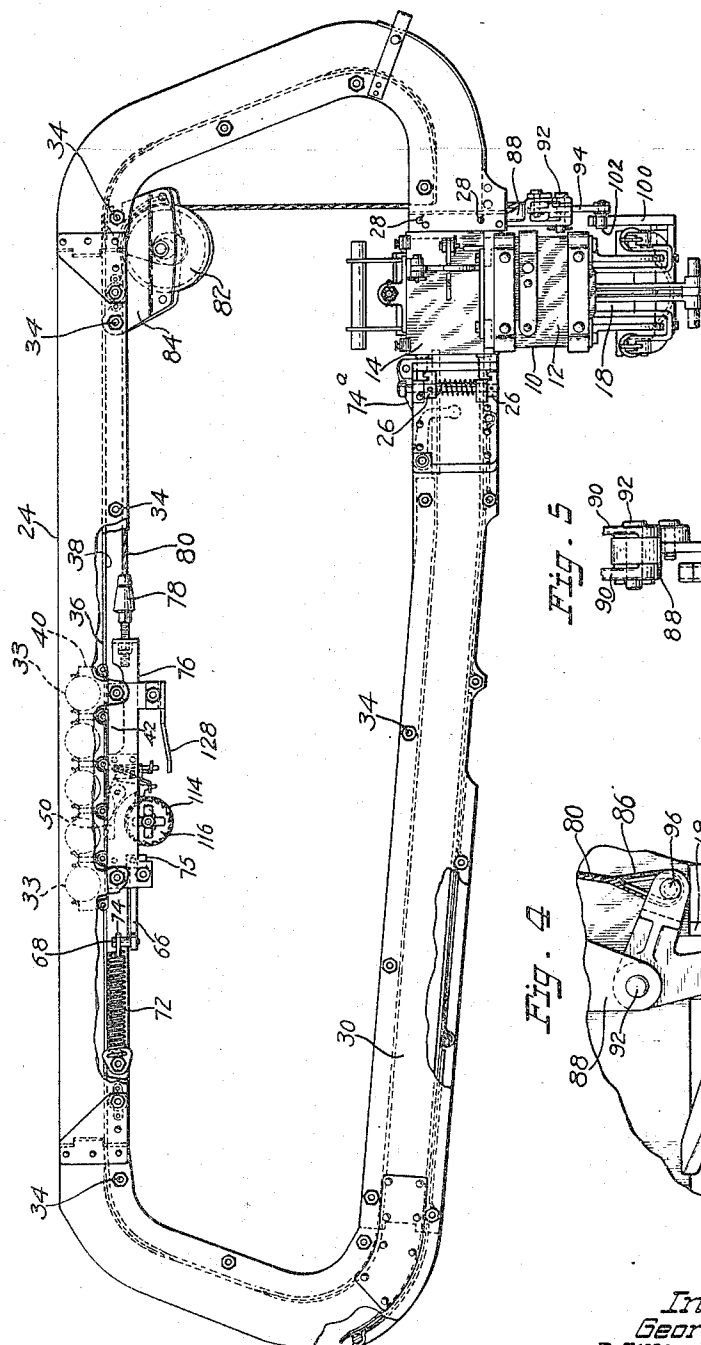


Fig. 5

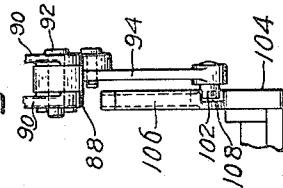
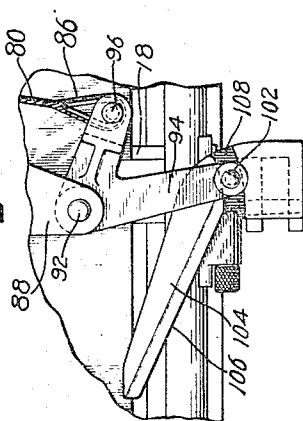


Fig. 4



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3 Sheets-Sheet 2

Fig. 3

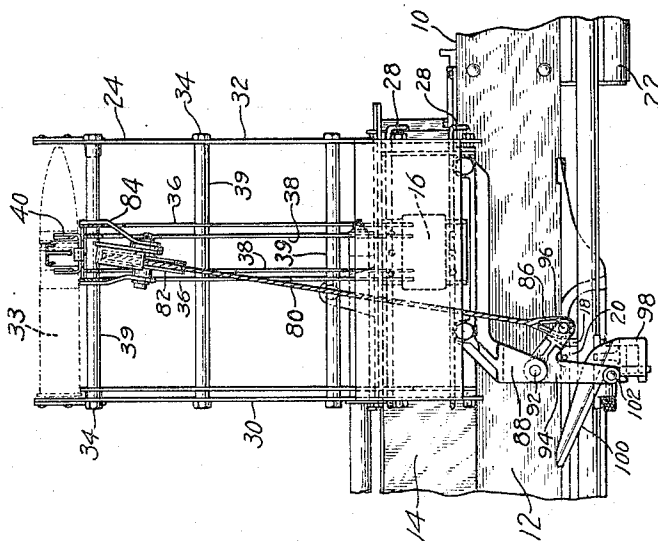
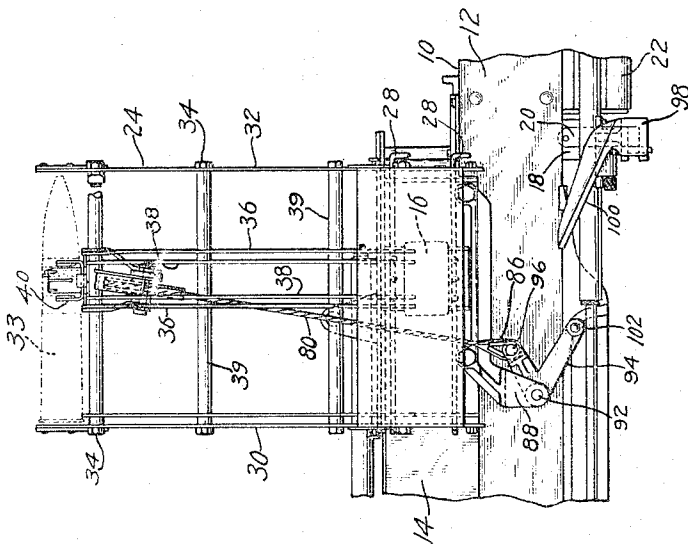


Fig. 2



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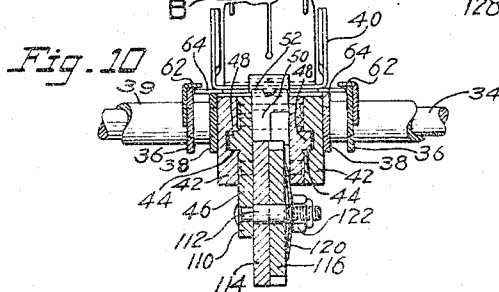
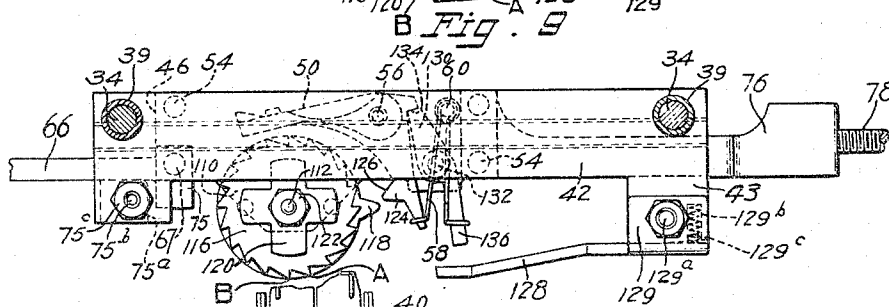
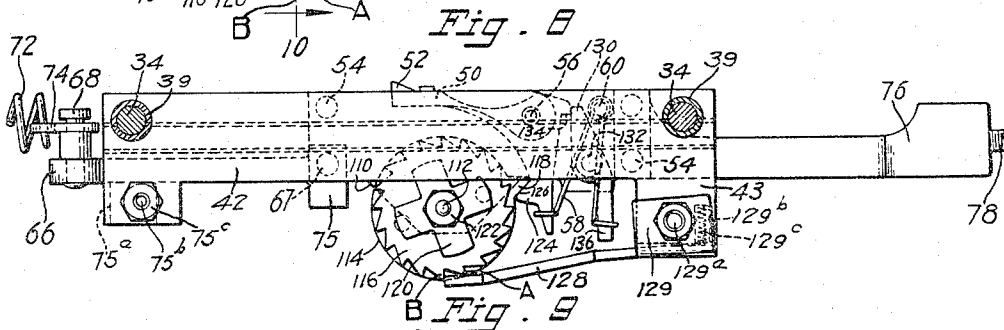
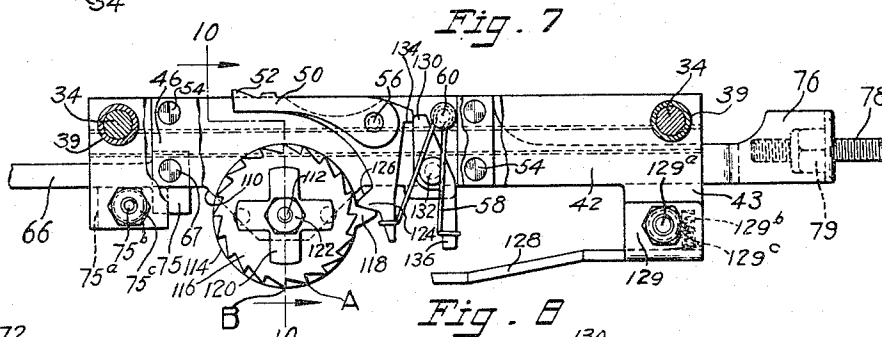
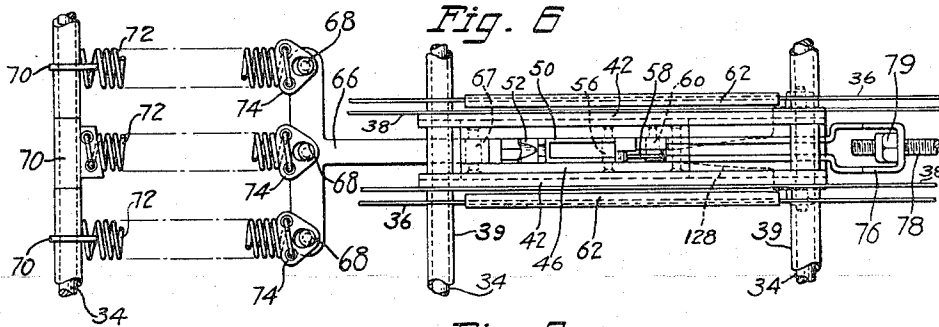
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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CARTRIDGE FEEDING DEVICE FOR
AUTOMATIC FIREARMS

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Application April 19, 1944, Serial No. 531,726

13 Claims. (Cl. 89-33)

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This invention relates to a cartridge feeding device for an automatic firearm and more particularly to a magazine attachable to an automatic firearm and provided with booster mechanism adapted to be actuated by a movable member on the firearm, whereby said booster mechanism supplements the conventional feeding mechanism of the firearm for feeding a loaded feeder along a guideway in the magazine and to the feeding channel of the firearm.

The firearm illustrated in the accompanying drawings is preferably, though not restrictively, of the type basically shown and described in U. S. Patent 1,525,065, dated February 3, 1925, to Browning and also, in improved form, in U. S. Patent 2,375,452, dated May 8, 1945, in the name of George Webb. Said firearm has a transverse feed channel and automatically actuated feeding mechanism adapted to feed a loaded feeder from any appropriate receptacle or container such as a magazine or feeding tray to and through the feed channel of the firearm.

In said firearm, the feed slide which engages the feeder to move it through the feed channel is actuated by certain parts of the firearm while moving in counter-recoil direction. Hence, the standard or conventional means in the firearm which move said movable parts in counter-recoil direction are sufficiently powerful to operate the feed slide in feeding direction for purposes of moving a loaded feeder of limited length to and through the feed channel. It has been found, for example, that feeders of sufficient length to accommodate fifteen or twenty rounds or cartridges may be fed by said feed slide to the feed channel without imposing any undue burden upon said movable parts of the firearm. It has also been found that where a magazine or suitable guide means are so constructed that gravity assists in the feeding of the feeder to the feed channel, feeders of sufficient length to accommodate a number of cartridges somewhat greater than fifteen may be satisfactorily fed to and through the feed channel by the conventional feed slide provided in the firearm.

In installations where it is desired to feed loaded feeders, of either flexible or rigid type, having capacities greater than thirty cartridges, for example, such an additional burden is sometimes placed upon the movable parts of the firearm, while moving in counter-recoil direction to actuate the feed slide, that the firing speed of the firearm is impeded and, if said burden is sufficiently great, malfunctioning or misfunctioning of the firearm may result.

Certain parts of the firearm which automatically move in recoil direction incident to the firing of rounds or cartridges in the firearm are so moved by such great force that utilization of even a substantial part of said force would place

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no undue burden on the satisfactory functioning of the fire arm. Accordingly, it is an object of the present invention to provide a booster mechanism which is preferably though not restrictively carried by a magazine attached to the firearm and provided with power means adapted to be energized by a certain movable member on the firearm while said member is moving in recoil direction.

It is another object of the invention to provide feeding means connected to said power means whereby, when the movable parts of the firearm are moving in counter-recoil direction, said power means moves said feeding means and the feeder engaged thereby in feeding direction.

It is a further object of the invention to provide a retractable pawl on said feeding means which is engageable by pawl retracting mechanism automatically operative to retract said pawl to an inoperative or non-feeder engaging position after a predetermined portion of the feeder has been moved in feeding direction by said booster mechanism, said portion of the feeder corresponding directly to a predetermined number of the cartridges carried by the feeder.

It is a still further object of the invention to provide a pawl retracting means in the form of a counting mechanism comprising a ratchet wheel which is progressively moved stepwise in one direction as the feeding means reciprocates, said ratchet wheel being connected to a member adapted to be progressively and simultaneously moved thereby from one position to another and, incident to reaching said latter position, said member will engage and retract said pawl from its feeder engaging position.

As a corollary to the foregoing object, it is another object to so construct the pawl retracting member and ratchet wheel that said ratchet wheel is advanced a distance corresponding to the space between successive teeth upon each reciprocative movement of the feeding means and, since said feeding means advances the feeder in feeding direction a distance equal to the space between successive cartridges each time the feeding means reciprocates, the number of teeth on the ratchet wheel will correspond to the number of cartridges which are adapted to be fed in feeding direction by the feeding means prior to the retraction of the feeding pawl on said feeding means to inoperative position.

Still another object of the invention is to provide power means which may be varied as to the force obtainable therefrom following each energization thereof by the firearm, whereby the present booster mechanism may be adapted to magazines or other suitable feeder guiding means having capacities greater or less than the magazine presently illustrated and described herein-

after.

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It is one further object of the invention to attach a cam member to a certain part on the firearm which is automatically reciprocable in opposite directions upon the firing of the firearm, the cam face of the cam member being so shaped that while moving in recoil direction, it operates a coengaging means which is moved thereby to energize the power means of the booster mechanism.

As a corollary to the foregoing object, it is a further object of another embodiment of the invention to provide a clearance opening adjacent one end of the cam face of the cam member whereby the means actuated by said cam face may pass through said opening at the end of the movement thereof by said cam face to permit quick actuation of the feeding mechanism in feeding direction by the power means that has just been energized by said cam member while moving in recoil direction.

Other objects of the invention, as well as details of the foregoing objects and details of the invention are set forth in the following specification and illustrated in the accompanying drawings.

The accompanying drawings show the embodiment of the invention which is deemed preferable, but it will be understood that the drawings are intended for illustrative purposes only and are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

In the drawings,

Fig. 1 is a rear end elevation of a magazine and firearm having combined therewith a booster mechanism comprising the present invention, the magazine being broken away in parts to better disclose certain features of the invention.

Fig. 2 is a fragmentary side elevation of the firearm and magazine shown in Fig. 1, said view being from the right hand side of Fig. 1 and illustrating the parts of the firearm and booster mechanism in their position at the instant a cartridge in the firearm is fired.

Fig. 3 is a view similar to Fig. 2 but shows certain movable parts of the firearm and booster mechanism in the position they assume at the end of the movement of said parts of the firearm in recoil direction.

Fig. 4 is an enlarged fragmentary side elevation of the cam member including another embodiment of the invention comprising a clearance slot or opening to permit quick return of the bell crank which is actuated by the cam member to energize the power means of the booster mechanism.

Fig. 5 is a fragmentary rear end elevation of the mechanism shown in Fig. 4.

Fig. 6 is an enlarged fragmentary top plan view illustrating details of the booster mechanism per se shown in Fig. 1.

Fig. 7 is a further enlarged fragmentary side view of the booster feeding means and pawl retracting per se of the booster mechanism at the end of the movement of said feeding means in feeding direction, the pawl retracting means being in its initial or first position in said view.

Fig. 8 is a view similar to Fig. 7 but shows the booster feeding mechanism at the commencement of its feeding stroke, the pawl retracting mechanism being illustrated in the position it occupies just prior to retracting the movable pawl to inoperative position.

Fig. 9 is a view similar to Fig. 7 but illustrates

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the pawl moved to and latched in its inoperative position.

Fig. 10 is a sectional vertical view of certain parts of the booster feeding means and pawl retracting means viewed on the line 10—10 of Fig. 7, said view also showing one end of a feeder mounted in operative position in the guideway of the feeding means and rearward of the feed pawl thereof.

Referring to the drawings, the firearm 10 preferably, though not restrictively, is of the type adapted to fire rounds or cartridges of a caliber considerably greater than rifle caliber and particularly cartridges having a caliber of approximately 37 mm. Said firearm comprises a breech casing 12 which is surmounted partially of its length by a feed box 14, the feed box being provided with a feed channel 16 extending transversely therethrough and defined at its ends by suitable openings in opposite side walls of the feed box 14. For all practical purposes as far as the present invention is concerned, the breech casing 12 and feed box 14 may be considered as a single casing notwithstanding the fact they are actually separable in accordance with the standard manner in which the firearm is manufactured.

Reciprocable within the breech casing 12 is a barrel extension having a depending portion 18 to which is secured a bracket 20 which is movable therewith. The portion 18 and bracket 20 reciprocate automatically in recoil and counter-recoil directions as the firearm functions. The explosion taking place upon the firing of a round or cartridge moves the barrel extension and portion 18 thereof in recoil direction to the position substantially shown in Fig. 3 and, following this, a spring mounted in recuperator tube 22 quickly moves the barrel extension and its portion 18 in counter-recoil direction to the position thereof shown in Fig. 2.

To illustrate the principles of the invention to advantage, the present drawings illustrate a frame-like magazine, generally designated 24, secured to the feed box 14 by suitable latches 26 and pins 28 extending longitudinally of the firearm to interconnect projecting members on the feed box and the end portions of the magazine frame. The magazine 24 comprises a rear end plate 30 and a front end plate 32 which are held in spaced relationship by a plurality of suitably spaced struts or rods 34, the spacing between the end plates being sufficient to accommodate cartridges 33 therebetween. Struts 34 also support in spaced relationship a plurality of narrow elongated plates 36 and 38 which comprise a skeletal channel or guideway for a feeder. Plates 36 and 38 are maintained properly positioned on said struts by a plurality of spacing sleeves 39. The guideway defined by plates 36 and 38 passes around the upper portion of the firearm and extends from approximately one end to the other of the feed channel 16. Except for its shape, the magazine herein illustrated generally resembles the frame-like magazines illustrated in U. S. Patent 2,375,453, dated May 8, 1945, and copending application, Serial No. 498,624, now U. S. Patent 2,537,562 to which attention is directed for a complete description thereof.

Heretofore the type of magazine to which the present invention relates was primarily designed to contain a flexible feeder loaded with approximately thirty cartridges of 37 mm. caliber. Inasmuch as the major portions of the magazine extended above the firearm when disposed in

normal position, gravity assisted in the feeding of the cartridges to the feed channel.

It is to be understood that the feed box 14 contains an automatically reciprocable feed slide having a feed pawl engaging a feeder to move the same in feeding direction through the feed channel 16. While not shown in the present drawings, said feed slide is fully described and clearly illustrated in U. S. Patent 2,375,452 and copending application, Serial No. 493,624. As shown therein the feed slide is automatically reciprocated by certain movable parts in the firearm during the functioning thereof and comprises the sole means in the firearm and magazine which moves the feeder in feeding direction in its guideway. As stated above, however, the feeding of the feeder and the cartridges contained therein is assisted by gravity while moving in the guideways in said magazines. Such feeding is accomplished satisfactorily by the feed slide of the firearm but, when it is desired to increase the capacity of the magazines by making the same larger or when it is desirable or necessary to so shape the same that gravity will not provide sufficient additional force to supply the total amount of force needed by the feed slide to feed a feeder of greater cartridge capacity, other means must be provided to supply such additional force as is required to move a feeder of longer length in said guideway or the firing speed of the firearm will either be materially impeded or a misfunction or a malfunction of the firearm will result.

It is therefore the principal object of the present invention to provide booster mechanism which is adapted to be mounted adjacent a feeder guideway and be actuated by power means energized by the firearm, whereby a feeder is moved in feeding direction in said guideway by said booster. To illustrate an exemplary installation of the booster mechanism comprising the present invention, the same is shown supported by a magazine 24. Said booster mechanism includes means engageable with a feeder 40 to move the same in feeding direction in the guideway formed by plates 36 and 38. While the feeder 40 has been illustrated as an endless flexible articulated-link type of feeder, it is to be understood that a booster of the type to be presently described is also equally adapted to feed or assist in the feeding of disintegrating link or rigid type feeders of any reasonably practical length and, if the feeders are flexible, the booster is cooperable therewith regardless of whether the feeder is of the endless type as illustrated in the present drawings or otherwise. In Fig. 1, incidentally, the feeder 40 is only fragmentarily illustrated but it is to be understood that said feeder continues entirely around the guideway and through the feed channel 16 of the feed box.

Considering the booster mechanism in detail, the same comprises a pair of spaced plates 42 which are mounted between plates 38 of the guideway and supported by a pair of the struts 34. Plates 42 are respectively provided on their inner surfaces with opposed guide grooves 44 which preferably extend the full length of the plates. A depending member 43 is provided on one end of each plate 42 for purposes to be described.

A reciprocable feeding means 46 is provided on its opposite sides with projecting horizontal ribs 48 which are respectively slidably received in guide grooves 44. Feeding means 46 pivotally supports an L-shaped pawl 50 having a feeding

tooth 52 adapted to be received in suitable spaced notches in or between the links of the feeder 40 whereby, as feeding means 46 moves in feeding direction during its reciprocative movements, the feeder assembly is moved in feeding direction. It is to be understood that a feeder assembly comprises a feeder completely or partially loaded with cartridges.

Feeding means 46 may be composed of a plurality of spaced side members which respectively directly carry said ribs 48, said side members being held in assembled relationship by any suitable means such as pins or rivets 54. Pawl 50 is pivotally supported between said side members of said feeding means on a transversely extending pivot pin 56. One leg of the L-shaped pawl 50 extends substantially horizontally while the other leg depends therefrom substantially vertically. A substantially U-shaped spring 58 extends around a transverse pin 60 in the feeding means and engages the depending leg of the pawl 50 so as to normally bias the tooth 52 of said pawl upward and into engagement with the feeder assembly.

In order that the feeder assembly may not be moved away from the pawl in a direction normal to the path of movement of the feeder in the guideway, supplementary guide means comprising a pair of spaced flanges 62 are mounted on and respectively project inward from the spaced plates 36 of the guideway. As is clearly shown in Fig. 10, said inward projecting flanges 62 overlap the oppositely extending side flanges 64 of the feeder 40, whereby the feeder may only move longitudinally of the guideway at least at that particular portion thereof where the supplementary guide means is located.

Power means to move the feeding means in feeding direction comprises a T-shaped member 66 which is secured to one end of the feeding means by a transverse pin 67, the member 66 being provided on its outer or head end with a plurality of spaced annularly notched pins 68. Another one of the spacing struts 34 is provided with a plurality of spaced apertured means 70 to which one of the ends of a plurality of helical springs 72 is respectively secured. The other ends of said springs are respectively secured to small apertured plates 74, one of the apertures of each of said plates receiving one of the notched pins 68 in such a manner that a portion of the plate is disposed in the angular notch of said pin. The connection between member 66 and feeding means 46 is such that said member may be slightly pivotally moved about pin 67 to permit the springs 72 to find their own level while the feeding means is moving between its two limits of movement.

Springs 72 are of such size that they will quickly move the feeding means 46 in feeding direction and still be under tension when the feeding means 46 has been moved to the limit of its path of movement in feeding direction, whereby the small apertured plates 74 will normally always be maintained in the annular notches of pins 68. Movement of the feeding means 46 in feeding direction is normally limited by a stop pawl 74a pivotally mounted on the magazine adjacent the feed box 14 and adapted to engage one of a plurality of notches in the feeder at the end of each feeding movement of the feed slide in feeding direction.

In order that feeding means 46 may not be moved substantially further in feeding direction than the position thereof indicated in Figs. 6, 7

and 9 when the feeder 40 is removed from the guideway, the T-shaped member 66 is provided with a lug 75 which depends from the end of said member that is secured to the feeding means. A stop block 75^a is disposed between and secured to the adjacent ends of spaced plates 42 by a pin 75^b which is threaded at its ends and extends through suitable openings in said ends of said plates and said stop block 75^a. Pin 75^b is secured in said plates and block by a plurality of nuts 75^c respectively threaded on the opposite ends of said pin 75^b.

The block 75^a not only serves as a stop means adapted to be engaged by the lug 75 to limit the movement of the feeding means in feeding direction under the conditions stated in the foregoing but said block 75^a also serves as a spacing means for maintaining one end of each of said plates 42 relatively properly spaced. However, under normal conditions of use when a feeder is mounted in the guideway and is engaged by the feeding means 46, there is a space between the adjacent faces of lug 75 and stop block 75^a when the feeding means reaches the limit of its movement in feeding direction.

A projection 76 extends longitudinally from the other end of feeding means 46 and is so constructed as to be adjustably secured to a threaded end of a coupling member 78 by means of a nut 79 threaded on said end of the coupling member. The other end of the coupling member 78 is secured to one end of a flexible cable 80. Cable 80 passes around a rotatably mounted pulley wheel 82 supported in the magazine by a suitable bracket 84 which is mounted on a pair of the struts 34, the other end of the cable terminating in a loop 86 depending below the lower portion of the magazine adjacent the right hand side of the feed box.

A bracket 88 is fixedly mounted on the magazine adjacent the right hand side of the breech casing, said bracket having a depending portion terminating in a pair of spaced legs 90 which are respectively provided with aligned apertures receiving a pivot pin 92. A bell crank 94 is pivotally mounted on pin 92 and one arm of the bell crank is provided with a laterally projecting lug 96 which is disposed in the loop 86 of the lower end of cable 80.

Secured to a portion of bracket 20 which projects laterally outward from the right hand side thereof is a cam member 98 provided with a cam face 100 which extends upward and rearward from said portion of bracket 20. Cam member 98 reciprocates in recoil and counter-recoil direction with the depending portion 18 of the barrel extension and the shape of the cam is such that, when moving in recoil direction, the cam face 100 engages a laterally extending lug 102 provided on the outer end of the other arm of bell crank 94 from that which engages the cable 80. In the course of the movement of cam member 98 from the position shown in Fig. 2 to that shown in Fig. 3, the lower arm of bell crank 94 is moved downward, as well as the depending lower end of the cable. Such movement of the bell crank and cable causes the feeding means 46 to be moved in counter-feeding direction toward the right, as viewed in Fig. 1, to energize or tension springs 72 which comprise power means for the booster. It is to be understood that energizing the power means comprising the springs 72 means stretching the springs so as to place them under greater tension than that possessed by them when

the feeding means is in the position shown in Figs. 1, 6 and 7.

While springs 72 and their mounting means mainly comprise the power means for the feeding means 46, said springs only move it in feeding direction while the cable 80, bell crank 94 and cam member 98 move said feeding means in counter-feeding direction. Hence, said cable, bell crank, and cam member may properly be considered part of the power means.

When the cable 80 and bell crank 94 are being initially adjusted upon installation thereof in the magazine and on the firearm respectively, the position of the cam engaging lug 102 must be properly adjusted so that it assumes its correct lowermost position, indicated in Fig. 2, whereby the cam member 98 will slidably engage said lug 102 to move the feeding means 46 the proper distance in counter-feeding direction. Locating the lug 102 in said proper position is accomplished by rotating nut 79 in the proper direction to adjust the threaded end of the coupling member 78 longitudinally with respect to the projection 76 on the feeding means and thus move the end of the cable secured to the coupling member the correct amount either toward or from the feeding means 46.

During the movement of the feeding means 46 in counter-feeding direction the tooth 52 of the pawl 50 is slidably moved with respect to the portion of the feeder assembly disposed adjacent said feeding means, said tooth being thus moved from engagement with one feeding notch in the feeder to the next succeeding feeding notch therein. As soon as the barrel extension is moved by the recuperator mechanism in counter-recoil direction, the cam member 98 is also moved therein in counter-recoil direction so as to release the lug 102 on the bell crank and permit the spring device comprising spring 72 to move the feeding means 46, and the feeder assembly engaged thereby through the medium of pawl 50, in feeding direction which is toward the left as viewed in Fig. 1.

Hence, the excess energy developed by the firearm during recoil movement is utilized advantageously to energize power means connected to feeding means in a booster mechanism in a magazine. While the barrel extension and certain other parts of the firearm are moving in counter-recoil direction to operate the conventional feed slide of the firearm, the energy stored in springs 72 of the power means of the booster mechanism in the magazine is utilized to supplement the conventional feeding mechanism of the firearm. Thus, no undue burden is placed upon said conventional feeding mechanism regardless of the fact that a magazine, or other suitable feeder assembly supporting and guiding means, may contain a feeder assembly considerably longer than that which could be normally fed properly by said conventional feeding mechanism of the firearm.

The present power means comprising the plurality of springs 72 may be varied as to the force produced by utilizing either one, two or all three of the springs provided for attachment between the relatively movable members comprising strut 34 and T-shaped member 66. Further adjustment of said force may also be obtained by using stronger or weaker springs. If a relatively short feeder is to be used, probably a single spring 72 will be sufficient to provide adequate force in the booster mechanism and, accordingly, the middle spring is used singly,

the two outermost springs being disconnected from T-shaped member 66. Said outermost springs may be either completely removed from the magazine or they may simply depend loosely from the strut 34. If somewhat greater force is desired than that provided by one spring in the booster mechanism, the middle spring is disconnected and the two outermost springs are utilized. Still greater force is obtained when all three springs are used.

Under some conditions of use, it may be found that it is desirable to have the feeding means 46 move in feeding direction more quickly than is permitted when using the type of cam shown in Figs. 1 to 5. Accordingly, another embodiment of the invention contemplates the use of a cam member 104 which has a cam face 106 extending upward and rearward substantially in the same manner as cam face 100 of cam member 98. However, the outer side of cam member 104 is provided, adjacent the lower end of cam face 106, with an arcuate clearance slot or opening 108 which is adapted to permit passage of lug 102 on the lower arm of the bell crank after said lug has slidably engaged the cam face 106 for substantially its full length.

The force of the power means comprising spring 72 will quickly move lug 102 on the bell crank 94 through clearance opening 108 before cam member 104 has started to move in counter-recoil direction. Hence, the power means of the booster mechanism will be permitted to start to move the feeding means 46 in feeding direction substantially at the same time that the normal feeding means of the firearm commences to move the feeder in feeding direction incident to the movement of the barrel extension and cam member 104 in counter-recoil direction. Movement of the lug 102 through the clearance opening 108 is possible where over-travel of the feeding means 46 in counter-feeding direction is provided, whereby the pawl 50, while moving in feeding direction, does not engage the next engageable feeding notch of the feeder until lug 102 has passed through opening 108 of cam 104.

Since the conventional feeding mechanism of the firearm is well adapted to properly feed a feeder assembly of certain lengths in feeding direction, it has been found preferable to have the booster mechanism of the type described above operate to feed only a certain portion of the feeder assembly and then be disengaged therefrom to permit the conventional feeding mechanism to feed the remainder of the feeder assembly. This is particularly true in the case of endless feeders of the type illustrated in Fig. 1. If the entire endless feeder assembly of the type shown in Fig. 1 were engaged by the booster mechanism, overfeeding of that portion of said feeder assembly which is last fed to the feed channel of the firearm may occur and result in jamming of the cartridges in the breech of the firearm. Such over-feeding may possibly be caused, as stated above, by the conventional feeding means of the firearm and the booster feeding means both cooperating with the said last portion of the feeder assembly which is sufficiently short that the feeding mechanism of the firearm alone could adequately move the same in feeding direction without any assistance from the booster feeding means.

Hence, in the preferred embodiment of the present booster mechanism described in the foregoing, a counting and pawl retracting mechanism

is provided for purposes of moving the pawl 50 and pawl tooth 52 from the position shown in Figs. 7 and 8 to the inoperative or non-feeder engaging position thereof shown in Fig. 9 after a predetermined portion of the feeder assembly has been moved in feeding direction by the feeding means 46 and pawl 50.

The counting and pawl retracting mechanism comprises a depending projection 110 carried by one side member of the feeding means 46. A pintle 112 projects laterally from one side of the projection 110 and pivotally supports a rotatable member 114 and a ratchet wheel 116. Rotatable member 114 is preferably a circular disc of appreciable thickness and is provided with a cam lug 118 extending radially outward beyond the periphery of the rotatable member, said lug in side elevation resembling an angularly sided tooth. Rotatable member 114 and ratchet wheel 116 are held in frictional engagement with each other, so as to be normally movable in unison, by means of a concave spring washer 120 which is also mounted on the pintle 112 and held in resilient engagement against ratchet wheel 116 by a threaded nut 122 which is mounted on the outer threaded end of pintle 112. Spring washer 120, as shown in Figs. 7, 8 and 9, is preferably cross-shaped.

The depending leg of the pawl 50 is provided with a laterally projecting cam 124 which extends in the direction of the rotatable member 114 and is provided with a cam face 126 slidably engageable by one side of lug 118 of the rotatable member 114 to cam the pawl 50 to the inoperative position thereof illustrated in Fig. 9 as the rotatable member moves in clockwise direction as viewed in Fig. 9. Fig. 8 illustrates the lug 118 in engagement with cam face 126 of cam 124 just prior to camming the pawl 50 to inoperative position.

Rotatable member 114 and ratchet wheel 116 thus comprise mechanism adapted to be progressively moved stepwise from one position, illustrated in Fig. 7, to another position, illustrated in Fig. 8, while the pawl 50 is progressively moving the feeder assembly in feeding direction in the guideway in the magazine. Said rotatable mechanism is progressively moved in clockwise direction, as viewed in Figs. 7 through 9, by engagement of one tooth of the ratchet wheel with the end of a pawl 128 which is supported from depending members 43 of side plates 42. Pawl 128 is provided with a plurality of upstanding spaced ears 129 respectively disposed adjacent one of the depending members 43. Ears 129 and members 43 are transversely aperture to receive a bolt 129^a which secures said pawl to said plates 42.

The right hand end of the lower side of each ear 43 is beveled slightly upward and rearward and is also provided with a vertical aperture 129^b, a coil spring 129^c being disposed in each aperture and adapted to bias the right hand end of pawl 128 downward and the left hand end upward until the left hand end of the lower side of each ear 43 is engaged by the pawl to limit the upward pivotal movement of the left hand end thereof. Thus, the pawl 128 is adapted for slight pivotal movement about bolt 129^a so as to be yieldable for purposes to be described. For all practical purposes, however, pawl 128 may be considered a fixed pawl.

Each time the feeding means 46 reciprocates in counter-feeding direction due to the movement of cable 20 by cam member 98, one tooth of the

ratchet wheel 116, in position A in Figs. 7 and 9, engages the free end of fixed pawl 128 and, as the feeding means 46 is moved slightly further in counter-feeding direction, said tooth is moved by said pawl to position B in Figs. 7 and 9, whereby the ratchet wheel 116 and rotatable member 114 are automatically advanced the distance between two adjacent teeth on the ratchet wheel. Such advancement of the rotatable member 114 also advances the lug 118 an equal distance.

As one tooth moves from position A to position B, the next succeeding tooth will engage the upper surface of the left hand end of pawl 128 and move it downward to the position thereof shown in Fig. 8. Springs 129^c permit such yielding movement of the pawl but, when the feeding means and ratchet wheel move in feeding direction and disengage pawl 128, springs 129^c will restore pawl 128 to the position shown in Figs. 7 and 9 wherein it will properly engage the next succeeding tooth of the ratchet wheel.

As has been stated above, each reciprocation of the feeding means 46 in feeding direction advances the feeder assembly a distance amounting to that between the centers of two adjacent cartridges in the feeder assembly. Upon the feeding means reciprocating in counter-feeding direction, the ratchet wheel 116 advances the lug 118 on the rotatable member 114 a distance approximately amounting to the space between two successive teeth on the ratchet wheel. Accordingly, it may be said that each tooth on the ratchet wheel corresponds to a cartridge in the feeder assembly as far as the relative advancement of the feeder assembly and lug 118 is concerned. Therefore, the feeding means 46 and pawl 50 will function to advance in the guideway of the magazine a number of cartridges in the feeder assembly equal to the number of the teeth on the ratchet wheel 116.

After the ratchet wheel and lug 118 have been advanced from the position shown in Fig. 7, the so-called starting position, to the position shown in Fig. 8, the feeding means 46 may advance in feeding direction to feed the feeder assembly one more time since, upon the feeding means 46 moving in counter-feeding direction during the next reciprocation, the tooth on the ratchet wheel engaged by the fixed pawl 128 during said reciprocation will serve to cam the pawl 50 to the inoperative position thereof illustrated in Fig. 9. Thereafter, the feeder assembly will not be advanced by the feeding means and pawl 50 notwithstanding the fact that said feeding means will be continuously reciprocated by the power means of the booster mechanism.

In order that pawl 50 may be retained in inoperative position, latch mechanism is provided to automatically engage said pawl upon the camming of the pawl to its inoperative position illustrated in Fig. 9. Said latch mechanism comprises a latch member 130 pivotally mounted intermediately of its ends on a pintle 132 carried by the feeding means 46. The upper end of the latch 130 is engageable with a locking detent 134 provided on the pawl 50. The lower portion 136 of the latch 130 is engaged by the end of the U-shaped spring 58 opposite that engaging the depending leg of the pawl 50, whereby said depending leg of the pawl 50 and lower portion 136 of the latch 130 are normally biased apart so that the upper end of latch 130 is constantly held in engagement with the outer end of locking detent 134 on the pawl when the pawl is normally functioning to engage the feeder assembly.

Only when the pawl 50 is moved by lug 118 to the position shown in Fig. 9 does the upper end of the latch 130 engage beneath the locking detent 134 on the cam to maintain the pawl in inoperative position.

After a feeder has been exhausted of all cartridges and the magazine or other cartridge containing and guiding means is reloaded, the booster mechanism is reset in operative position by manually rotating the ratchet wheel 116 and rotatable member 114 until they occupy the position shown in Fig. 7 or any other position which will permit feeding of the required number of cartridges prior to retraction of pawl 50. The pawl 50 is then released from its latched position shown in Fig. 9 by manually engaging the lower portion 136 of the latch 130 and moving it toward the ratchet wheel 116 until the locking detent 134 on the pawl is clear of the upper end of latch 130. Following this, spring 58 will automatically move the pawl to the position shown in Fig. 7.

The tooth 52 of pawl 50 may not move substantially above the position thereof illustrated in Figs. 7 and 8 inasmuch as the outer end of cam 124 normally rides on the cylindrical outer surface of rotatable member 114 as is clearly evident from Fig. 7.

Should it be desired to change the feeding capacity of the booster mechanism described above so that the booster mechanism will feed a larger or smaller portion of a feeder assembly containing a greater or lesser number of cartridges than the feeder assembly illustrated in Fig. 1, for example, said change may be effected by replacing the present ratchet wheel 116 with another one having sufficient teeth to correspond to the number of rounds which it is desired to have boosted or fed by the booster mechanism. Preferably, the ratchet wheel should be of the same diameter as the present one so as to be readily interchangeable therewith. In substituting another ratchet wheel having a different number of teeth from the present one, since the length of the reciprocative path of the feeding means 46 will preferably remain the same, the end of the pawl 128 which engages the ratchet wheel should preferably be varied either toward or away from the ratchet wheel, depending on whether the substituted ratchet wheel has a greater or fewer number of teeth than the presently used one, to compensate for the change in space between said teeth.

Such change of said end of the pawl 128 may be effected by providing adjustment means, not shown, to vary the longitudinal position thereof with respect to members 43 on spaced plates 42 which support the fixed pawl. Rather than vary the position of the fixed pawl 128 with respect to spaced plates 42 under the circumstances described above however, it is deemed preferable to supply one or more sets of substitute parts, said sets each comprising a ratchet wheel and a fixed pawl properly cooperable therewith whereby said substitute parts may replace the ratchet wheel and pawl presently mounted in the booster mechanism when it is desired to change the feeding capacity of said booster mechanism.

Should it be further desired to so increase the capacity of the booster mechanism beyond that which can be obtained by using a ratchet wheel of the same diameter as the presently shown one, a ratchet wheel and rotatable member of larger diameter may be used but, in this event, a different feeding means having a longer projection 110

will have to be used. Such a substitution of feeding means could be readily effected however.

In the foregoing description of the invention, the terms used to describe position or direction such as upward, rearward, downward, left hand side, right hand side, front, rear, and the like, are to be considered when the magazine and firearm are disposed in the normal position thereof which is the position of the firearm and magazine shown from the rear end in Fig. 1 of the present drawings when said figure is viewed while holding the sheet containing the same in substantially vertical position with the longitudinal axis thereof disposed horizontally. Said descriptive terms are to be considered in the same relative sense regardless of the position in which the magazine and firearm may be ultimately disposed.

While the invention has been illustrated and described in its preferred embodiment and has included certain details, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways, falling within the scope of the invention as claimed.

What we claim is:

1. In an automatic firearm having a feed channel and feed mechanism operable automatically to move a feeder assembly therethrough, and a magazine mounted on the firearm and provided with a guideway communicating with the feed channel and adapted to support and guide a feeder assembly in its movement therein, the combination of a booster mechanism comprising feeding means additional to the feed mechanism of the firearm and repetitively operable to engage and effect the movement of the feeder assembly through the magazine, power means for actuating the feeding means, and acting independently of the length of the feeder assembly and constructed and arranged to render the feeding means ineffective after the feeder assembly has been moved by the feeding means a predetermined extent.

2. In an automatic firearm having a feed channel and feed mechanism operable automatically to move a feeder assembly therethrough, and a magazine mounted on the firearm and provided with a guideway communicating with the feed channel and adapted to support and guide a feeder assembly in its movement therein, the combination of a booster mechanism comprising feeding means additional to the feed mechanism of the firearm and operable periodically to engage and effect the movement of the feeder assembly through the magazine, power means for actuating the feeding means, and counting mechanism including means to render the feeding means ineffective after a predetermined number of feeding operations.

3. A combination according to claim 2, wherein the feeding means comprises a spring pressed pawl and the counting mechanism comprises a ratchet operated cam for shifting the pawl to an inoperative position.

4. In an automatic firearm having a feed channel and feed mechanism operable automatically to move a feeder assembly therethrough, and a magazine mounted on the firearm and provided with a guideway communicating with the feed channel and adapted to support and guide a feeder assembly in its movement therein, the combination of a booster mechanism comprising reciprocable feeding means additional to the feed mechanism of the fire-

arm, a pawl carried thereby and adapted to engage and move the feeder assembly at each reciprocation of the feeding means, means for reciprocating the feeding means, and pawl retracting means constructed and arranged to move progressively in response to the reciprocation of the feeding means and upon being moved a predetermined extent to effect the retraction of the pawl from its engagement with the feeder assembly.

5. In an automatic firearm having a feed channel and feed mechanism operable automatically to move a feeder assembly therethrough, and a magazine mounted on the firearm and provided with a guideway communicating with the feed channel and adapted to support and guide a feeder assembly in its movement therein, the combination of a booster mechanism comprising reciprocable feeding means additional to the feed mechanism of the firearm, a pawl carried thereby and adapted to engage and move the feeder assembly at each reciprocation of the feeding means, means for reciprocating the feeding means, pawl retracting means constructed and arranged to move progressively in response to the reciprocation of the feeding means and upon being moved a predetermined extent to effect the retraction of the pawl from its engagement with the feeder assembly, and means for holding the pawl in its retracted position.

6. A combination according to claim 4, wherein the pawl retracting means comprises a ratchet operated cam, the ratchet being actuated by the reciprocating movement of the feeding means to move the cam into position to effect the retraction of the pawl thereby.

7. A combination according to claim 4, wherein the pawl retracting means comprises a ratchet operated cam, the ratchet being actuated by the reciprocating movement of the feeding means to move the cam into position to effect the retraction of the pawl thereby, and being constructed and arranged to be initially set in the desired position to count off a predetermined number of reciprocations of the feeding means before the cam reaches its pawl retracting position.

8. In an automatic firearm having a feed channel, mechanism automatically operable to feed a feeder assembly through the channel, a member intermittently movable in recoil and counter-recoil directions as the firearm functions, a cam carried by said movable member and formed with a cam face extending at an angle to the path of movement of said cam and terminating at one end in an opening extending transversely to said cam face, and a magazine mounted on said firearm and provided with a guideway communicating with said feed channel and shaped to support and guide a feeder assembly for movement in said magazine, the combination of a booster mechanism comprising feeding means additional to the feed mechanism of the firearm and positioned and formed to engage and move said feeder assembly in feeding direction in said guideway in timed relation to the operation of said firearm feed mechanism, power means comprising a spring device connected to said feeding means to move the same in feeding direction, a bellcrank lever pivoted to a fixed portion of the firearm, means interconnecting said spring device with one arm of said lever, and a projecting lug on the other arm of the lever engaging the said cam upon each successive movement thereof in recoil direction so

as to rock the lever and thereby energize said spring device until the cam has been moved to a position where the opening therein permits the passage of the lug therethrough to release the lever from the influence of the cam, whereby the spring device is free to relax and effect the movement of the feeding means.

9. A cartridge feeding device for use with an automatic firearm having a transverse feed channel for receiving a cartridge feeder assembly, the said cartridge feeding device comprising in combination, a power actuated repetitively operable feeding means engageable with the feeder assembly to move the said feeder assembly intermittently into the firearm feed channel, and mechanism acting independently of the length of the feeder assembly and constructed and arranged to automatically render the feeding means inoperative after the feeder assembly has been moved by the feeding means to a predetermined extent.

10. A cartridge feeding device for use with an automatic firearm having a transverse feed channel for receiving a cartridge feeder assembly, the said cartridge feeding device comprising in combination, a power actuated repetitively operable feeding means engageable with a portion of the feeder assembly to move the said feeder assembly intermittently into the firearm feed channel, and counting mechanism including means constructed and arranged to automatically render the feeding means inoperative after a predetermined number of feeding operations.

11. The combination of an automatic firearm provided with a transverse feed channel and with feed mechanism immediately adjacent the feed channel for engaging a cartridge feeder assembly to move it intermittently through the channel during the functioning of the firearm, a magazine including a guideway for engaging and guiding a feeder assembly which guideway has an end portion positioned adjacent the firearm feed channel so as to guide the feeder assembly to the said feed channel, a booster mechanism positioned adjacent the magazine guideway and including feeding means additional to the firearm feed mechanism and engageable with the feeder assembly to assist the firearm feed mechanism in moving the feeder assembly along the guideway toward and through the firearm feed channel, means for repetitively operating the said booster mechanism, and means acting independently of the length of the feeder assembly and constructed and arranged to operate when the feeder assembly has been moved to a predetermined extent to automatically render the feeding means of the booster mechanism ineffective and to thereby cause continued movement of the feeder assembly to be thereafter effected solely by the feed mechanism of the firearm.

12. The combination of an automatic firearm provided with a transverse feed channel and with feed mechanism immediately adjacent the feed channel for engaging a cartridge feeder assembly to move it intermittently through the channel during the functioning of the firearm, a magazine including a guideway for engaging and guiding a feeder assembly which guideway has an end portion positioned adjacent the firearm feed channel so as to guide the feeder assembly to the said feed channel, a booster mechanism positioned adjacent the magazine guideway and

including feeding means additional to the firearm feed mechanism and engageable with the feeder assembly to assist the firearm feed mechanism in moving the feeder assembly along the guideway toward and through the firearm feed channel, means for repetitively operating the said booster mechanism, and counting mechanism including means to automatically render the feeding means of the booster mechanism ineffective after a predetermined number of feeding operations and to thereby cause continued movement of the feeder assembly to be thereafter effected solely by the feed mechanism of the firearm.

13. The combination of an automatic firearm provided with a transverse feed channel and with feed mechanism immediately adjacent the feed channel for engaging a cartridge feeder assembly to move it intermittently through the channel during the functioning of the firearm, a magazine including a guideway for engaging and guiding a feeder assembly which guideway has an end portion positioned adjacent the firearm feed channel so as to guide the feeder assembly to the said feed channel, a booster mechanism positioned adjacent the magazine guideway and including a reciprocable spring-pressed pawl engageable during each advancing stroke with the feeder assembly to assist the firearm feeding mechanism in moving the feeder assembly along the guideway toward and through the firearm feed channel, means for reciprocating the pawl, and a ratchet operated cam mechanism constructed to be set to count off a predetermined number of feeding strokes in response to the reciprocations of said pawl and serving upon the counting of the final stroke of said predetermined number of strokes to operate the cam to shift the pawl to a position out of engagement with the feeder assembly to permit continued movement of the latter to be effected thereafter solely by said feeding means.

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