Feb. 27, 1951 A. L. BUREAU 2,542,988

BELT LOADER

Filed Feb. 2, 1943 4 Sheets-Sheet 1

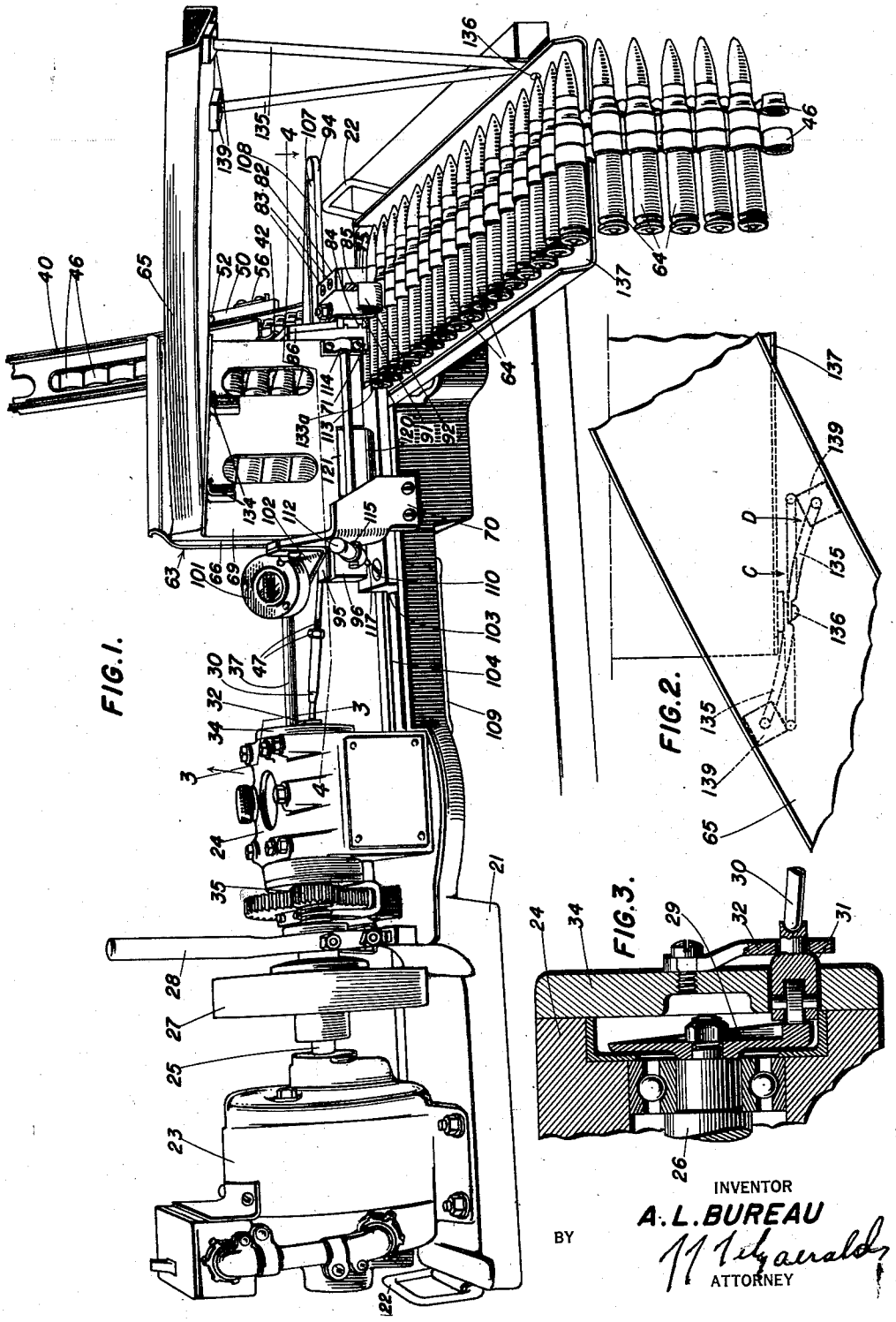


FIG. 1.

FIG. 2.

FIG. 3.

INVENTOR
A. L. BUREAU
BY
ATTORNEY

Feb. 27, 1951 A. L. BUREAU 2,542,988

BELT LOADER

Filed Feb. 2, 1943 4 Sheets-Sheet 2

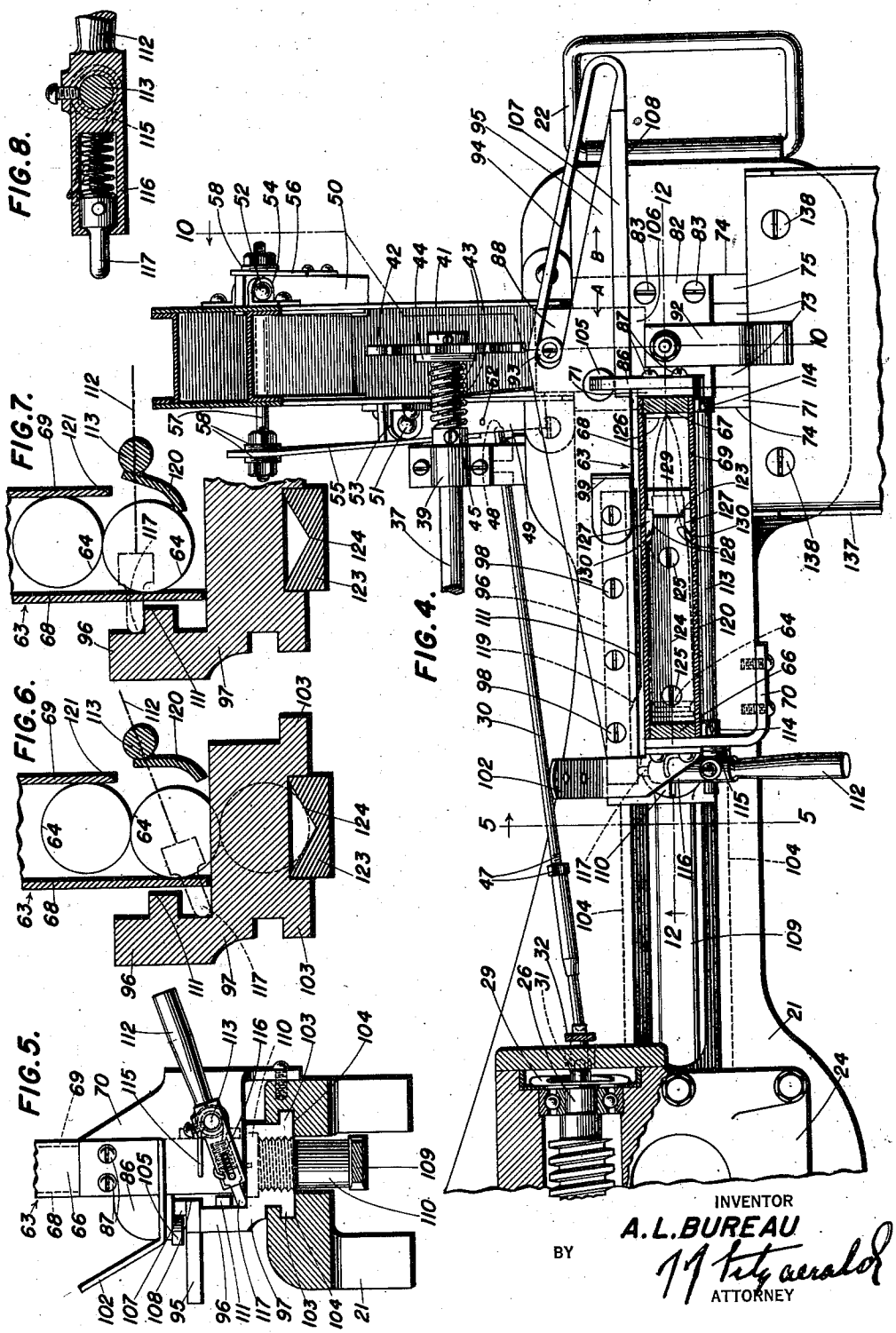


FIG. 8.

FIG. 7.

FIG. 6.

FIG. 5.

FIG. 4.

INVENTOR
A. L. BUREAU
BY
ATTORNEY

Feb. 27, 1951 A. L. BUREAU 2,542,988

BELT LOADER

Filed Feb. 2, 1943 4 Sheets-Sheet 3

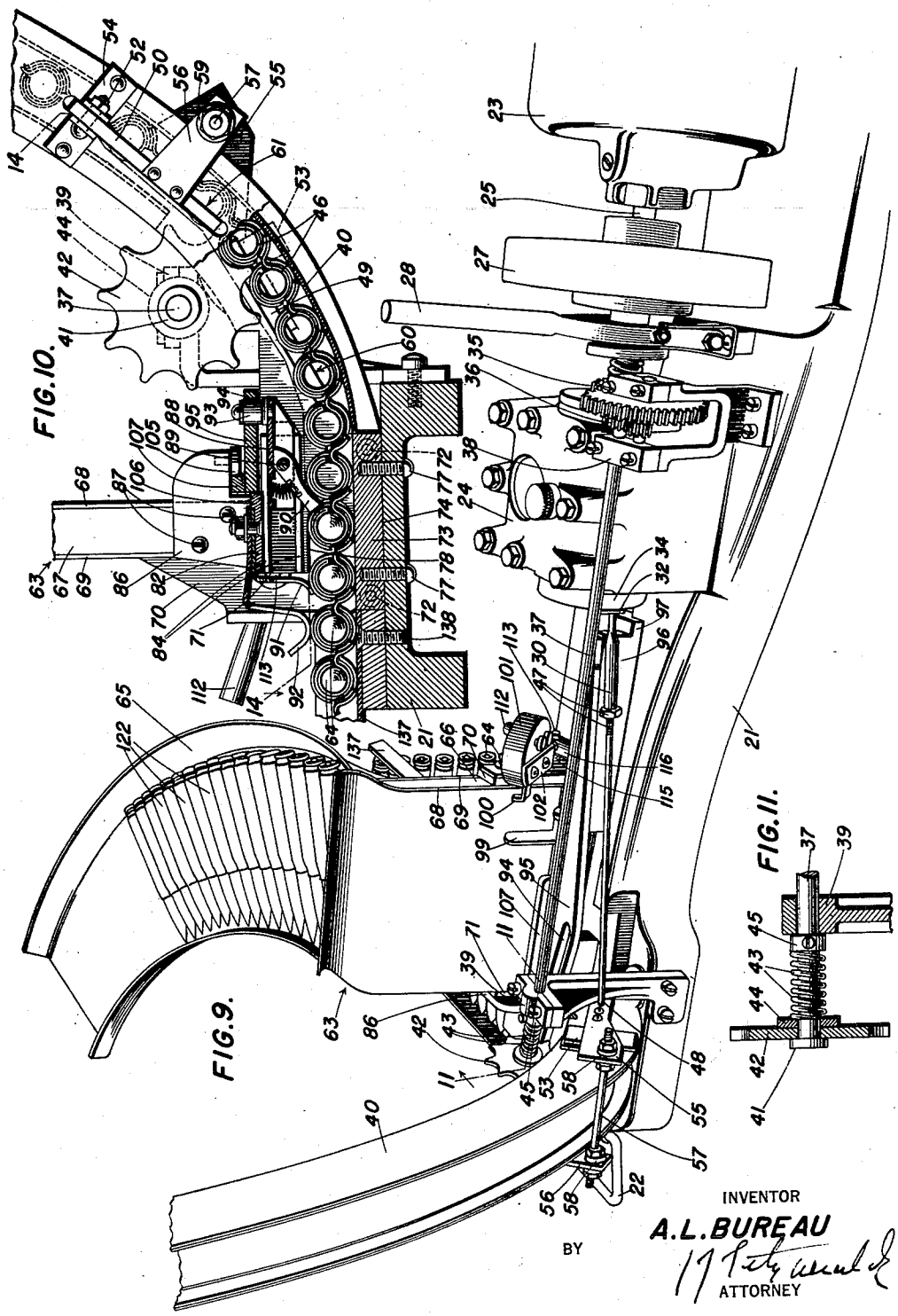


FIG. 10.

FIG. 9.

FIG. 11.

INVENTOR
A. L. BUREAU
BY
ATTORNEY

Feb. 27, 1951 A. L. BUREAU 2,542,988

BELT LOADER

Filed Feb. 2, 1943 4 Sheets-Sheet 4

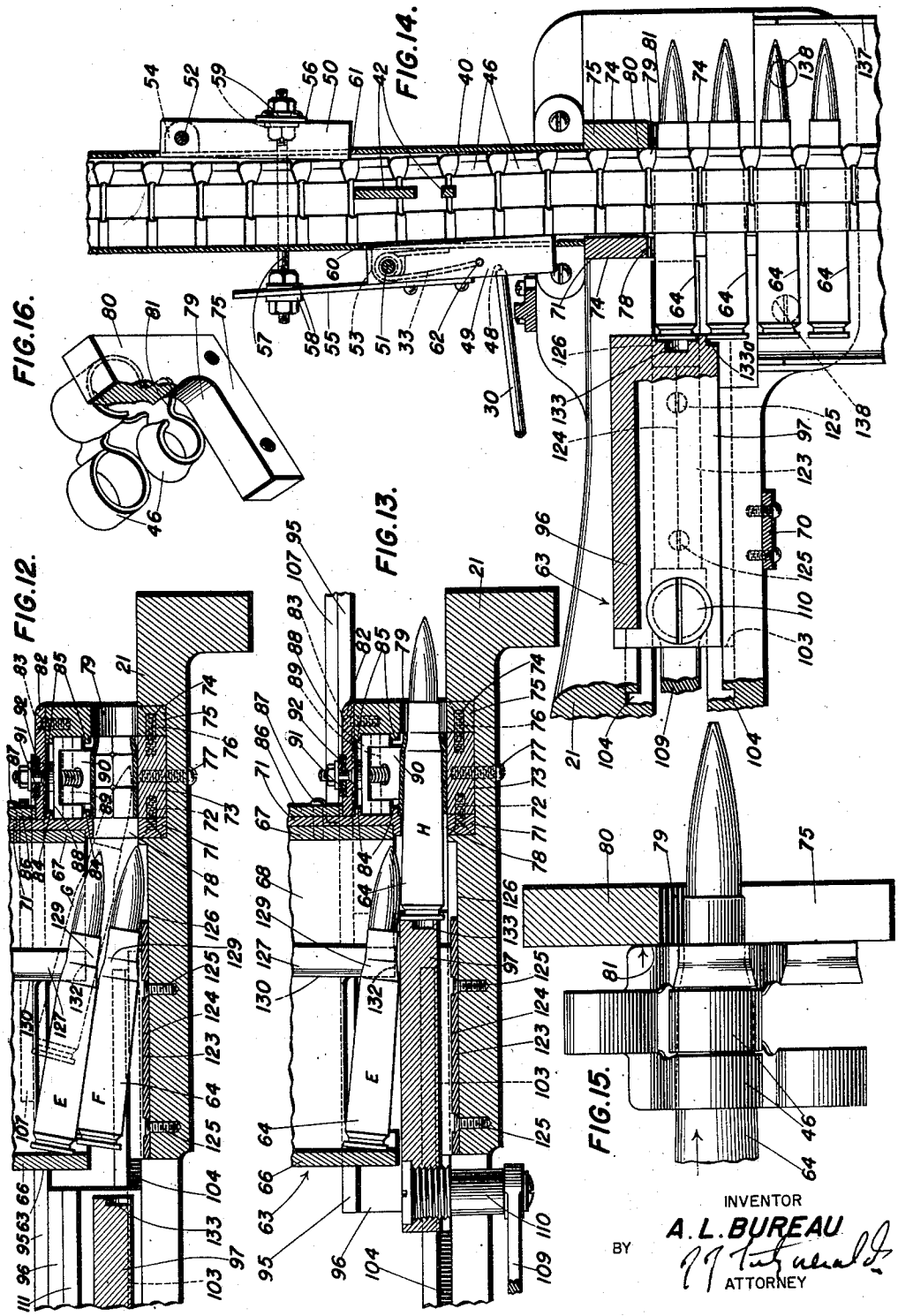


FIG. 14.

FIG. 16.

FIG. 13.

FIG. 12.

FIG. 15.

INVENTOR
A. L. BUREAU
BY
ATTORNEY

Patented Feb. 27, 1951 2,542,988

UNITED STATES PATENT OFFICE

2,542,988

BELT LOADER

Arthur L. Bureau, United States Navy

Application February 2, 1943, Serial No. 474,452

9 Claims. (Cl. 86—48)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

This invention relates to improvements in machines for loading and forming disintegrable ammunition belts, more particularly being an improvement on the belt loader disclosed in the patent of Arthur L. Bureau, 2,397,944 of April 9, 1946.

Continuous practical use of the latter machine has taught the desirability of simplifying the structure and of so feeding the links on the link-entrance side of the machine as to insure the interfitting of their knuckles in the cartridge-ramming position. Said use has also taught the advisability of guiding the rounds of ammuntion, especially the last few rounds, through the feed magazine in a particular manner so as to prevent either the last or next to last round from slipping into an obstructing position ahead of the ramming slide.

Thus, one of the objects of the invention is to provide a machine which will automatically load a cartridge belt with a plurality of types of ammunition, for example, ball and tracer ammunition, one simplification of the structure consisting of using only a single feed chute by which a single stream of rounds is delivered to the magazine, the tracer ammunition being interspersed with the ball ammunition in said chute by hand according to current requirements.

Another object of the invention is to provide a belt loader equipped with means for insuring the interfitting of the link knuckles on the link-entrance side of the machine, said means consisting of a vibrator which imparts a jogging action to a portion of the link column thereby to accomplish the purpose stated.

Another object of the invention is to provide means for holding the links down on the link-entrance side of the machine, so as to prevent heaving of the column when reduced to a comparatively few links.

A further object of the invention is to provide the cartridge feed magazine with guides on its inner walls to serve the primary purpose of preventing the last or next to last round from slipping into the feed throat of the magazine and thereby to jam the machine, the secondary purpose of said guides being to prevent the possibility of letting the rounds of ammunition drop backwards into the magazine.

Other objects and advantages of the invention appear in the following specification, reference being made to the accompanying drawings in which:

Fig. 1 is a perspective view of the improved belt loading machine, showing its appearance from the front.

2

Fig. 2 is a detail plan view of a portion of said machine, particularly illustrating the support for the ammunition trough.

Fig. 3 is a cross section taken substantially on the line 3—3 of Fig. 1.

Fig. 4 is a horizontal section taken substantially on the line 4—4 of Fig. 1, parts being shown in plan.

Fig. 5 is a cross section taken on line 5—5 of Fig. 4.

Fig. 6 is a detail cross section illustrating the normal position of the shutter in relationship to the feed magazine.

Fig. 7 is a similar view illustrating the break-link position of the shutter.

Fig. 8 is a detail sectional view of the break-link lever, illustrating the details of its spring pin.

Fig. 9 is a perspective view of the belt loading machine, showing its appearance from the rear.

Fig. 10 is a cross section taken on the line 10—10 of Fig. 4, parts being shown in elevation.

Fig. 11 is a detail section taken on the line 11—11 of Fig. 9.

Fig. 12 is a longitudinal section taken on the line 12—12 of Fig. 4, illustrating the orientation of the last few rounds on the back stroke of the ramming slide.

Fig. 13 is a similar view, illustrating the orientation of said rounds on the forward stroke of the ramming slide.

Figure 14 is a horizontal section taken on the line 14—14 of Fig. 10, parts being shown in elevation.

Fig. 15 is a detail sectional view illustrating how a round is thrust into a pair of links.

Fig. 16 is a detail sectional perspective view, illustrating the relationship of a link to the abutment block.

In carrying out the invention provision is made of a base 21 which comprises the foundation upon which all of the parts of the machine are mounted. The machine can readily be moved from place to place, for which purpose it has handles 22. A source of power in the form of the electric motor 23 is secured to one end of the base (Figs. 1 and 9). A gear box 24 is mounted on the base 21 in line with the motor, and contains speed reduction gearing which is driven by the motor shaft 25. The showing of said gearing is omitted with the exception of the driven worm (Fig. 4) on the terminal shaft 26 (Figs. 3 and 4). A clutch 27 and its operating handle 28 provide a convenient control between the motor and gear box.

The shaft 26 is a vibrator shaft. It has an attached cam 29 (Fig. 3) which reciprocates a rod 30. That end of the rod nearest the cam is socketed in a fitting, the roller 31 of which engages the cam face. This engagement is maintained in part by a clip 32 which supports the fitting, but largely by a spring 33 (Fig. 14) which is mentioned again in the following description. A plate 34 attached to the box 24, provides a closure for the recess which contains the case and a support for the clip.

A spur pinion 35, affixed to the motor shaft 25, is the driver for a gear train (Fig. 9), the terminal pinion 36 of which is mounted on one end of a link feed-shaft 37. This shaft is supported by bearings 38 and 39, the former of which is part of a fork (Fig. 9) in which the gear train is mounted. The shaft 37 is sufficiently longer than the distance between bearings to establish the position of its other end substantially centrally over the link chute 40 (Fig. 4). Said other end has a fixed collar 41 against which a star wheel 42 is pressed by a spring 43. This spring is mounted on the shaft 37 between a leather or other friction washer 44 and a set collar 45.

The star wheel is loose on the shaft excepting for the pressure of the spring 43. The tension of the spring is increased or diminished by adjusting the set collar 45. Thus the tendency of the relatively high-rotating shaft 37 to turn the star wheel is controlled by regulating the drag of the washer 44 against said wheel. The teeth of the star wheel engage the links 46 as shown in Fig. 10 and exercise a continuous downward and forward push on the link series, of a degree determined by the frictional effort of the washer 44 against the wheel. This prevents the heaving of the link column at each return stroke of the feed pawl during the loading operation and works effectively down to the last few links. Further, the operation of the star wheel avoids depending entirely upon gravity for feeding the links.

An adjustment at 47 enables increasing or diminishing the effective length of the vibrator rod 30. That end of it opposite to the cam 29 (Fig. 3) is socketed in a recess 48 (Figs. 4, 9 and 14) in one of a pair of vibrator bars 49, 50 (Fig. 14). The respective bars are pivoted on bolts 51, 52 which are bracketed at diagonal points to the sides of the chute 40 at 53, 54. The bar 49 has secured to it a plate 55 which extends backward beyond the pivot 51 to a place substantially matching the position of a lug 56 which depends from the bar 50 on the other side of the chute 40. The free ends of the plate and lug are coupled by a pin 57 which is buffed with resilient washers 58, 59 at its points of connection, thereby to allow for the diverse motions of the bars. The free ends of these bars operate against the sides of the link column (Fig. 14) through openings 60, 61 in the sides of the chute. The effect of these motions is to push the link column from side to side and results in so jogging the links as to settle their hinge knuckles into final place.

The previously mentioned spring 33 is wrapped around the bolt 51 mainly to support it. One of its ends is anchored at 62 in the bar 49. The other end presses against the adjacent side of the link chute. The outward pressure of the spring keeps the rod 30 in place at its socketed ends. It also keeps the roller 31 (Fig. 3) pressed against the cam 29 and produces the return or outward strokes of the bars 49, 50 in respect to the chute 40 after said bars have been driven inwardly thereof by action of the cam.

Thus the vibrator bars 49, 50 are swung in alternately opposite directions; first by the cam, second by the spring. On the first and inward swing the bars push against the link column from opposite sides at said diagonal points. This puts a slight twist in the link column (Fig. 14). On the second and outward swing the bars retreat from the column, leaving the links to relax and thus settle into the desired close interconnection, the ultimate purpose of which is to obviate the possibility of offering any obstruction to the rounds when rammed in place.

An ammunition feed magazine 63 is mounted on the base 21. This magazine comprises a single hopper to which the rounds 64 are delivered from a single feed chute 65 and thereupon are ranked in a single erect column because of the upright and narrow confines of the hopper. Said hopper consists of end plates 66, 67 to which the sides 68, 69 are attached to complete the enclosure. A bracket 70 secured at its extremities to the base 21 and the plate 66 supports the magazine at that end. A member 71 supports the other end of the magazine because of its attachment at 72 to one edge of an insert 73 in a slot 74 across the top surface of the base 21. An abutment block 75 is attached at 76 to the opposite edge of the insert and the resulting assemblage is secured in the cross slot by screws 77 driven through from the under side of the base.

The respective member 71 and block 75 have passageways 78, 79 through which the cartridges 64 are driven in the ramming operation. Said passageways consist of slots cut in from the front of the member and block thereby providing avenues of egress for the cartridges as loaded in belt form. The solid rear wall 80 (Fig. 16) of the block 75 forms an abutment against which edge portions, such as 81 (Figs. 15 and 16), of the links 46 are pushed by each cartridge as rammed in. A cover plate 82 is secured at 83 to the block 75 and from there is extended across the space above the insert 73. It rests on the top ones of pairs of ribs 84, 85, occupying confronting positions on the respective member 71 and block 75. The unsecured end of the plate 82 is held down upon the top rib 84 by a bracket 86 which is secured to the end plate 67 by screws 87 in common with the interlocated upper portion of the member 71.

A link-advancing slide 88 rides the ribs 84, 85. It has a stud 89 on which a spring-pressed pawl 90 is pivoted. The pressure of the spring is downward, thus keeping the nose of the dog in its pushing position against and over the tops of successive links 46. The tension of the spring necessarily is considerable because of its having to keep the pawl against the fairly heavy load of links and cartridges on each forward stroke. Under this circumstance the pawl tends to drag the uncoupled links with it on the backstrokes, causing an undesired heaving of the link column. This tendency is prevented by the action of the star wheel 42 which, as explained, exercises a constant downward push on the last few links so as to frustrate the foregoing tendency of the pawl 90.

Leaf springs 91, 92 bear down on the link chain (Fig. 10) for the purpose of stabilizing it. These springs are secured to the plate 82 from which they depend as shown. A roller stud 93 (Figs. 4 and 10) projects upwardly from the slide 88 and thus occupies the cam slot 94 of a plate 95 (Fig. 4). The plate is reciprocable and since the slot is formed at an angle to the direction of rectilinear motion it follows that the walls of the

slot will produce a cam action on the roller stud. The cam plate 95 is firmly secured at that end opposite which contains the slot to the upstanding wall 96 of the ramming slide 97 by means of screws 98. One of these screws also secures the striker 99 which periodically actuates the plunger 100 of a counter 101. Said counter is carried by a bracket 102 which is secured to adjoining structure.

The ramming slide 97 has a slidable ribbed connection at 103 with guide grooves 104 in the base 21. The slide is thus guided in its required rectilinear motion. Any possibility of lateral springing of the cam end of the plate 95 on its working (arrow A, Fig. 4) and return (arrow B) strokes is prevented by a roller 105 and the edge 106 of the plate 82. The roller is carried by the bracket 86. It bears on one side of a spline 107 which is upstanding from the cam plate adjacent to its straight edge 108. Said straight edge bears against the plate edge 106, and by virtue of the confinement of the spline thus provided the cam end of the plate 95 is adequately stabilized against deflection. Reciprocation of the ramming slide 97 is produced by a pitman 109 which at its respective ends is connected to a stud 110 (Fig. 13) pendent from said slide and to the wrist pin (not shown) of a revolvable crank of the gear box 24.

A ledge 111 is cooperable with a break-link lever 112, the purpose of which is to check the cartridges during one ramming cycle and thus cause a break in the belt of links. The lever is pivoted along the side 69 of the magazine 63 by means of a shaft 113 and bearings 114 (Fig. 4). A spring 115 exerts a constant downward pressure on the inner end 116 of the lever (Figs. 6 and 8) thus tending to keep its pin 117 down and in contact with the top of the slide 97. The position which it then assumes is in a plane immediately below the ledge 111 (Figs. 1, 5 and 6) and, loosely stated, constitutes the working or ramming position. Said pin is yieldably mounted in the lever end 116 which is made hollow (Fig. 8) for the purpose. The yieldable mount prevents possible breakage of the lever in case the pin point should be caught in front of the ledge 111, it being noted that the ledge has a beveled approach 119 (Fig. 4) which in that case would force the pin back.

The shaft 113 carries a shutter 120 which is movable through an opening 121 in the side 69 of the magazine 63. During the ramming operation said shutter assumes the pendent position shown in Fig. 6, virtually coinciding with the side 69 so as to clear the column of cartridges 64. At this time the lever 112 is in the position shown in Fig. 5. Upon desiring to cause a break in the link belt the handle end of the lever is pushed down. This push should occur when the ramming slide 97 is at the limit of its ramming stroke. The resulting turn of the shaft 113 will swing the shutter 120 through the opening 121 into the magazine (Fig. 7) whereupon it obstructs the cartridges. The pin 117 will ride the ledge 111 and thus support the cartridge column during one ramming cycle, namely, through the return stroke and the ensuing ramming stroke. The latter will be idle because of the lack of a cartridge, with the result that a pair of the links will remain uncoupled. One link of this pair will be the terminal of a cartridge belt. The other link of said pair will be the beginning of the next belt, the formation of which will start when the pin 117 drops off the beveled end 119 of the ledge 111 at the end of said ramming stroke. Thereupon the shutter 120 returns to its position in Fig. 6 and the column drops the distance of one cartridge diameter.

A trough 123 receives each succeeding cartridge. Said trough has a V-groove 124 for the purpose. The trough is secured by screws 125 in a recess 126 in the top surface of the base. Guides 127 (Fig. 4), attached at a slightly vertical pitch to the inner walls of the sides 68, 69, define a restricted upright passageway 128 to which the shoulders 129 of the cartridges are confined. Corresponding edges 130 of the guides are rounded to more nearly match the shape of the cartridges. Said guides extend from places in the magazine approximately on a level with the discharge end of the ammunition trough 65 to places stopping short of the top surface of the base a distance a little greater than the diameter of a cartridge (Fig. 4). The outlet 132 thus defined is occupied by succeeding cartridges as the slide 97 recedes (Fig. 12) and traversed by said slide as it completes its ramming stroke (Fig. 13). The leading end of the slide 97 is recessed at 133 to make a rim contact with the head of the cartridge and thus avoids striking its primer. A cut-out 133*a* (Fig. 14) in the forward end of the ramming slide permits said slide to clear the head of the cartridge next succeeding.

The ammunition trough 65 desirably is curved (Fig. 9) and disposed at an upward pitch (Fig. 1) respectively to suit the tapering shape of the cartridges and to insure their gravitation toward the magazine 63. Rounds of both tracer and ball ammunition are placed in the trough 65 by hand, the former being interspersed with the latter in any ratio desired. Lugs 134 (Fig. 1) on the side 69 provide places of attachment of the trough at the magazine end. Rods 135 support the trough elsewhere along its length. These rods are anchored at 136 to a flange of the belt chute 137 (Figs. 1 and 2) which possesses considerable rigidity. Said chute is secured at 138 to a portion of the base 21. The rods 135 diverge upwardly where they are socketed in blocks 139 on the nether side of the trough 65. Initially these rods are substantially in line (position C, Fig. 2). But the blocks 139 are sufficiently offset to each side of the alined position to develop enough tension in the rods when flexed (position D, Fig. 2) to reach the blocks and to insure the retention of the rods.

The operation of the belt loading machine is readily understood. The chutes 40 and 65 are filled with links 46 and cartridges 64 respectively. Both move to the loading point by gravity, but the link chute 40 is supplemented by the star wheel 42 which not only tends to forward the links but more particularly prevents any tendency of the link column to heave in its chute 40 by the action of the feed pawl 90 (Fig. 10) on its return strokes.

Vibration of the link column occurs during the entire operation of ramming. This is caused by the action of the cam 29 (Figs. 3 and 4) on the rod 30. The reciprocation of the rod is accomplished by the cam on the forward stroke and by the spring 33 (Fig. 14) on the return stroke. The result is the rocking of the bars 49, 50 in successively opposite directions and the consequent jogging of the links (Fig. 14) so that the interfitting of the knuckles is assured before the column enters the ramming mechanism.

Here successive cartridges are driven through matching link knuckles (Figs. 12, 13 and 14) on

each ramming stroke of the slide 97. Gravity feeds the cartridges in the magazine, the column of rounds of the column assuming a slightly forward pitch (E, Fig. 12) because of their tapered shape and because of abutting the guides 127 at their shoulders 129. Said guides make it impossible to insert the cartridges in an incorrect position because were a particular cartridge reversed its large head portion would not fit the restricted passageway 128 (Fig. 4) and thus stop the cartridge at the top of the magazine whence it is readily removed.

The function of greatest importance of the guides 127 is that of keeping the cartridges properly ranked in the magazine. When the supply dwindles to the last few rounds, such as E and F (Fig. 12), there would be the likelihood of the cartridge E slipping down to the position G were it not for the obstruction of the guides 127. The nose of said cartridge would therefore enter the link chain prematurely and cause a severe jam and breakage of mechanism on the next stroke of the ramming slide which would be effective upon the cartridge F. However, the cartridge E is restrained by the guides (Fig. 13) and rides the slide 97 while it rams the bottom cartridge F to its coupling position H. It is to be observed that the height of the outlet 132 as defined by the bottoms of the guides and the top surface of the base, is but little more than the depth of the slide. Therefore it is impossible for more than one cartridge to pass through at a time, especially when the supply is reduced to the last two at which time the weight of the column is lacking to prevent that contingency.

Belts of requisite lengths are produced by the break-link action of the lever 112 (Fig. 5). When this lever is pushed down (Fig. 7) its carried shutter 120 supports the cartridge column in the magazine during one cycle of motions of the ramming slide 97. Since there is no cartridge in position to ram, the forward motion of the slide remains idle and the link knuckles which would have been the target of the absent cartridge remain uncoupled. The operator does not need to maintain pressure upon the lever because the riding of its pin 117 on the ledge 111 automatically keeps the shutter 120 in its obstructing position.

While the invention has been described with reference to certain preferred examples thereof which give satisfactory results, it will be understood by those skilled in the art to which the invention pertains, after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is my intention, therefore, to cover in the appended claims all such changes and modifications.

The invention herein described may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. In a belt loader, a link chute to contain interfitting links for delivery to a loading position, vibrator means for jogging the links to perfect their interfitting, said vibrator means including bars which are positioned to repeatedly strike the links, and a power source for actuating the vibrator means.

2. In a belt loader, a link chute to contain interfitting links for delivery to a cartridge loading position, a vibrator bar carried by the chute close to adjacent edges of the links, spring means urging the vibrator bar in one direction in respect to the link column in the chute, and pusher means acting on the bar counter to the spring, thereby coacting with the spring to periodically jog the link column.

3. In a belt loader, a link chute to contain interfitting links for delivery to a cartridge loading position, a vibrator bar pivoted to one side of the chute close to and contactibly with adjacent edges of the links, spring means urging the vibrator bar in one direction in respect to the link column in the chute, and pusher means acting on the bar counter to the spring, thereby coacting with the spring to periodically strike the link edges and jog the column.

4. In a belt loader, a link chute to contain interfitting links for delivery to a cartridge loading position, a pair of vibrator bars to jog the links, respectively pivoted on opposite sides of the chute close to adjacent edges of the links, spring means urging one of the bars in one direction in respect to the link column in the chute, pusher means acting on the same bar counter to the spring means, thereby coacting with the spring means to vibrate said bar, and a pin coupling the bars, causing the remaining bar to move in unison with said one bar.

5. In a loader, an article chute to convey interfitting articles to a delivery point, a vibrator bar pivoted to one side of the chute, a portion of the bar extending into the chute and contacting the article column, a spring acting on the vibrator bar to tend to swing it on its pivot in one direction, and pusher means acting on the vibrator bar counter to the spring to swing the bar in the other direction.

6. In a loader, an article chute to convey interfitting articles to a delivery point, a pair of vibrator bars to jog the articles, respectively pivoted on opposite sides of the chute close to the edges of the article column, spring means urging one of the bars in one direction in respect to the article column, a plate on said one bar extending beyond its pivot, pusher means acting on the same bar counter to the spring means, thereby coacting with the spring means to vibrate said bar, and a pin coupling the plate with the other bar.

7. In a belt loader, the combination with a link chute from which interfitted links are delivered to a loading position of means for continuously feeding links from such chute by a progression of alternate advance and checked rest periods, and frictionally driven means continuously acting on the links to positively forward the links during the advance periods and slipping to yield to the checked links while maintaining a constant pressure thereon during the rest periods.

8. In a belt loader, a link chute in which interfitted links of an advancing link column alternately rest and move, link advancing means for alternately resting and moving the links, a star wheel in working engagement with the link column, a driving shaft for the star wheel, a slip-friction drive between said shaft and the star wheel, and means rotating the shaft at a rate higher than required in order to keep links feeding to the link advancing means so as to feed the links to a loading position, causing said wheel to act upon the links continuously through the rest and move periods.

9. In a belt loader, a link chute to contain a column of interfitted links, a forward and return stroke feed pawl for advancing the foremost links

to a loading position, a star wheel in working engagement with the link column, over-drive means for the star wheel, and a slip-friction coupling between the over-drive means and the star wheel, causing the star wheel to exercise a continuous but yieldable thrust on that portion of the link column between the star wheel and feed pawl to prevent heaving of said portion on the return strokes of the feed pawl.

ARTHUR L. BUREAU.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
277,540	Bolton et al.	May 15, 1883
678,827	Morris	July 16, 1901
752,648	Bristol	Feb. 23, 1904
890,190	Stephens	June 9, 1908
945,685	Blakeslee	Jan. 4, 1910
952,477	Stilwell	Mar. 22, 1910
1,075,891	Ayars	Oct. 14, 1913
1,452,843	Nordstrom	Apr. 24, 1923
1,922,856	Marasso	Aug. 15, 1933
2,094,026	Simpson	Sept. 28, 1937
2,094,620	Rodler	Oct. 5, 1937
2,123,915	Rodler	July 19, 1938
2,140,746	Huyett	Dec. 20, 1938
2,245,659	Everett	June 17, 1941
2,262,799	Everett	Nov. 18, 1941
2,289,393	Turnock	July 14, 1942
2,320,465	Pilcher	June 1, 1943

FOREIGN PATENTS

Number	Country	Date
382,142	Great Britain	Oct. 20, 1932
384,781	Great Britain	Dec. 15, 1932