July 6, 1948. J. C. TROTTER 2,444,884

GUN BATTERY WITH AMMUNITION FEED MEANS

Filed Nov. 26, 1942 3 Sheets-Sheet 1

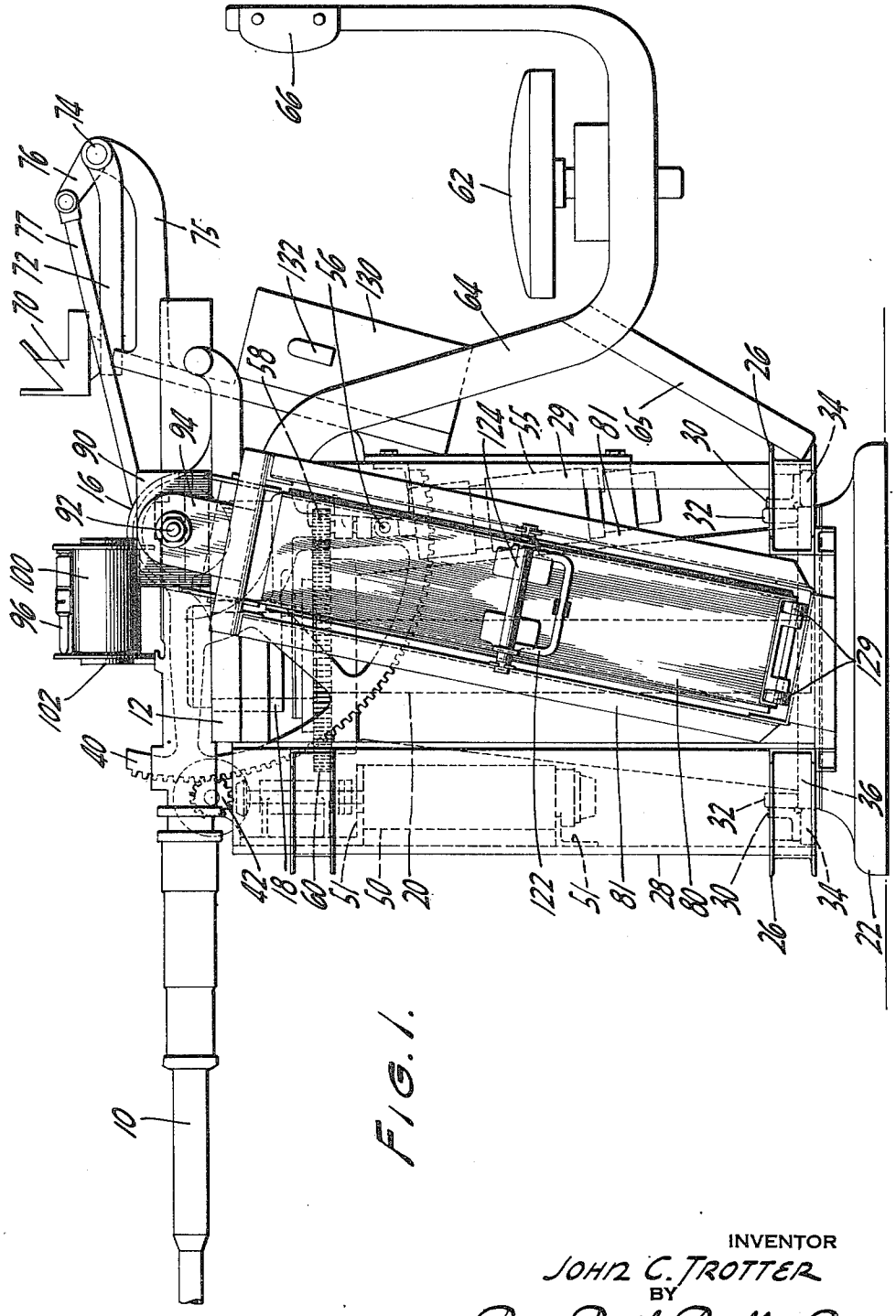

FIG. 1.

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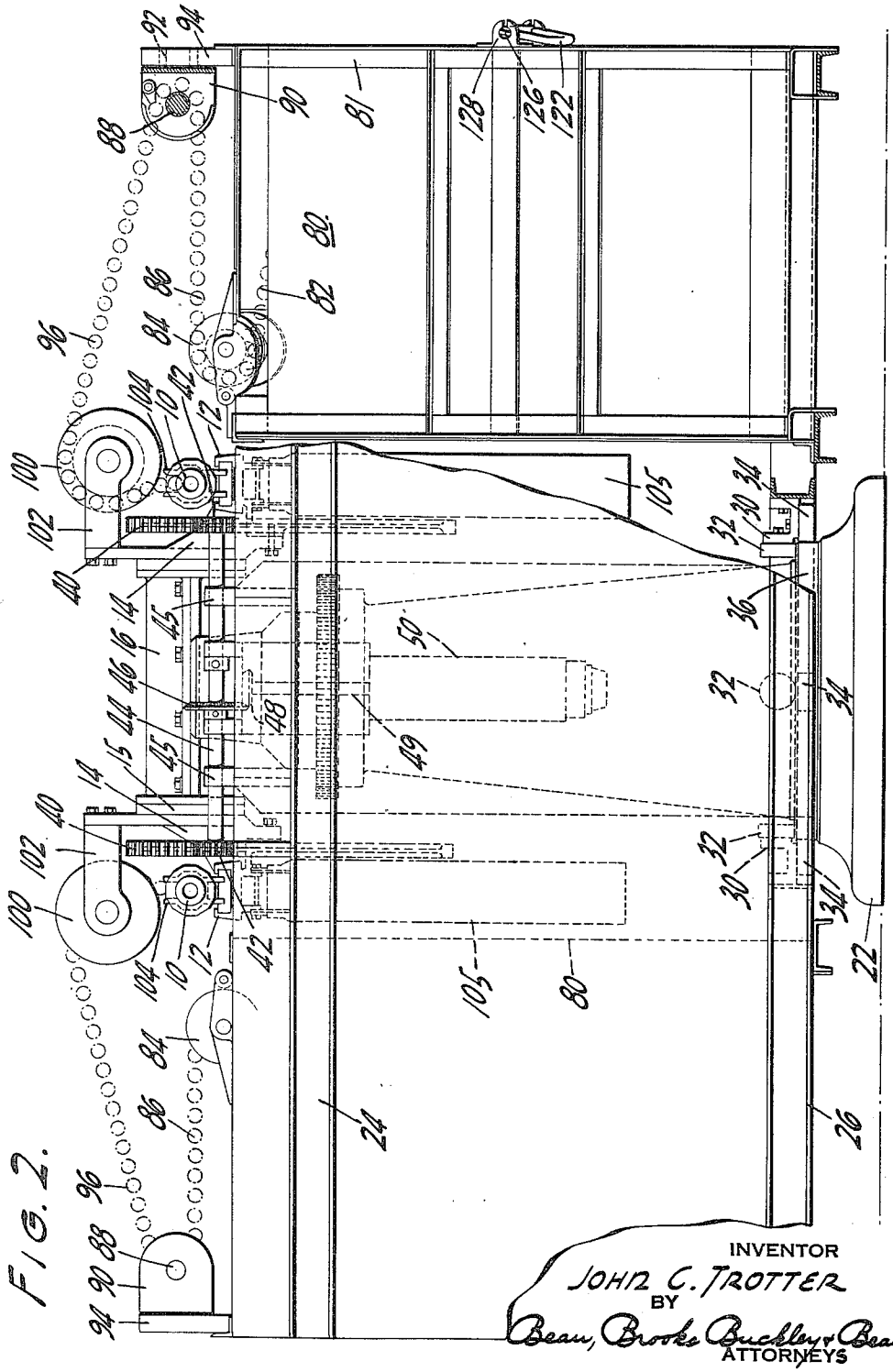

FIG. 2.

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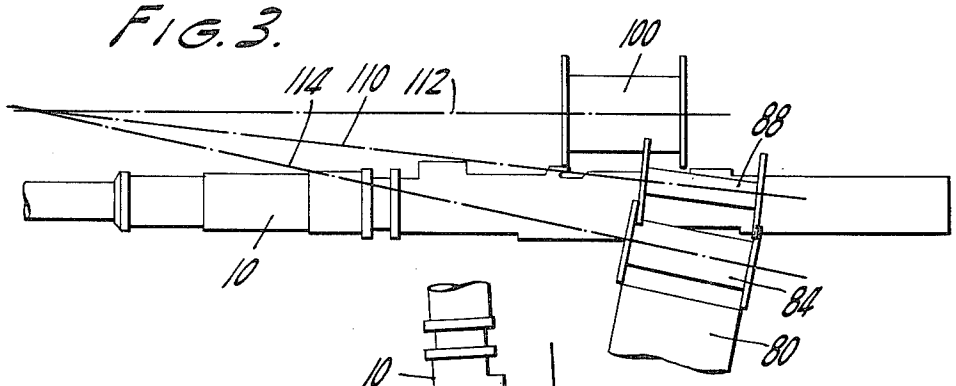
FIG. 3.



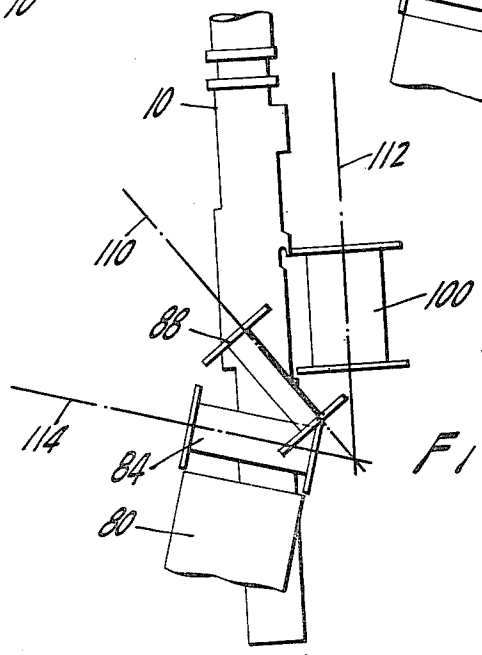


FIG. 4.

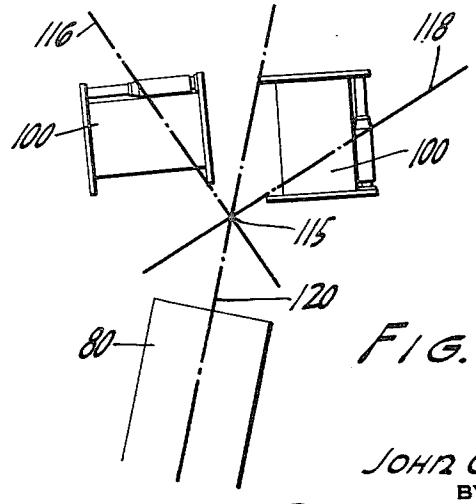


FIG. 5.

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GUN BATTERY WITH AMMUNITION FEED MEANS

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5 Claims. (Cl. 89—33)

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This invention relates to ordnance, and more particularly to an improved gun and ammunition magazine organization, for example, of the anti-aircraft battery type. More specifically, it also relates to improved means for storing and feeding ammunition from elevationally fixed magazines to elevationally adjustable machine guns, or the like.

The primary object of the invention is to provide an improved gun battery of the character described which is mounted for rotation as a unit on a pedestal for azimuth adjustment purposes, and which comprises an elevationally fixed ammunition magazine organization and an elevationally adjustable gun organization and means for training belted ammunition from the magazine organization to the gun organization in improved manner. Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawings:

Fig. 1 is a side elevation of a gun battery of the invention;

Fig. 2 is a front elevation thereof with portions broken away to show a magazine unit;

Fig. 3 is a fragmentary diagrammatic view in side elevation of essential elements of the ammunition belt training mechanism, shown in gun horizontal aiming position;

Fig. 4 is a view corresponding to Fig. 3 with the gun in substantially vertically aiming position; and

Fig. 5 is a diagrammatic view in side elevation of essential portions of the ammunition training mechanism at opposite maximum gun elevational adjustment positions.

The drawings illustrate the invention as embodied in a gun battery including twin guns 10—10 of the so-called automatic cannon or machine gun type. The guns are mounted in spaced parallel relation upon corresponding gun mount brackets 12—12 which are fixed to corresponding trunnion brackets 14—14. The trunnion brackets 14—14 rigidly connect to opposite ends of a horizontal trunnion shaft 15 which extends transversely between the guns concentrically of the axis of elevational adjustment thereof and is carried by a bearing housing 16. Thus, both guns are pivotable simultaneously about the horizontal axis of the bearing housing 16 for elevational aiming adjustment.

The bearing housing 16 is formed with a downwardly extending cap portion 18 (Fig. 1) which is socketed to receive in rotatable relation therein the upper end of a gun mount post 20. The post

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20 is supported by means of a pedestal 22 adapted to be fixed to any suitable supporting surface, such as the deck of a warship, or any other suitable foundation. Thus, it will be understood that the gun battery unit is adapted to be rotated about the vertical axis of the post 20 for adjustments of the gun aim in azimuth.

The gun mount cap 18 carries a frame which suspends therefrom and integrally therewith to substantially encompass the pedestal 22. As illustrated in the drawing, the frame comprises vertically spaced upper and lower frame elements 24—26 of channel form at opposite front and rear faces of the gun battery, and interconnecting sheet metal plates 28—29 at the front and rear faces of the battery, respectively; thus forming a housing structure skirting the pedestal 22. The housing structure is fixed at its upper end directly to the cap piece 18, and thus moves integrally therewith in connection with azimuth adjustments of the gun unit relative to the pedestal 22. At its lower end the housing carries a circular rail 30 which carries spaced rollers 32 by means of horizontally disposed bearings and another set of spaced rollers 34 by means of vertically spaced bearings. The rollers 32—34 are arranged to bear against top and side edge portions, respectively, of a track ring 36 which is carried by the pedestal 22 for guiding the lower end portion of the housing in free rotating relation relative to the pedestal about the axis of the post 20. Thus, the housing and gun elements move as a unit upon the pedestal 20 in connection with azimuth adjustments of the gun battery.

The trunnion brackets 14—14 each carry a toothed sector 40 arranged to mesh with a corresponding pinion 42 carried by a shaft 44 which is rotatably mounted by means of bearing 45 on the frame element 24. A bevel gear 46 is carried by the shaft 44 to mesh with another gear 48 carried by the drive shaft 49 of an electric motor 50, the housing of which is mounted upon the frame plate 28 by means of brackets 51 (Fig. 1). The motor 50 is of reversible direction type and therefore it will be understood that through suitable control means the motor may be caused to operate in either direction to procure alternative elevating and depressing adjustments of the gun battery about the axis of the trunnion bearing 16.

A second electric motor 55 of the reversible direction type is similarly carried upon the frame structure at the opposite side thereof and arranged to drive through means of a universal joint 56 a pinion 58 meshing with a ring gear portion 60 carried by the trunnion bracket 18.

Thus, it will be understood that operation of the motor 55 will drive through the ring gear 60 to rotate the gun battery carrying bracket 18 about the vertical axis of the post 20 for corresponding azimuth adjustments of the gun battery aim; and that the gunner may readily aim the battery through simple adjustments of the controls corresponding to the motors 50—55.

A seat 62 for support of the gunner is carried by an arm 64 extending from the frame and is braced as at 65 from the lower portion of the frame. A back rest 66 is mounted upon the seat support arm for further support of the gunner's body. A gun sight device of any suitable type as indicated at 70 will preferably be arranged in conjunction with the gun battery; and as shown in the drawing (Fig. 1) the sight may be carried by a bracket 72 which pivotally connects at 74 to an arm 75 extending rigidly from the cap piece 18 and the battery frame structure. A crank arm 76 extends rigidly from the bracket 72 and pivotally connects to a strut 77 which in turn connects at its other end to a rigid extension from the trunnion bracket 14. The parts are so proportioned and arranged that a line between the pivot points at the opposite ends of the strut 77 at all times lies parallel to a line through the pivot axis of the trunnion bearing 16 and the sight bracket pin 74 whereby a parallelogram type mount for the gun sight is provided to automatically maintain the sight at all times parallel to the gun aiming direction under all conditions of gun elevational adjustments.

The ammunition for the guns 10—10 is arranged to be fed thereto in the form of belts of linked ammunition rounds training from corresponding magazines carried by the frame structure at opposite sides thereof. In the drawing, the magazines are illustrated at 80—80 as comprising box-like receptacles formed of sheet metal or the like carried by skeleton frames 81 which are built into the gun battery housing structure and adapted to receive the magazines in telescopic relation and to substantially encompass them upon sliding of the magazines thereinto from opposite side end portions of the supporting frames.

The ammunition for the gun battery is arranged to be stored within the magazines 80—80 in the form of belts of ammunition rounds articulated by any suitable form of links and lap-folded within the magazines so as to be adapted to train upwardly and outwardly therefrom, as indicated at 82, for continuous feeding into the associated guns. A cartridge belt guide roller 84 is mounted upon each magazine 80 adjacent the upper inner end portion thereof so as to be adapted to cause the corresponding cartridge belt to train out of the magazine at the upper inner corner portion thereof and thence horizontally and outwardly as indicated at 86 toward the corresponding outer end portion of the magazine. A swivel guide roller 88 is carried at the outer end portion of the magazine by means of a bracket 90 which is pivotally mounted by means of a horizontally disposed pivot connection 92 upon a fixed bracket member 94 extending from the frame structure 81. Thus, the cartridge belts are adapted to train around the rollers 88—88 and thence to train as indicated at 96 in reverse direction toward the corresponding guns.

A guiding roll 100 is mounted adjacent the ammunition feedway of each of the guns 10—10 by means of a corresponding bracket 102 carried by the corresponding trunnion bracket 14. The gun ammunition feedways are indicated at 104—104 and the rolls 100—100 are rotatably mounted upon the corresponding brackets 102—102 and are arranged to guide the corresponding cartridge belts thereover so as to be delivered directly into the corresponding gun feedway. Since the guiding rolls 100—100 are mounted directly to the trunnion brackets that carry the guns, the feed rolls are positionally fixed relative to the gun ammunition feedway portions and at all times guide the ammunition belts in free feeding relation irrespective of the aiming position of the guns. Also, it will be understood that inasmuch as the guiding rolls 100—100 are parallel to the gun ammunition feedways irrespective of the aimed position of the guns the ammunition belts will feed from the guiding rolls 100—100 to the guns without intermediate twisting or turning thereof. Bags 105—105 (Fig. 2) are pivotally suspended from the brackets 12—12 to receive empty cartridge cases from the guns 10—10 as they fire their ammunition.

Since the magazines 80—80 are carried by the housing structure to move with the gun unit in azimuth but to be elevationally independent of the guns, and since the guide rollers 84—84 are positionally fixed relative to the magazines 80—80 the ammunition belts will twist between the positions of the guide rolls 84—84 and the guiding rolls 100—100 in connection with every elevational aiming adjustment of the gun battery. However, since the swivel guide rolls 88—88 are freely pivotable about the horizontal axes of their mounting pins 92—92, the swivel rolls are free to automatically adjust themselves so as to divide the twist of the ammunition belt between the upper and lower strands 96—86 thereof. Thus, although the guns 10—10 are closely coupled to the ammunition magazines 80—80 whereby an unusually compact gun battery is provided, the ammunition guide roll arrangement of the invention enables the ammunition to train freely from the magazines into the guns in improved manner under all conditions of gun aiming adjustments. For example, as illustrated by Fig. 3, when the gun 10 is aimed horizontally the swivel roll 88 automatically adjusts itself so that its rotational axis which is designated at 110 approximately bisects the angle between the rotational axes 112—114 of the corresponding rolls 100—84, respectively. Or, as illustrated in Fig. 4, when the gun 60 is aimed substantially vertically the rotational axis 110 of the swivel roll 88 is automatically adjusted to bisect the angle between the rotational axes 112—114.

The gun battery of the drawing is particularly adapted for so-called anti-aircraft combat purposes, and the elevational adjusting mechanism of the gun battery as shown is arranged to provide a range of elevational adjustments between a position of approximately 5° depression below horizontal and 87° elevation thereabove. Therefore, if the magazines 80—80 were to be mounted in normal upright attitudes upon the battery framing structure the ammunition belts would be required to twist under all conditions of gun elevating adjustments in a single direction away from the original direction of issuance from the magazine.

A special feature of the present invention resides however in the novel arrangement of the ammunition magazines 80—80, which magazines are mounted as illustrated by Figs. 1, 3, 4, 5 to incline rearwardly away from the normal up-

right attitude. For this purpose the magazine frame elements are tilted with respect to the gun battery unit as seen in side view, whereby as illustrated diagrammatically by Fig. 5, the ammunition belts training out of the magazines are required to twist only to slight degrees and within approximately equal ranges in opposite directions away from the original direction of belt movement out of the magazine when feeding the guns at corresponding maximum depressed and maximum elevated aiming positions.

The gun elevation axis is disposed behind the location of the gun ammunition feedways and the guiding rolls 100—100, and thus the feed rolls move between the alternative positions thereof shown in Fig. 5 in connection with corresponding adjustments of the gun aim between maximum depressed and maximum elevated positions; and the corresponding angles between the trunnion axis 115 of elevational gun adjustment and the approximate longitudinal centers of the ammunition rounds as they climb over the guiding roll 100 are indicated at 116—118, respectively. To accomplish this object of the invention the magazines 80 are tilted so that the direction of original movement of ammunition therefrom as indicated at 120 (Fig. 5) intersects the gun elevation or trunnion axis 115 and bisects the angle between the lines 116—118. Consequently, when the gun battery is in maximum depressed aiming position the ammunition belt twists toward the left as viewed in Fig. 5 to train over the guiding roll 100 in the direction of the line 116; and as explained hereinabove the corresponding swivel roll automatically adjusts itself to divide the belt twist between the upper and lower strands of the belt. When the gun battery is elevated to aim at its maximum elevated position the ammunition belt twists to the right so as to approach the guiding roll 100 in the direction of the line 118, and again the swivel roll automatically adjusts itself to divide this twist between the upper and lower strands of the ammunition belt. Consequently, the arrangement provides that the ammunition belts will twist either to the right or to the left away from the direction of original movement of the belts from the magazines, depending upon the direction of gun aim, and the degrees of belt twist throughout the entire range of gun adjustments are thereby minimized.

To latch the magazines 80—80 within their carrying frames 81—81, a pull handle 122 is fixed to extend from a cross bar 124 which is pivotally mounted upon each magazine at the outer end thereof. The ends of each bar 124 are arranged to extend into slotted portions 126 of ears 128 carried by the corresponding frame 81, and the ends of the bar 124 are flattened so that when the handle 122 is lifted to a horizontal attitude the flat end portions of the bar will freely withdraw through the slotted formation of the ears 128. However, upon lowering of the handle 122 the bar ends are rotated crosswise of the slotted formation of the ears 128 (Fig. 2) to lock the magazine within the frame. Thus, to service the magazine the handle 122 is simply lifted, and the magazine may be then pulled out of the frame by the handle for reloading with ammunition. Rollers 129 are carried by the magazines 80—80 at their bottoms for rolling engagement against the supporting frame structures to ease the operations of loading and unloading the magazines relative to the battery.

To effect control of the gun battery a control box 130 is mounted upon the battery frame structure and a pair of control handles 132—132 are arranged at opposite sides of the box to extend into convenient reach of the gunner's hands; and the controls are so arranged that twisting movements of the handles 132—132 will procure corresponding operations of the elevational and azimuth control motors 50—55.

I claim:

1. A gun battery comprising, in combination, a frame, a gun having a vertically arranged ammunition feedway, gun mounting means carried by said frame, horizontally arranged pivot means for said gun carried by said mounting means, said pivot means being mounted rearwardly of said ammunition feedway when said gun is in its substantially horizontal axial position, said pivot means permitting adjustments of said gun in a substantially vertical plane from a substantially horizontal axial position to a substantially vertical axial position, an ammunition belt for said gun, an ammunition belt guide roll fixedly mounted upon said gun in parallel alignment with said feedway, an ammunition belt magazine mounted upon said frame and having its vertical axis inclined backwardly at an angle which substantially bisects the angle between the lines of travel of said belt when the gun is in its extreme positions of adjustment, whereby to reduce the amount of twist in the belt to a minimum when moving the gun to such extreme positions, and said magazine having an ammunition outlet opening in the upper end thereof, said opening being positioned rearwardly of said ammunition feedway when said gun is in its substantially horizontal position.

2. A gun battery comprising, in combination, a frame, a gun having a vertically arranged ammunition feedway, gun mounting means carried by said frame, horizontally arranged pivot means for said gun carried by said mounting means, said pivot means being mounted rearwardly of said ammunition feedway when said gun is in its substantially horizontal axial position, said pivot means permitting adjustments of said gun in a substantially vertical plane from a substantially horizontal axial position to a substantially vertical axial position, an ammunition belt for said gun, an ammunition belt guide roll mounted upon said gun in parallel alignment with said feedway, an ammunition belt magazine mounted upon said frame and having its vertical axis inclined backwardly at an angle which substantially bisects the angle between the lines of travel of said belt when the gun is in its extreme positions of adjustment, whereby to reduce the amount of twist in the belt to a minimum when moving to such extreme positions, said magazine having an ammunition outlet adjacent said gun pivot means, a stationary ammunition guide roller carried by said magazine adjacent the outlet opening thereof, and a swivel belt guide roller carried by said magazine, said swivel guide roller being spaced from said stationary guide roller laterally of the gun axis, and a bracket pivotally secured to said magazine for rotatably supporting said swivel roller, whereby the swivel roller may automatically adjust itself so as to bring its rotative axis to a position where it will substantially bisect the angle formed between the axis of the stationary guide roller and the axis of the belt guide roller throughout the range of adjustment of said gun.

3. A gun battery comprising, in combination, a frame, a gun having a vertically arranged ammunition feedway, gun mounting means carried

by said frame, horizontally arranged pivot means for said gun carried by said mounting means, said pivot means being mounted rearwardly of said ammunition feedway when said gun is in its substantially horizontal axial position, said pivot means permitting adjustments of said gun in a substantially vertical plane from a substantially horizontal axial position to a substantially vertical axial position, an ammunition belt for said gun, an ammunition belt guide roll mounted upon said gun in parallel alignment with said feedway, an ammunition belt magazine mounted upon said frame and having its vertical axis inclined backwardly, said magazine having an ammunition outlet opening in the upper end thereof, said opening being positioned rearwardly of said ammunition feedway when said gun is in its substantially horizontal axial position, the outlet opening of said magazine being laterally adjacent said gun, a stationary ammunition guide roller carried by said magazine adjacent the outlet opening thereof, a swivel belt guide roller carried by said magazine and located in a position remote from said stationary roller, and a swivel bracket carried by said magazine for rotatably mounting said swivel roller, said bracket having an axis of oscillation normal to the axis of rotation thereof, whereby said swivel roller may be automatically oscillated to accommodate the twist in said belt as the gun is being adjusted.

4. A gun battery comprising, in combination, a frame, a gun having a vertically arranged ammunition feedway, gun mounting means carried by said frame, horizontally arranged pivot means for said gun carried by said mounting means, said pivot means being mounted rearwardly of said ammunition feedway when said gun is in its substantially horizontal axial position, said pivot means permitting adjustments of said gun in a substantially vertical plane from a substantially horizontal axial position to a substantially vertical axial position, an ammunition belt for said gun, an ammunition belt guide roll mounted upon said gun in parallel alignment with said feedway, a box-like ammunition belt magazine fixedly mounted upon said frame and having its vertical axis inclined backwardly, a stationary ammunition guide roller carried by said magazine adjacent the outlet opening thereof, and a swivel belt guide roller carried by said magazine, said swivel guide roller being spaced from said stationary guide roller laterally of the gun axis, and a bracket pivotally secured to said magazine for rotatably supporting said swivel roller, whereby the swivel roller may automatically adjust itself so as to bring its rotative axis to a position where it will substantially bisect the angle formed between the axis of the stationary guide roller and the axis of the belt guide roller throughout the range of adjustment of said gun.

5. A gun battery comprising, in combination, a frame, a gun having a vertically arranged ammunition feedway, gun mounting means carried by said frame, horizontally arranged pivot means for said gun carried by said mounting means, said pivot means being mounted rearwardly of said ammunition feedway when said gun is in its substantially horizontal axial position, said pivot means permitting adjustments of said gun in a substantially vertical plane from a substantially horizontal axial position to a substantially vertical axial position, an ammunition belt for said gun, an ammunition belt guide roll mounted upon said gun in parallel alignment with said feedway, an ammunition belt magazine mounted upon said frame and having its vertical axis inclined backwardly at an angle which substantially bisects the angle between the lines of travel of said belt when the gun is in its extreme positions of adjustment, whereby to reduce the amount of twist in the belt to a minimum when moving to such extreme positions, said magazine having an ammunition outlet in the upper end adjacent the gun pivot, a stationary ammunition guide roller carried by said magazine adjacent the outlet opening thereof, and a swivel belt guide roller carried by said magazine, said swivel guide roller being spaced from said stationary guide roller laterally of the gun axis, and a bracket pivotally secured to said magazine for rotatably supporting said swivel roller, the axis of oscillation of said bracket being normal to the axis of rotation of said swivel roller, whereby the swivel roller may automatically adjust itself so as to bring its rotative axis to a position where it will substantially bisect the angle formed between the axis of the stationary guide roller and the axis of the belt guide roller throughout the range of adjustment of said gun.

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