Nov. 30, 1943. F. M. SALISBURY 2,335,449

COMBAT AIRPLANE

Filed July 9, 1941 3 Sheets-Sheet 1

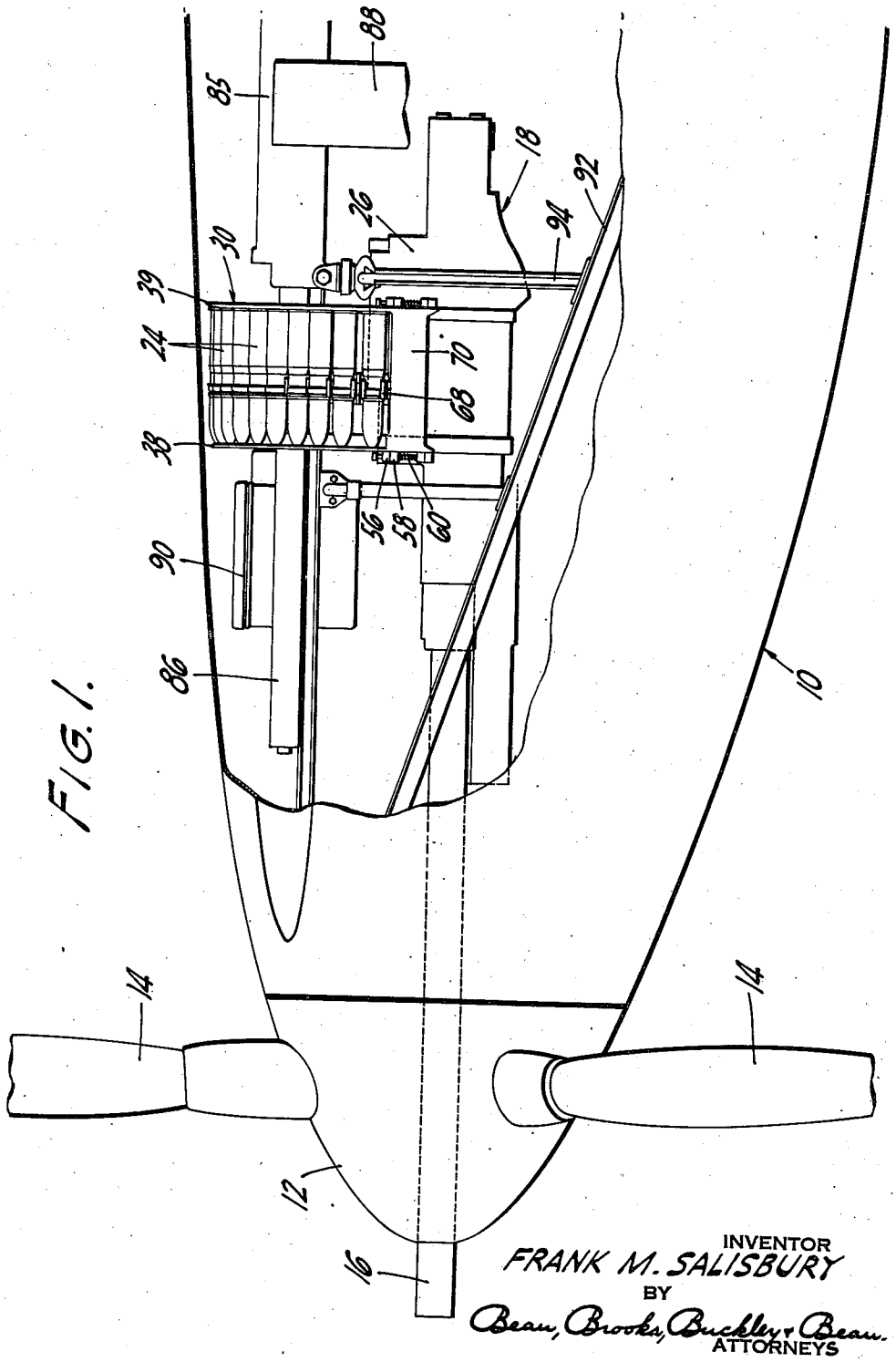


FIG. 1.

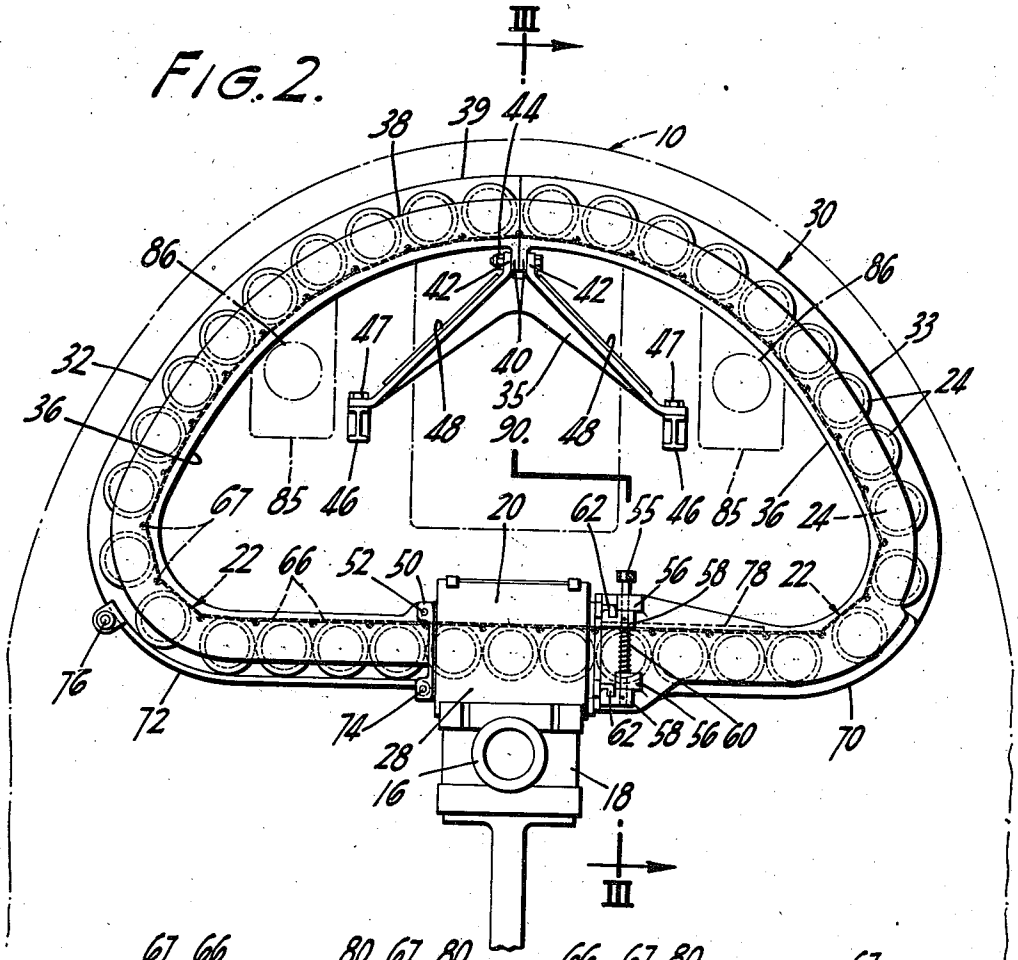
INVENTOR
FRANK M. SALISBURY
BY
Bean, Brooks, Buckley & Bean.
ATTORNEYS

Nov. 30, 1943. F. M. SALISBURY 2,335,449

COMBAT AIRPLANE

Filed July 9, 1941 3 Sheets-Sheet 2

FIG. 2.



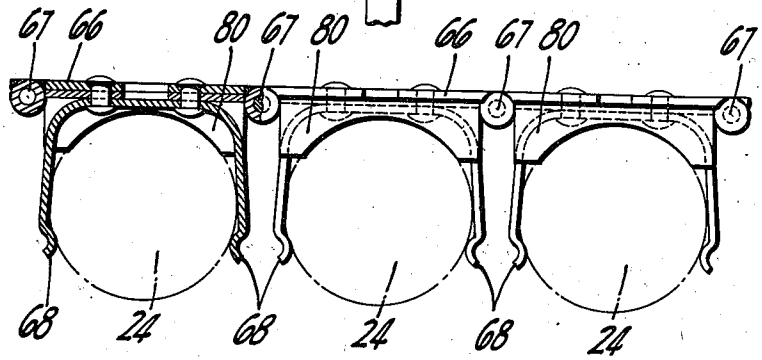


FIG. 4.

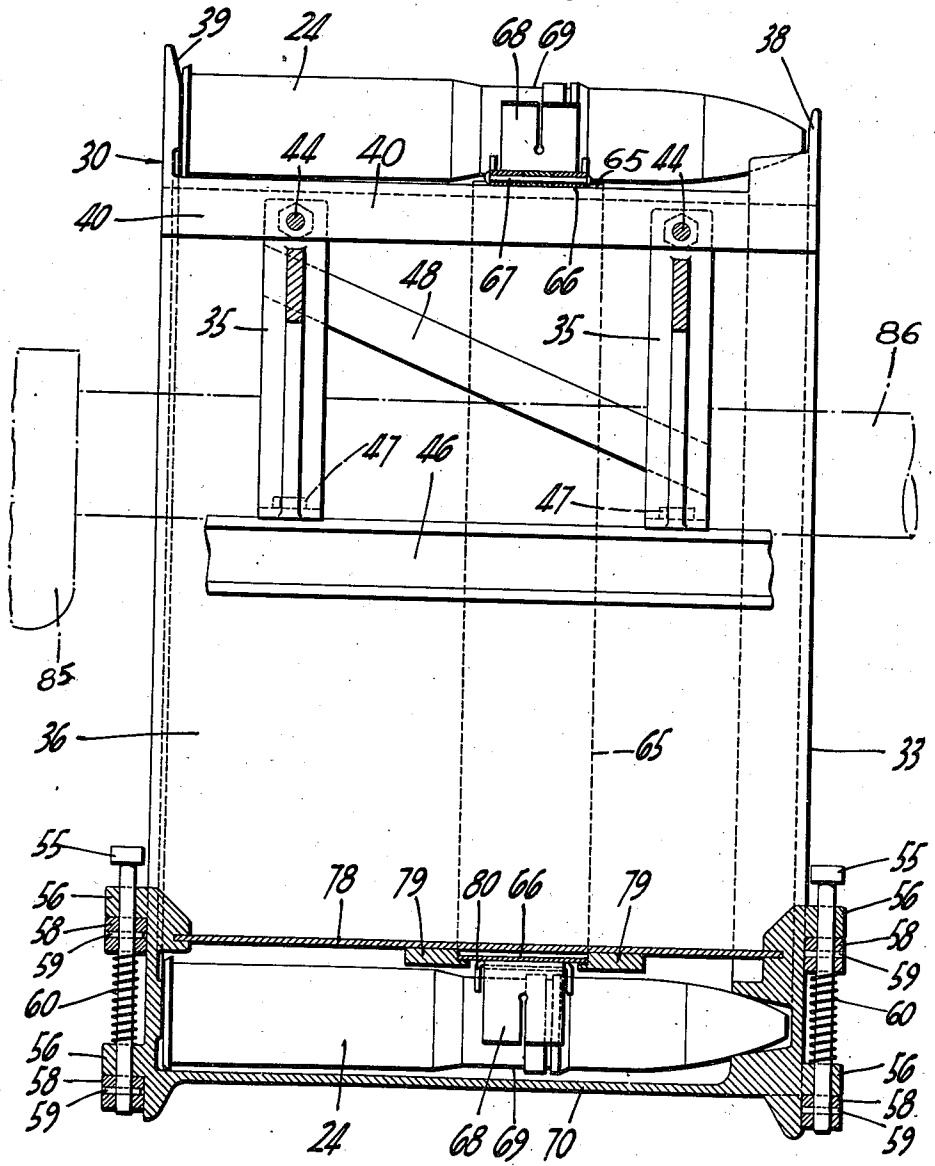
INVENTOR
FRANK M. SALISBURY
BY
Beau, Brooks, Buckley & Beau.
ATTORNEYS

Nov. 30, 1943. F. M. SALISBURY 2,335,449

COMBAT AIRPLANE

Filed July 9, 1941 3 Sheets-Sheet 3

FIG. 3.



INVENTOR
FRANK M. SALISBURY
BY
Beau, Brooks, Buckley & Beau.
ATTORNEYS

Patented Nov. 30, 1943

2,335,449

UNITED STATES PATENT OFFICE

2,335,449

COMBAT AIRPLANE

Frank M. Salisbury, Kenmore, N. Y., assignor to Bell Aircraft Corporation, Buffalo, N. Y.

Application July 9, 1941, Serial No. 401,603

5 Claims. (Cl. 89—33)

This invention relates to combat airplanes mounting cannon or automatic guns of the relatively heavy caliber types, and more particularly to improvements in ammunition magazine and feeding mechanisms for use in conjunction therewith.

One of the objects of the invention is to provide an improved combat airplane mounting heavy caliber guns in an improved manner. Another object of the invention is to provide an improved combat airplane mounting a plurality of guns in an improved manner. Another object of the invention is to provide an improved combat airplane in which improved ammunition magazine and feeding mechanisms are provided in conjunction with the mounted guns. Another object of the invention is to provide a shell supply magazine and feed mechanism for aerial cannon of improved character. Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawings:

Fig. 1 is a fragmentary elevation of an airplane of the invention, with portions broken away to show gun battery and ammunition magazine and feed mechanisms thereof;

Fig. 2 is a fragmentary front elevation of the gun battery and magazine arrangements thereof;

Fig. 3 is a section taken substantially along line III—III of Fig. 2; and

Fig. 4 is a fragmentary front elevation of a portion of the shell carrying belt mechanism of the invention, shown detached from the magazine.

The invention is illustrated in conjunction with an airplane fuselage indicated generally at 10 and mounting a nose spinner 12 from which the engine driven propeller blades 14 extend. It will be understood that the propeller blades 14 mount upon a hollow hub which is provided with a ring gear for driving connection with an axially offset drive shaft operatively coupled with the airplane engine (not shown). Thus, the propeller blades 14 and the spinner 12 are arranged to be rotated as a unit and the barrel 16 of a cannon 18 may be disposed to extend through the propeller hub for firing forwardly of the airplane and in line with the thrust axis thereof. It will be understood that the propeller hub driving mechanism is not the subject matter of this patent application, and inasmuch as several arrangements for suitably accomplishing this purpose have been previously devised, the engine and propeller driving gear are not illustrated herein.

The cannon indicated at 18 may be of any suitable type wherein the shell feedway portion thereof which is designated at 20 is provided to accommodate transverse movement therethrough of a link belt 22 carrying a series of shells 24 through the gun casing in the region just above and in alignment with the breech mechanism of the gun. Also, the gun 18 will be of such type as to include a self-contained pawl actuating mechanism for feeding shells into the feedway portion 20 thereof and thence into the gun breech, as may be enclosed within the housing portion of the gun casing indicated at 26 (Fig. 1). Thus, it will be understood that the shell feed passageway of the gun is adapted to permit movement of successive shells 24 transversely therethrough as illustrated in Fig. 2, and that as the shells move successively into vertically central position with respect to the gun breech mechanism as indicated at 28 they will be automatically depressed from this position by the gun feed pawl mechanism into the breech mechanism of the gun for firing in the customary manner. Thus, it will be understood that the present invention relates to gun battery arrangements embodying guns of the type described wherein the gun mechanisms per se include automatically operating pawl mechanisms for engaging successive shells as they enter the shell feedway portion of the gun casing for driving the shells into the gun breech feeding position indicated at 28 and subsequently depressing them into the breech mechanism of the gun. In this connection an important feature of the present invention resides in improved means for storing the ammunition supply in conjunction with the gun so as to be readily available and susceptible to the operation of the shell feed pawl mechanism of the gun in an improved manner.

The ammunition magazine for the gun 18 comprises generally a shell or cartridge trackway of substantially semi-cylindrical form which is designated generally in the drawings by the numeral 30. Inasmuch as the gun barrel 16 is disposed on the line of the thrust axis of the airplane, and the breech delivery position 28 of the gun feeding shells is closely adjacent the upper portion of the gun barrel 16, the semi-cylindrical form of the magazine trackway 30 adapts the trackway to nest against and to closely conform to the adjacent wall portion of the fuselage 10 in the region above the gun casing. Also, because of the relative arrangement and proportioning of modern combat airplane fuselage parts, the trackway 30 may be conveniently formed to ex-

tend, as illustrated, transversely across the mid section of the fuselage from opposite sides of the gun and thence upwardly and thereover in compactly nested relation with respect to the fuselage wall, while being smoothly curved throughout. The magazine trackway may thus be conveniently so dimensioned and proportioned as to be adapted to slidably carry a substantial supply of shells aligned in side-by-side relation therewithin, as distinguished from various forms of magazine or shell clip devices previously used in conjunction with aerial cannon and which are so limited as to shell capacity as to be adapted to contain only a fraction of the number of shells which may be carried by the magazine of the invention.

The magazine trackway **30** is formed by a pair of track members **32—33** which are generally of U-shaped sectional form and are mounted at their lower end portions upon opposite sides of the gun casing **18** and at their upper end portions upon a pair of brackets **35—35** (Fig. 2). Each of the track members **32—33** comprises generally a curved wall plate portion **36** carrying at its forward edge a flanged portion **38** and at its rear edge a flanged portion **39** whereby an outwardly open-side magazine of circular sectional form is provided for supporting a plurality of shells **24** in side-by-side relation and with their longitudinal axes disposed parallel to the gun bore axis. To mount the magazine track members upon the brackets **35—35** the track members are provided with contiguous depending flanges **40** at their upper end portions which are arranged to be inserted between spaced ear portions **42—42** of the brackets **35—35** and mounted thereon by means of bolts **44**. The brackets **35—35** are each of generally inverted V-shape and are rigidly mounted at their opposite extending feet portions upon a pair of rails **46** by means of screws **47**; the rails **46** being arranged to extend longitudinally of the airplane fuselage and to be supported thereon by any suitable structural means (not shown). Diagonal braces **48—48** are provided to stiffen the bracket structure.

Adjacent the gun casing **18**, the track member **32** is slip-fitted between laterally extending ears **50—50** of the gun casing **18**, and is detachably connected thereto by means of pins **52—52**. The track member **33** is arranged to be detachably mounted at its lower end upon the opposite side of the gun casing **18** by means of a pair of locking pins **55—55**, at opposite fore and aft sides of the track member. The pins **55—55** are vertically disposed and are slidably carried upon the member **33** in suitably apertured ear portions **56** thereof, and each of the pins **55** carries a pair of vertically spaced locking jaws **58** adjacent upper and lower end portions thereof; the jaws **58** being fixed to the pins **55** by means of fasteners **59** (Fig. 3). Coil compression springs **60** are arranged about intermediate portions of the pins **55—55** so as to bear at their upper ends against the upper jaw members **58—58** and at their lower ends against the lower ear portions **56—56** of the member **33**. Thus, the springs **60** resiliently resist movements of the pins **55—55** downwardly from the positions thereof illustrated in Figs. 2 and 3. Overhanging jaw portions **62—62** extend from the gun casing **18** in such manner as to be adapted to coact with corresponding of the jaw portions **58** when the pins **55—55** are in their normal elevated positions, as illustrated, whereby the track member **33** is fixed against lateral displacement relative to the gun casing **18**. However, upon manual depression of the pins **55—55** the cooperating jaw elements of the mechanism will be thereby disengaged. Corresponding side wall portions of the member **33** are arranged to slidably fit between the extending jaw portions **62—62** of the gun casing **18**, so as to prevent unintended displacement of the member **33** relative to the gun casing in directions longitudinally of the gun when in mounted relation thereon. Thus, it will be understood that the magazine trackway **30** may be conveniently serviced by simply depressing the pins **55—55** for disengagement of the jaw devices **58—62**, whereupon the right hand end portion of the trackway may be displaced from connection with the gun casing **18**; the connections with the supporting brackets **35—35** having been previously disconnected for this purpose.

A shell carrying belt designated generally at **22** is formed of a plurality of articulated links **66** connected by hinge pins **67** so as to provide an endless belt adapted to be trained around about the inner wall portions **36** of the track members **32, 33**. Each of the links **66** is provided with a pair of spaced spring fingers **68** (Fig. 3) for resiliently gripping therebetween corresponding of the shells **24** of the magazine load. The link belt **22** is longitudinally disposed of the magazine trackway so as to bring the shell gripping fingers **68** into registry with suitably reduced center portions **69** of the shells **24** (Fig. 3), and so as to grip the shells at substantially the longitudinal positions of their centers of gravity. Thus, the corresponding spring finger and link portions provide substantially U-shaped sockets into which the corresponding shells **24** are adapted to be gripped; said sockets facing outwardly of the magazine trackway at all sides thereof.

Thus, the shells disposed within the upper sections of the trackway **30** rest downwardly upon the corresponding links and the adjacent floor portions **36** of the track members **32, 33**, while in the lower regions of the trackway device the shells are retained against displacement therefrom in response to the forces of gravity by reason of the grip thereon of the spring finger members **68**. As illustrated in Fig. 2, the outer marginal edge portions of the flange members **38, 39** are shaped to guide the front and rear ends of the shells and are preferably arranged in close proximity to the fuselage structure **10** so as to preclude possibility of accidental displacement of the shells **24** from the trackway. A covering plate portion **70** (Figs. 2 and 3) is preferably formed integrally with the track member **33** to encompass the lower portion of the shell trackway adjacent the gun feed end portion thereof, and a cover plate **72** is detachably fitted as at **74** to a suitable lug formation extending from the track member **32** so as to detachably enclose the opposite lower end portion of the trackway against accidental displacement of shells therefrom, as under the jarring impact of a rough landing of the airplane, or the like. The cover plate **72** is hinged to the track member **33**, as at **76**. Preferably, a top guide plate **78** is arranged to extend above the level of the shells **24** as they move into registry with the opening in the shell feedway portion of the gun casing **18** for positive alignment of incoming shells with the gun feedway port, and thus the plate **78** cooperates with the oppositely disposed covering portion **70** of the track member **33** to positively align the shells **24** as they approach the shell feedway port of the gun. Preferably, the plate **78** will be provided

with opposed flanged slide rails 79 (Fig. 3) with which the margins 65 of links 66 will be slidably engaged and supported so as to move into perfect alignment with the shell feedway portion of the gun. A cradle 80 is welded or otherwise fastened to extend from each of the links 66 (Figs. 3 and 4) to assist the spring fingers 68 in holding the shells 24 in firmly centered relation upon the corresponding links of the belt 22.

It will be understood that the gun feed pawl mechanism (not shown) which forms a portion of the gun mechanism per se will be adapted to engage successive of the cartridges 24 filling the magazine trackway 30 to operate thereupon in such manner as to cause the entire link belt 22 to move circularly around the path thereof as provided by the inner floor and flanged end portions of the trackway structure, so that the cartridges 24 move successively into the position 26 of registry with the gun breech mechanism, whereupon they are subsequently depressed by the gun feed mechanism and disengaged from the spring fingers 68 so as to move downwardly into the gun breech mechanism for firing purposes.

The magazine trackway of the invention is adapted to be initially loaded with a supply of shells from externally of the airplane fuselage by simply forcing the shells 24 into clamped engagement with corresponding of the resilient fingers of the belt links. Suitably apertured portions of the fuselage shell may be provided with detachable cover plates to permit of passing the gun shells therethrough into clamped relation upon the gun feed belt. Upon completion of the loading of the upper reaches of the trackway 30 in this manner, the link belt may then be rotated by manual actuation of the charging mechanism of the gun in such manner as to bring the first loaded shell into registry with the feed pawl mechanism of the gun at the right hand side thereof as viewed in Fig. 2. Thereupon the remainder of the magazine trackway at the upper left side thereof may be filled from externally of the airplane, and the lower left hand portion of the trackway may be filled by unlatching the hinged cover plate 72 and passing shells upwardly from below the magazine trackway into clamped engagement upon the spring finger members exposed by opening of the cover plate 72. Thus, the entire interior of the magazine trackway may be occupied by loaded shells, and upon initial charging of the gun breech mechanism with the first loaded shell the gun is ready for firing, and subsequent feeding of the gun with ammunition will be automatically accomplished through operation of the gun feed pawl mechanism as explained hereinabove, and accompanying movement of the shell carrying belt 22 about the magazine trackway.

Thus, it will be understood that the cannon 18 is located in line with the approximate longitudinal center line of the airplane fuselage whereby the cannon is in the best position for accurate aiming thereof upon pointing of the airplane at the target. Also, it will be understood that another advantage of this cannon mounting arrangement resides in that the recoil forces of the cannon firing operation are thus directed against the approximate front view location of the center of mass of the airplane, whereby the airplane structure will absorb the cannon recoil forces in an improved manner. Also, the cannon ammunition magazine and feed trackway mechanism is substantially nested against the inner wall of the fuselage shell, and there is thus provided through the open center of the magazine trackway a substantial space within which other units of the gun battery of the airplane, and other accessories thereto, are arranged.

As illustrated in Figs. 1 and 2, a pair of relatively small caliber machine guns 85 are mounted upon the airplane fuselage so as to have their barrels 86 extending through the open center of the magazine trackway 30. The guns 85 are located longitudinally of the fuselage so as to dispose their cartridge feedway and ejected case and link chutes 88 (Fig. 1) to the rear of the cannon magazine trackway 30, and thus it will be understood that a further improved battery arrangement is provided wherein the gun units thereof and associated accessory devices are nested together in an improved manner so as to save much valuable space within the airplane fuselage. At the same time the gun battery parts are disposed in such manner as to be readily accessible from externally of the fuselage for servicing operations thereon. The guns 85 are disposed in plan view spaced relation and at opposite sides of the fuselage, and thus maximum accessibility thereto from exteriorly of the fuselage is provided and the space so provided therebetween may be usefully employed, as for example, by mounting battery devices or the like as indicated at 90 therebetween. Struts as indicated at 92 (Fig. 1) may be conveniently arranged to extend from suitable stationary portions of the fuselage structure for mounting the guns 85 thereon, as by means of intermediately disposed posts 94 or the like.

Thus, it will be understood that the airplane of the invention includes a multiple gun battery of improved form which comprises, in combination with an airplane fuselage, a battery of relatively heavy caliber gun type mounted substantially in line with the thrust axis of the airplane and so as to direct the recoil forces thereof against the approximate center of mass of the airplane; and a plurality of relatively smaller caliber guns mounted relatively close to and parallel to the first mentioned battery; and ammunition magazine and feeding means of improved form arranged in conjunction with the first mentioned gun battery and so disposed as to embrace about the battery of smaller caliber guns and to nest compactly against the fuselage shell to provide a continuous trackway of smoothly curving form for accommodating an endless belt carrying shells. Consequently, the ammunition carrying belt is adapted to be easily moved about the magazine trackway for feeding ammunition to the associated gun in response to the action of the feed pawl mechanism of the gun per se.

It will be understood that the ammunition magazine of the invention is adapted to function smoothly under all flight conditions, including that of inverted flight, because of the fact that the shell loads at opposite sides of the magazine are substantially balanced, regardless of the airplane attitude. However, under normal upright flight conditions any differential in shell loads at opposite sides of the magazine is in favor of the gun feeding operation, and to this extent and under these conditions the operation of the feed pawl mechanism of the gun per se will be automatically assisted by the forces of gravity. It will be understood that the magazine of the invention provides another important feature in that after commencement of firing of the shell load of the magazine the emptied portion of the shell carrying belt is automatically stowed within

the compass of the magazine trackway in the regions formerly occupied by loaded portions of the belt. Thus, no extra containers need be supplied to receive the emptied belt portion, and further saving of valuable space is provided. It will also be understood that the magazine of the invention is particularly adapted to be conveniently loaded from externally of the airplane fuselage, and to be otherwise serviced in an improved manner; and that the various features and advantages of the invention are provided through use of light weight structures and mechanisms of simple and rugged design.

It will be understood that throughout the specification hereinabove the term "fuselage" has been employed with respect to the structure housing the gun battery of the invention, but that within the concept of the invention and the meaning of the terms used hereinabove, the gun battery housing structure may comprise any other suitable portion of an aircraft, such as a nacelle, or the like, and that although only one form of the invention has been shown and described in detail, it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. An automatic gun having a laterally extending ammunition feedway portion with an inlet and an outlet opening respectively on opposite sides, a magazine composed of a pair of separable arcuate sections, a support arranged above the feedway portion, each section suspended at one ends from the support and having its other end detachably engaged with the feedway portion over a respective one of the laterally spaced openings to form an endless trackway, and an endless cartridge carrier encircling the magazine sections and slidable in the trackway and through the feedway portion for feeding cartridges into the latter, the trackway portions as provided by said other ends of the magazine sections extending in opposite directions from the feedway portion and being joined by an upstanding arcuate portion as provided by the first ends of the sections.

2. A combat airplane including a nacelle portion with a forwardly disposed nose spinner supporting a propeller, a gun extending axially through the spinner and having ammunition feedway and feeding portions mounted within said nacelle portion and disposed substantially in line with the longitudinal center line of said nacelle portion, an ammunition magazine for said gun having an upstanding semi-cylindrical portion adjacent and conforming with the wall of the nacelle and other portions connected to the ends of said semi-cylindrical portion for completing the magazine to form a continuous closed path for cartridges, said other portions being in open communication with the gun feedway, said semi-cylindrical portion and said other portions cooperating to provide an open center upright frame transversely of the nacelle portion, a continuous endless belt for feeding ammunition through said magazine upon operation of the ammunition feeding portion of said gun, a second gun mounted upon said nacelle portion above the first gun and arranged within the magazine frame offcenter from the spinner, said second gun discharging through the wall of the nacelle portion at a point disposed rearwardly from the spinner, and means supporting the two guns and the magazine as a unit.

3. An automatic gun having a laterally extending ammunition feedway portion with an inlet and an outlet opening respectively on opposite sides, a magazine composed of a pair of separable substantially arcuate sections, a support arranged above the feedway portion, each section detachably suspended at one end from the support and having its other end detachably engaged with the feedway portion over a respective one of the laterally spaced openings to form an endless trackway, and an endless cartridge carrier encircling the magazine sections and slidable in the trackway and through the feedway portion for feeding cartridges into the latter, the trackway portions as provided by said other ends of the magazine sections extending in opposite directions from the feedway portion and being joined by an upstanding arcuate portion as provided by the first ends of the sections, said other end of one section having a removable cover giving access to the carrier adjacent the feedway portion.

4. An automatic gun having a laterally extending ammunition feedway portion with an inlet and an outlet opening respectively on opposite sides, a magazine composed of a pair of separable substantially arcuate sections, a support arranged above the feedway portion, each section detachably suspended at one end from the support and having its other end detachably engaged with the feedway portion over a respective one of the laterally spaced openings to form an endless trackway, an endless cartridge carrier encircling the magazine sections and slidable in the trackway and through the feedway portion for feeding cartridges into the latter, the trackway portions as provided by said other ends of the magazine sections extending in opposite directions from the feedway portion and being joined by an upstanding arcuate portion as provided by the first ends of the section, and manually operable means effecting such detachable engagement between said other ends and the feedway portion.

5. An automatic gun having a laterally extending ammunition feedway portion with an inlet and an outlet opening respectively on opposite sides, a magazine composed of a pair of separable substantially arcuate sections, a support arranged above the feedway portion, each section detachably suspended at one end from the support and having its other end detachably engaged with the feedway portion over a respective one of the laterally spaced openings to form an endless trackway, an endless cartridge carrier encircling the magazine sections and slidable in the trackway and through the feedway portion for feeding cartridges into the latter, the trackway portions as provided by said other ends of the magazine sections extending in opposite directions from the feedway portion and being joined by an upstanding arcuate portion as provided by the first ends of the section, a pair of manually depressible pins slidably supported on said other end of one section, one pin on each side thereof, and each pin carrying a pair of locking jaws interlockable with spaced parts on the feedway portion for effecting such detachable engagement between the latter and such one section, and spring means yieldably holding the interlock.

FRANK M. SALISBURY.