CONTENTS.

	Page.
Preface	5
Section A:	
List of reference books	7
Conversion tables	8
Section B—Machine guns:	
Marlin aircraft machine gun	17
Lewis aircraft machine gun	25
Vickers aircraft machine gun	35
11 m/m Vickers aircraft machine gun	42
Mounting on aircraft—Precautions before and after flights, ammunition, etc	10
Tools to be supplied with armorer's chest	13
Tools to be supplied with armorer's truck	14
Metallic disintegrating link belts	42
Section C—Machine gun mounts:	
Fixed mounts	46
Flexible mounts	47
Single Lewis gun yoke	49
Double Lewis gun yoke	52
Lewis magazine racks	53
Section D—Synchronizing gears:	
Hydraulic or C. C. synchronizing gear	55
Mechanical synchronizing gear	56
Section E—Machine gun sights:	
Theory of ring and post sights	60
Auxiliary sight	61
Ring and wind vane sight	61
Unit sight	63
Sight mountings	65
Section F—Bombs:	
High capacity drop bombs	66
Fragmentation bombs	69
Incendiary bombs	71
Dummy bomb, Mark I	73
Marking of bombs	73
Packing of bombs	74
Storage of bombs	74
Section G—Bomb-release mechanism:	
List of bomb-release mechanisms	75
Mark V bomb-release mechanisms	78
Section H—Theory of bomb sighting:	
Mark I–A bomb sight	81

	Page.
Section I—Aircraft ammunition:	
Armor piercing	83
Tracer	83
Incendiary	83
Armor-piercing incendiary	84
Armor-piercing tracer	84
Storage of incendiary ammunition	84
Packing of aircraft ammunition	84
Cartridge gauges	85
Section J—Pyrotechnics:	
35 mm. pistol aviation, Mark, I	61
Airplane flare, Mark I	88
Wing-tip flare, Mark I	89
Section K—Small arms:	
Browning machine rifle	92
Winchester rifle, caliber .351	93
Colt, and Smith & Wesson revolvers	93

PREFACE.

In compiling this Handbook of Armament as used on aircraft, no attempt has been made to treat the various subjects in an exhaustive technical manner. Full data of this description can be obtained from the various reference books issued by the War Department, of which there is a list embodied in this book.

The principal idea has been to acquaint all interested, with the correct nomenclature in particular, and with the appearance, fundamental ideas, and theories relative to all articles of armament pertaining to airplanes as produced by the United States.

Owing to the various additions and improvements which must necessarily occur in the armament of aircraft due to new ideas and methods of aerial warfare, this book is prepared in loose-leaf form in order that any additions or changes may be facilitated.

E. T. BRADLEY,
Major, A. S. A. P.

HANDBOOK OF AIRCRAFT ARMAMENT.

SECTION A.

LIST OF REFERENCE BOOKS.

The handbooks listed below are issued by the War Department, and may be obtained upon request:

MACHINE GUNS AND SMALL ARMS.

No. 1866. Automatic Pistol, Caliber .45.
No. —. Browning Aircraft Machine Gun, Model of 1918.
No. 1937. Browning Machine Gun, Model of 1917.
No. 1934. Browning Machine Rifle, Model of 1918.
No. 1932. Hotchkiss Machine Gun, Model of 1914.
No. —. Lewis Aircraft Machine Gun, Model of 1917.
No. 1931. Lewis Machine Gun, Model of 1917.
No. 1933. Marlin Aircraft Machine Gun, Model of 1917.
No. 1923. United States Rifle, Model of 1903.

BOMBS AND BOMB-RELEASE MECHANISMS.

No. 742. Barlow Heavy Drop Bomb and Release Mechanism.
No. 717. Dummy Drop Bomb, Mark I.
No. —. Fragmentation Bombs, Marks I, II, and III.
No. 724. High Capacity Drop Bombs, Marks I, II, and III.
No. —. High Capacity Drop Bombs, Marks IV, V, and VI.
No. 777. Incendiary Drop Bombs, Marks I and II.
No. —. Smoke Drop Bombs, Marks I, II, and III.
No. —. Release Mechanism, Mark V.
No. —. Release Mechanism, Mark VII, A and B.

BOMB SIGHTS.

No. 741. Bomb Sight, Mark I.
No. —. Bomb Sight, Mark I–A.
No. —. Synchronizing Bomb Sight.

MISCELLANEOUS.

No. —. Airplane Flares, Mark I, and Airplane Signals.
No. —. Military Explosives.
No. 739. Very Pistol, Mark III, and Signal Light, Mark II.
No. 752. Smoke Torch, Mark I.
No. 751. Signal Light, Mark I, and Rifle Light, Mark I.
No. 722. Position Lights, Marks I and II.

CONVERSION TABLES.

WEIGHT.

1 metric ton	2,204.6 pounds (avoir.).
1 kilogram	2.2046 pounds (avoir.).
1 gram	0.03527 ounce (avoir.).
1 ton	1,016 kilograms.
1 pound	0.4536 kilogram.
1 ounce	28.35 grams.

LINEAR MEASURE.

1 kilometer	0.6214 mile.
1 meter	39.39 inches.
1 centimeter	0.3937 inch.
1 millimeter	0.03937 inch.
1 mile	1.609 kilometers.
1 yard	0.9144 meter.
1 foot	0.3048 meter.
1 inch	2.54 centimeters.

SQUARE MEASURE.

1 square kilometer	0.3861 square mile.
1 square meter	10.76 square feet.
1 square centimeter	0.1550 square inch.
1 square mile	2.590 square kilometers.
1 square foot	0.0929 square meter.
1 square inch	6.452 square centimeters.

CUBIC MEASURE.

1 cubic meter	35.314 cubic feet.
1 cubic centimeter	0.0610 cubic inch.
1 cubic foot	0.02832 cubic meter.
1 cubic inch	16.387 cubic centimeters.

CAPACITY.

1 gallon	3.785 liters.
1 cubic foot	28.317 liters.
1 liter	61.023 cubic inches.
1 liter	2.20 pounds water.

MISCELLANEOUS.

1 pound (avoir.)	7,000 grains.
1 metric ton	1,000 kilograms.
1 gallon	231 cubic inches.
1 British imperial gallon	277.418 cubic inches.
1 gallon gasoline	6.50 ± pounds.
1 cubic foot of water weighs	62.287 pounds at 62° F.
1 gallon of water weighs	8.3267 pounds at 62° F.
1 knot	1.15 miles per hour.

To convert Fahrenheit to centigrade, subtract 32 and multiply by $\frac{5}{9}$.
To convert centigrade to Fahrenheit, multiply by $\frac{9}{5}$ and add 32.

MACHINE GUNS.

SECTION B.

MACHINE GUNS.

In dealing with the subject of the care of machine guns for aircraft mounting, it is assumed that the officers and men for whose use this handbook is intended are thoroughly familiar with the operation of these guns. Each man should have in his possession the handbooks issued by the Ordnance Department, which take up the subject of each gun in detail. These handbooks are given in the "List of reference books" and may be obtained from the Ordnance Department upon request. It will, therefore, be necessary to consider here only that phase of the subject of the care of the guns which applies particularly to aircraft. This will consist of a description of the special devices and attachments, with instructions concerning their use and care, and a list of precautions to be observed in connection with the care and adjustment of the guns.

Machine guns for aircraft are divided into two classes, according to the type of mount for which they are adapted.

The guns intended for installation on a fixed mount are Marlin, Browning, and Vickers.

The guns intended for installation on a flexible mount are Lewis.

The gun installed on a fixed mount is rigidly attached to the aircraft and synchronized with the engine, so as to make it possible to shoot between the blades of the propeller. The gun installed on a flexible mount does not shoot between the blades of the propeller and may be aimed independently of the machine. The mounts and synchronizing devices will be dealt with in a later section.

GENERAL PRECAUTIONS TO BE OBSERVED PREPARATORY TO FLIGHT.

CARE OF THE GUN.

The great importance of the proper care of machine guns designated for aircraft work should be fully realized, particularly inasmuch as the guns are working under adverse conditions, and a stoppage due to improper care or adjustment may prove fatal to the operator or at least result in the failure of his mission.

Inasmuch as some little time is always needed to get a machine ready for flight, it will not be necessary to keep the flexible guns mounted on machines, but they should be kept in their boxes until needed for use. It is very important

that these boxes be kept covered at all times to prevent the accumulation of dust and dirt on the guns. If it is necessary to keep any guns mounted in readiness for a flight, they should be protected by some sort of covering.

It is absolutely necessary to have the gun free from all traces of grit when it is ready for use. All parts should be thoroughly cleaned and the moving parts covered with a thin film of oil. The oil to be used is a light oil, known as airplane machine-gun oil, and is furnished by the Air Service.

It should be remembered that too much oil may give as much trouble as too little, due to its tendency to gum and clog the mechanism. The oil should be applied to the moving parts with the fingers or with a cloth patch or camel's-hair brush, and used sparingly.

The mechanism should work freely when operated by hand and the proper adjustments should be made. The cause of any excessive friction should be found and remedied. Burrs should be removed from hardened surfaces by means of a stone—never use a file for this.

A short burst should be fired before going up, in order to test the working of the gun.

Never send a gun up in an airplane when there is the slightest doubt of its functioning properly.

AMMUNITION.

It is essential that only the ammunition expressly designed for aircraft be used. This ammunition will be packed without clips and bandoleers, but in paper boxes of 20 cartridges per box. The wooden cases in addition to the other standard marking, will bear the following words: "For aircraft use—No clips or bandoleers."

In addition, the training insignia carried by airplanes, consisting of star within circle, will be stamped on each end of the packing box.

Each individual round should be carefully inspected. In the absence of cartridge gauges, the best service test applicable to discover defects in shape, is to drop each round into a spare barrel to see that it seats properly. A cartridge with a deep-set or deformed primer should never be tolerated.

Great care should be exercised in loading belts and magazines to see that the cartridges are all in correct alignment. Web belts should be *thoroughly dry* and should never be used when any round is held loosely enough to allow the least chance of its slipping out of position during flight. The cartridges should *never* be lubricated, as the oil itself or the dirt which it will collect, will prevent the cartridges from seating properly in the chamber. The loaded belt, whether

web or link, should always be placed zigzag in the belt box, never in the form of a roll.

SPARE PARTS.

The care of spare parts is a very important matter. Great pains must be taken to keep new parts separate from defective ones.

Spares should be kept in their proper receptacles, wrapped in oiled paper. The lids of the boxes should always be kept closed in order to prevent the accumulation of dust.

A strict account of the spares on hand must be kept and requisitions for additional parts must be made up in time to allow for delay in shipment.

GENERAL PRECAUTIONS TO BE OBSERVED AFTER A FLIGHT.

The gun should be immediately taken apart and every part thoroughly cleaned. Never allow a gun to remain dirty any longer than is absolutely necessary, as the action of the powder residue on the bore may seriously hamper the accuracy. Whenever possible, all parts should be washed in gasoline, *thoroughly dried*, and coated with a thin film of oil. All parts should be given a complete inspection, and any which show the least signs of wear should be removed and replaced with new ones.

It will be necessary to inspect the bore every day for several days and remove whatever residue has "sweated" out from the metal.

In applying cosmoline to the bore, only a small amount should be used on a cloth patch. The rod should be pulled slowly through the barrel and revolved sufficiently to allow the patch to follow the grooves of the rifling. This will give a thin coating of cosmoline, and any residue which "sweats" out from the metal can be readily detected. If too much cosmoline is applied, chemical action may take place between the residue and the metal underneath the cosmoline and can not be observed. It has been found that a film of cosmoline so thin as to be hardly noticeable is sufficient to prevent rust even when the barrel was exposed to the weather for a considerable length of time, provided the bore was clean before the cosmoline was applied. Rusty, worn, and pitted barrels cause tracer bullets to become "dead," i. e., they will not ignite.

INSPECTION.

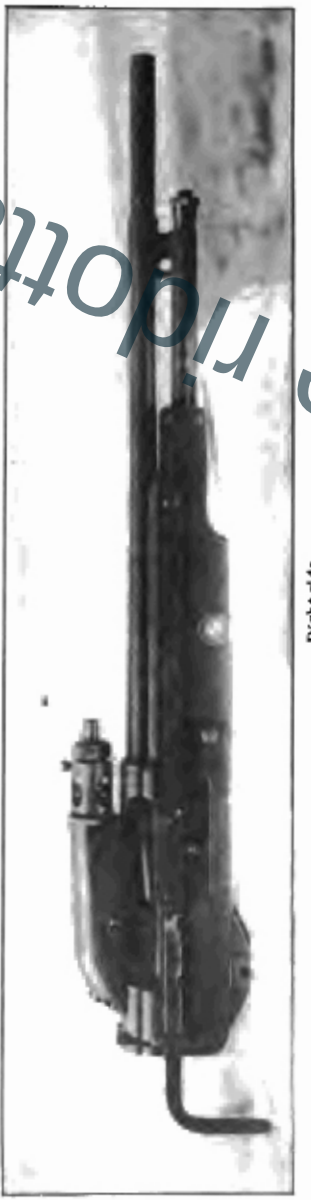
All guns, spares, belts, and magazines should be inspected by the officer in charge of guns at least once a week. The guns should be completely stripped and the parts laid out for inspection.

TOOLS FOR MAINTENANCE OF LEWIS AND MARLIN AIRCRAFT MACHINE GUNS TO BE SUPPLIED WITH ARMORER'S CHESTS FOR AIR SERVICE TRAINING SCHOOLS.

Arms chest (Vickers) Ordnance Department drawing 16, class 76, division 13	1
Ball pean hammers, 12-ounce	2
Soft babbitt hammers, 15–5–180, U180C	6
Standard hammer handles	6
Sets mild steel drifts—$\frac{1}{32}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{8}$ inch	6
Bulldoze drifts, copper, $\frac{3}{8}$ by 4, $\frac{3}{8}$ by 6	4
Drill, hand and breast, with chuck to hold drills 0 to $\frac{3}{8}$-inch, Goodell Pratt, 5½B	1
Set assorted drills $\frac{1}{16}$ to $\frac{3}{8}$ by $\frac{1}{32}$	2

FIG. 1.—ARMORER'S CHEST.

Screw drivers, 5-inch	12
Screw drivers, 9-inch, all steel, Channon, 1	2
Pliers, 6-inch, round nose	3
Pliers, 6-inch, side cutting, 15–5–254	3
Large bench vise 3½ by 4 inch jaw, Prentiss	3
Set copper jaws for same	3
Small hand vise, Simmons Hardware Co., No. 540	2
Sets copper jaws for same	2
Oil cans, dome type, 15–5–46	6
Pair 6-inch iuside spring calipers, No. 610, Goodell Pratt	1
6-inch outside spring calipers, No. 504GP	1
3-inch dividers, No. 513GP	1
6-inch flexible Starret scales graduated hundredths and sixty-fourths	2
Center punches, small, GP	2
Scrapers, 3½-inch blade, No. 382GP	4



Right side.

Left side.

FIG. 2.—MARLIN AIRCRAFT MACHINE GUN. MODEL 1918.

[Model 1917.]

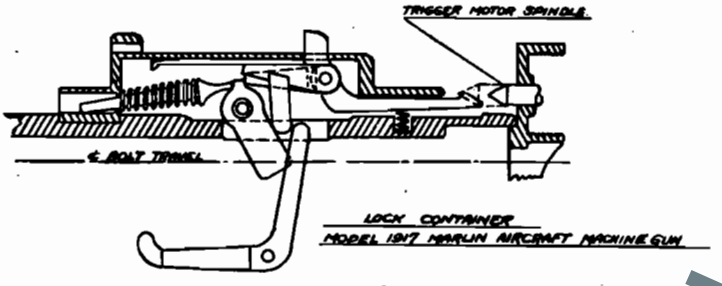


FIG. 2B.

[Model 1918.]

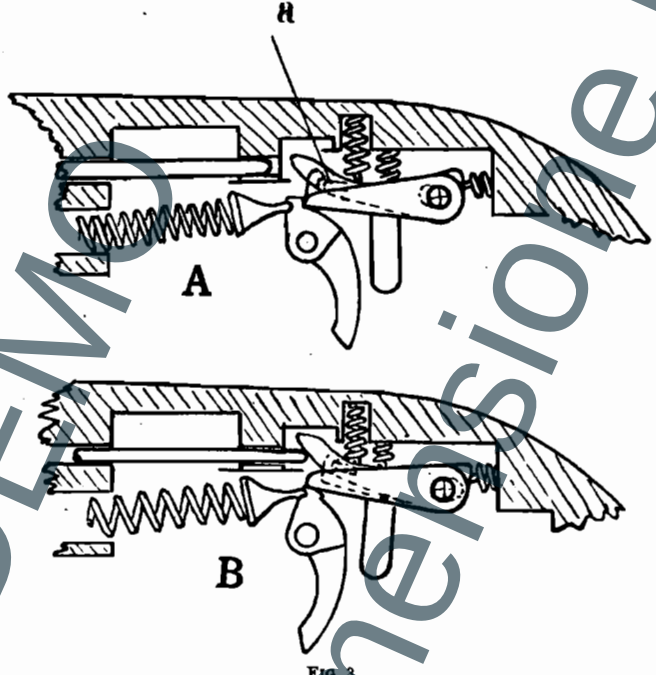


FIG. 3.

hook bears against the lug on the synchronizer trigger. The hammer is thereby prevented from falling.

As soon as the pressure of the piston is released from the synchronizer trigger, the synchronizer trigger is forced down by the synchronizer trigger spring, allowing the hammer to force the trigger to the rear so that it hooks over the lug on the synchronizer trigger. We now have the condition already explained in the preceding paragraph (sketch A) and the gun is fired at the next impulse of the synchronizer piston.

TRIGGER MOTOR.

The Model 1918 Marlin guns are supplied with a trigger motor attached to the lock container, adapted for connection to a C. C. synchronizing gear. The trigger motor consists of

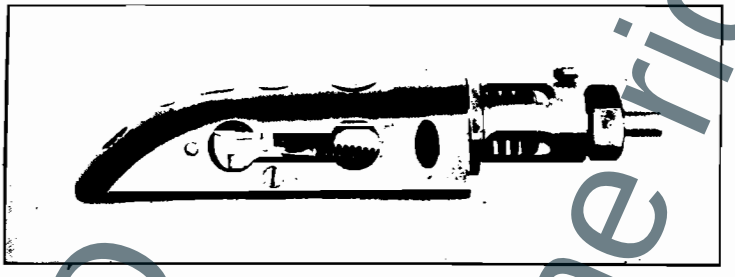


FIG. 4.—MODEL 1918 MARLIN LOCK CONTAINER AND TRIGGER MOTOR.

The lock container in above illustration is cut away to show internal mechanism.

a piston and spring contained in a bronze cylinder which is screwed into the forward end of the lock container. The cylinder is provided with a coupling nut and tube end into which the main pipe line may be soldered. A small vent screw located on top of the cylinder allows for the release of air from the system.

The C. C. synchronizing gear trigger motor as used with the Model 1917 Marlin aircraft gun is shown in figure (29), page 57.

LEWIS AIRCRAFT MACHINE GUN.

DESCRIPTION.

The Lewis aircraft machine gun is designed for flexible mounting. As may be seen from the photograph, it differs

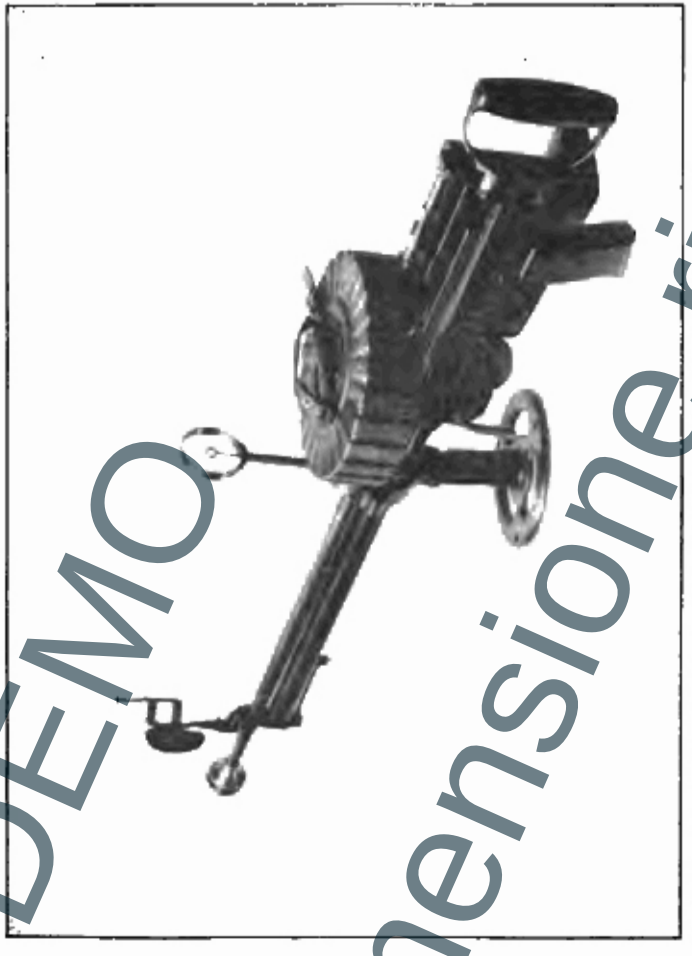


FIG. 6.—LEWIS AIRCRAFT MACHINE GUN.

from the Army type, in that the radiator has been removed, and a spade grip is used instead of a regular butt stock, and it is fitted with a special mounting yoke and recoil check. The gun is fed from a magazine holding 97 rounds.

The weight of the gun is 18 pounds, and the rate of fire 600 shots per minute. The ground type gun is described in Ordnance Pamphlet No. 1931.

These guns are usually installed in pairs or singly on a flexible mount.

Lewis guns are packed for shipment in a wooden box 40 inches by 4¼ inches by 7¾ inches deep, containing one gun and its spare parts. The magazines are packed in a wooden box 9¼ by 11¼ inches by 9¼ inches deep containing three magazines. Six magazines in containers are supplied with each gun.

POINTS TO BE OBSERVED BEFORE A FLIGHT.

The gun must be in perfect operating condition, all parts cleaned and properly oiled.

The parts which need particular attention in oiling are:

Bolt.
Worm of feed operating stud.
Head of piston.
Striker post.
Slot in feed arm for feed operating stud.
Feed pawl (at pivot).
Stop pawls (at pivot).
Teeth on mainspring casing and on rack.
Threads on gas chamber gland and gas regulator cup.

Make sure that the hole in the gas chamber gland registers with the hole in the gas chamber, and the gas cylinder connection is tightly screwed onto the gas chamber.

See that the large gas port (No. 4) in the gas regulator cup is turned to the rear, thereby giving the maximum gas pressure on the recoiling parts.

The gun ordinarily operates with a spring tension of from 12 to 14 pounds. Due to the adverse conditions under which the gun works it may sometimes be necessary to reduce the tension to insure operation, but it should never be made less than 10 pounds.

Work the mechanism slowly back and forth several times by means of the charging handle to see that it runs smoothly.

The magazines for the Lewis gun should be very carefully inspected before being used, since a defective magazine is almost certain to give trouble. A little oil should be applied to the bearings and to the magazine latch. The latter should be tested to see that its spring works freely, as cases have been found where the latch did not return to its proper position to lock the magazine to the magazine post.

The magazines should be spun on a loading handle to see that they revolve easily. They should then be placed upon

the magazine post and rotated, in order to make sure that no part of the rim rubs on the receiver or feed cover.

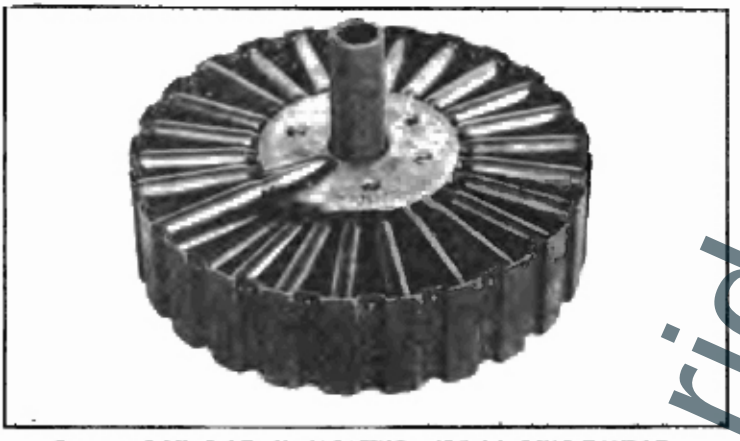


FIG. 7.—97 ROUND LEWIS MAGAZINE WITH LOADING HANDLE.

FIG. 9.—97 ROUND LEWIS MAGAZINE—TOP VIEW.

The magazine gauge (see Fig. 10) should be used to test the rim of the pan and the position of the interior separator pins. The pins should be examined for straightness and firmness.

from the center and the distance apart of the pins. The outside edge of the corrugations should appear opposite the small slit. The wider slit shows the tolerances which may be accepted; the inner or outer edge of the corrugation should be included within the inner or outer edge of the slit.

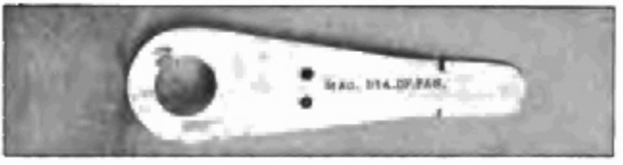


FIG. 10.—LEWIS MAGAZINE GAUGE.

SHELL DEFLECTOR BAG.

The empty shells from the Lewis gun are caught in a shell-deflector bag which is clamped to the receiver of the gun. This bag is made of heavy canvas reinforced with

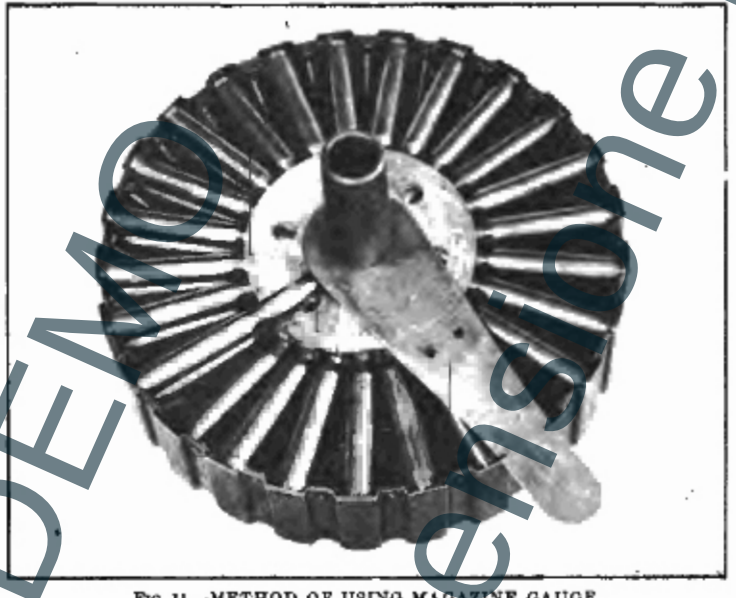


FIG. 11.—METHOD OF USING MAGAZINE GAUGE.

wire and held in a distended position by three wire loops. The bottom of the bag is closed by a flap which may be unclasped to permit the removal of the shells. The bag will hold 97 rounds, the contents of one magazine.

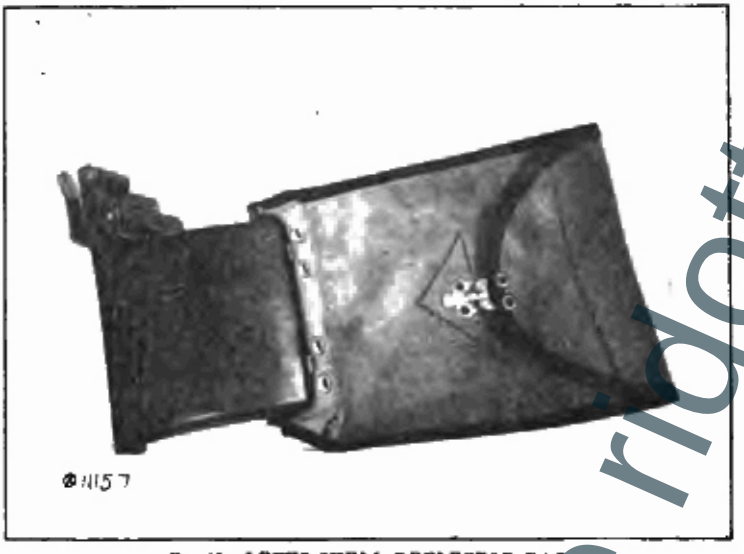


FIG. 12.—LEWIS SHELL DEFLECTOR BAG.

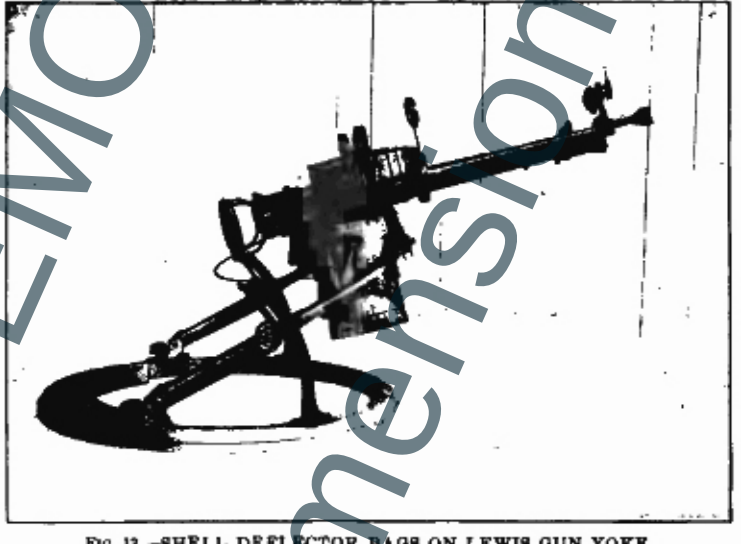


FIG. 13.—SHELL DEFLECTOR BAGS ON LEWIS GUN YOKE.

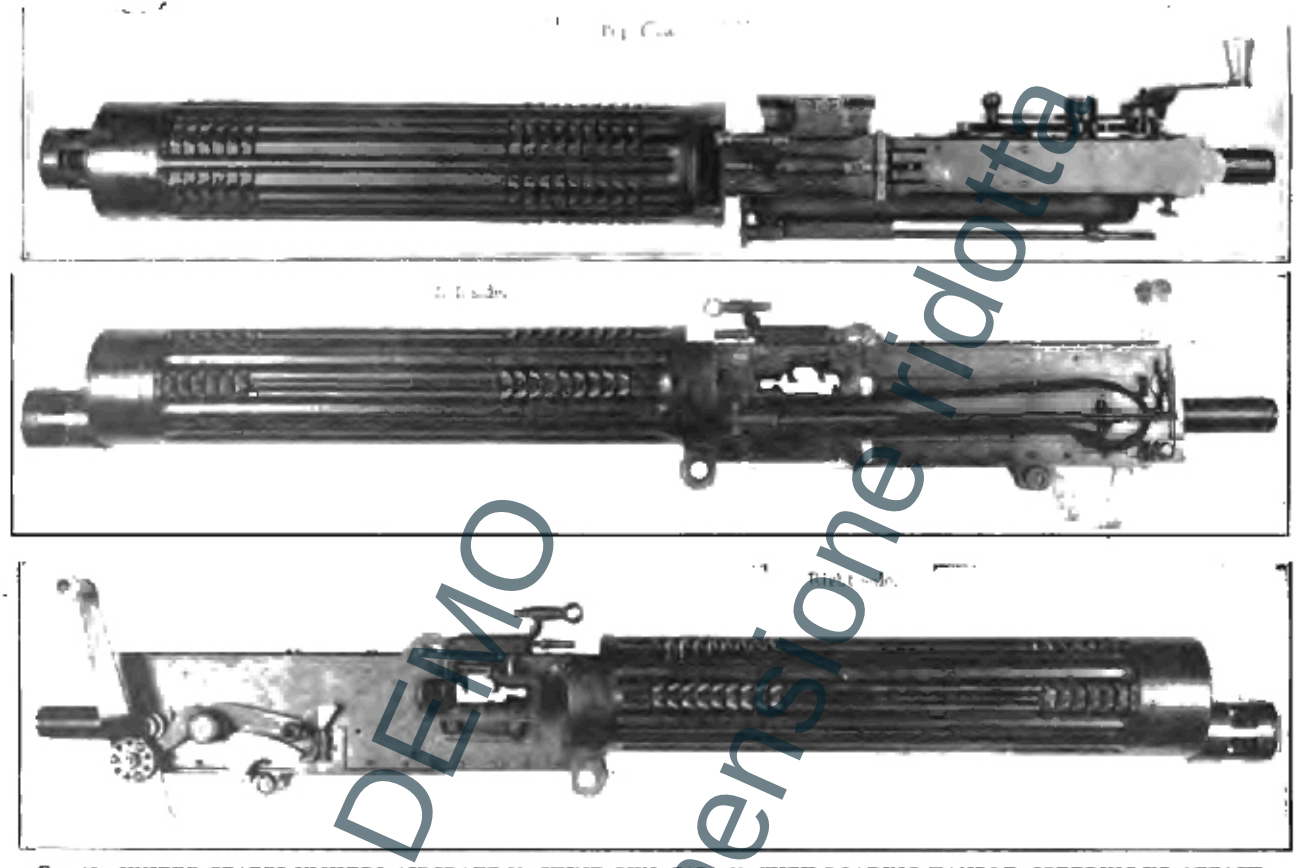


FIG. 17.—UNITED STATES VICKERS AIRCRAFT MACHINE GUN, CAL. .30, WITH LOADING HANDLE, SPEEDING-UP ATTACHMENTS, AND TRIGGER MOTOR FOR MECHANICAL SYNCHRONIZING GEAR, TYPE H-S.

LOADING.

The method of loading is as follows: Twenty links are placed in the corrugations of the base of the loading machine so joined together as to form a section of the belt. Twenty cartridges are then placed in the corrugations behind the links and the pushing bar is pushed forward by means of the handle. This forces the cartridges the proper distance into the links, thereby joining a section of the belt. This section is then moved to the left or right so that the last cartridges rest in the support provided, allowing the unoccupied loop of the last link to line up with the first link of the next section. (See figures 19, 20, 21.)

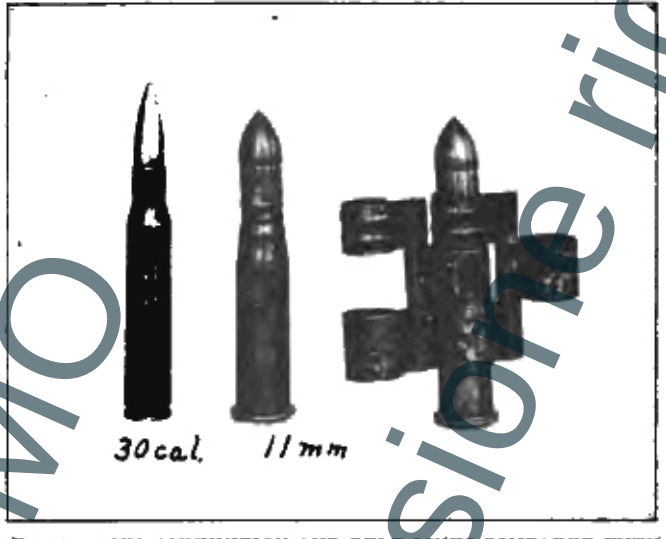


FIG. 18.—11-MM. AMMUNITION AND BELT LINKS COMPARED WITH 30-CAL. AMMUNITION.

PACKING.

Metallic links are packed in cardboard containers (see figs. 20–21) holding 10 links in each. These containers are designed to facilitate laying out the links on the loading machine.

Twenty-five containers, one of which, marked with a red stripe, contains a link fastened to a brass strip 6 inches long, are packed in a carton. This strip is for threading the belt through the gun.

Forty cartons, containing 10,000 links, are packed in a wooden box ready for shipment and marked "For aircraft use."

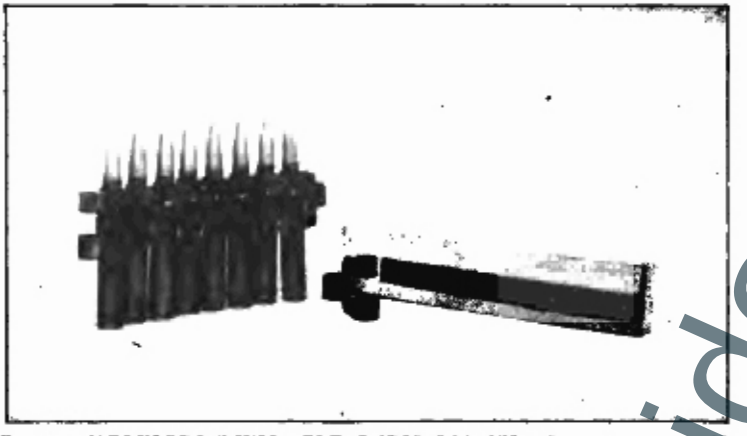


FIG. 19.—MARLIN-BROWNING BELT LINKS SHOWING CARDBOARD CONTAINER.

FIG. 20.—VICKERS BELT LINKS SHOWING CARDBOARD CONTAINER.

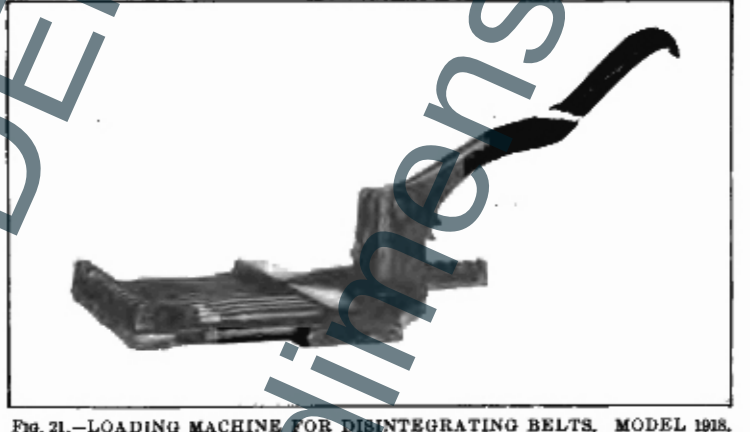


FIG. 21.—LOADING MACHINE FOR DISINTEGRATING BELTS, MODEL 1918.

SECTION C.

AIRCRAFT MACHINE GUN MOUNTS.

The mounts for aircraft machine guns are divided into two classes—fixed and flexible.

Fixed mounts are attached to the airplane in front of the pilot's cockpit, either on top or underneath the cowling, holding the guns rigid so that they may be synchronized with the engine to shoot between the blades of the propeller.

Fixed mounts vary according to the types of guns and planes for which they are intended, usually consisting of two brackets, one of which allows for lateral and vertical adjustment so that the guns may be lined up with the sights. Fixed guns are mounted singly and in pairs.

Flexible mounts are attached to the airplane above the gunner's cockpit, and permit of moving the guns through a considerable arc of fire independently of the airplane.

FIXED MOUNTS.

Figure 22 shows two Marlin aircraft machine guns mounted on the cowl of a DH-4 plane and fitted with C. C. synchronizing gears.

The front mounting bracket is a bronze casting and consists of a base plate curved to fit the cowl with two upright side plates, one of which is threaded to receive the forward gun bolt. The brackets are attached to the cowl by means of four small bolts, and are set 14 inches from center to center.

The rear mount consists of a bronze socket attached to the cowl by means of six bolts. This socket receives a brass post, which may be adjusted for height by a knurled nut located underneath the cowl and clamped by means of an hexagonal nut on the lower end of the post. The top of the post is made in the form of a T head, threaded to receive the rear gun bolt. This allows for lateral adjustment, and the gun may be clamped by means of the small bolt provided.

To adjust the guns, the plane is placed so that the Unit, and the Ring and Post sights may be sighted on a target at a set distance. After the necessary adjustments have been made to the sight brackets, they are clamped in place. The guns are then mounted and a sight is taken through the bores at the same target, the adjustments being made on the rear bracket. This means that the center lines of the gun converge to meet at a predetermined distance. The guns are now correctly mounted and must be firmly clamped.

BELT BOXES AND SHELL CHUTES.

The aluminum belt boxes are located inside the cowl and bolted to it, one underneath each gun. The covers of the boxes are shaped to act as a guide for the loaded belt being fed into the gun, and are provided with catches to keep these closed. Between the two belt boxes is installed the aluminum shell and link chute for the left-hand gun, and ejects through the bottom of the fuselage. This is also bolted to the cowl and is provided with a cover which fits over the ejection and belt openings of the gun. The shells and links for the right-hand gun are carried down outside the fuselage by separate chutes attached to the cowl.

FIG. 22.—FIXED MOUNTS FOR TWO MARLIN AIRCRAFT MACHINE GUNS ON DE HAVILAND 4.

Care must be taken to see that the belt box covers do not become bent so as to hinder the feeding of the belt. The catches must be kept in proper order so that there is no possibility of the covers becoming unlatched by the weight of the loaded belt when the machine is upside down.

FLEXIBLE MOUNTS.

AIRPLANE FLEXIBLE GUN MOUNT, TYPE A.

The airplane flexible gun mount, Type A, which is adapted from the British Scarff-ring mount, consists of a fixed ring which is bolted to the fuselage over the gunner's cockpit. A revolving ring provided with small rollers fits over the fixed ring and runs on it. The main tube bracket, containing the machine-gun mount socket, is pivoted on the revolving ring.

This bracket may be raised or lowered, and is locked in any position of elevation by the quadrant latch pins, which fit in the teeth of the inside and outside quadrants. The revolv-

FIG. 23.—FIXED MOUNT FOR ONE MARLIN AIRCRAFT MACHINE GUN ON CURTISS H-HG, SHOWING UNIT SIGHT, AUXILIARY SIGHT, AND MECHANICAL SYNCHRONIZING GEAR, TYPE H-S.

ing ring is held in position by two plunger stops which are contained in the main tube bracket plates and fit into holes in the fixed ring. The quadrant latch pins and plunger stops are released by means of the Bowden wire lever located under

the machine-gun socket. The weight of the guns is balanced by the exerciser cords, which run under the exerciser cord pulleys on each side of the main tube and over the quadrant hook at the top of the quadrant. This enables the guns to be raised or lowered with ease. The back rest enables the gunner to assist the rotation of the revolving ring with his back.

Inasmuch as the mounting yoke for the gun is fitted with a universal joint, no fine adjustment of setting the airplane flexible gun mount is necessary when bringing the gun into

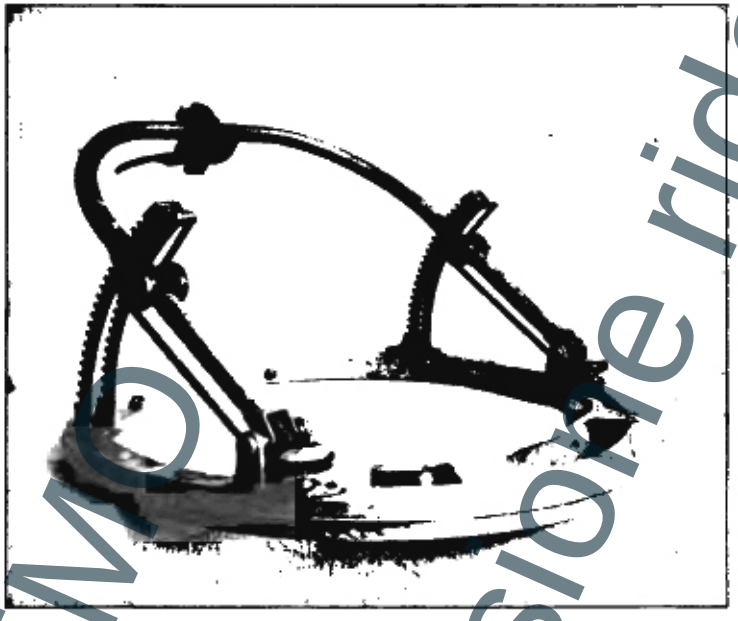


FIG. 24.—AIRPLANE FLEXIBLE GUN MOUNT, TYPE A.

action. Both single and double Lewis gun yokes are adapted for this mount.

SINGLE LEWIS GUN YOKE.

The single Lewis gun yoke (see figs. 25 and 26), is designed for adapting one Lewis gun to the airplane flexible gun mount, Type A. This yoke fits into the socket on the flexible gun mount and permits of the gun being swung through a greater arc, both in a vertical and horizontal plane. A friction sleeve, operated by a hand lever, locks the yoke in the desired position.

66715°—18——4

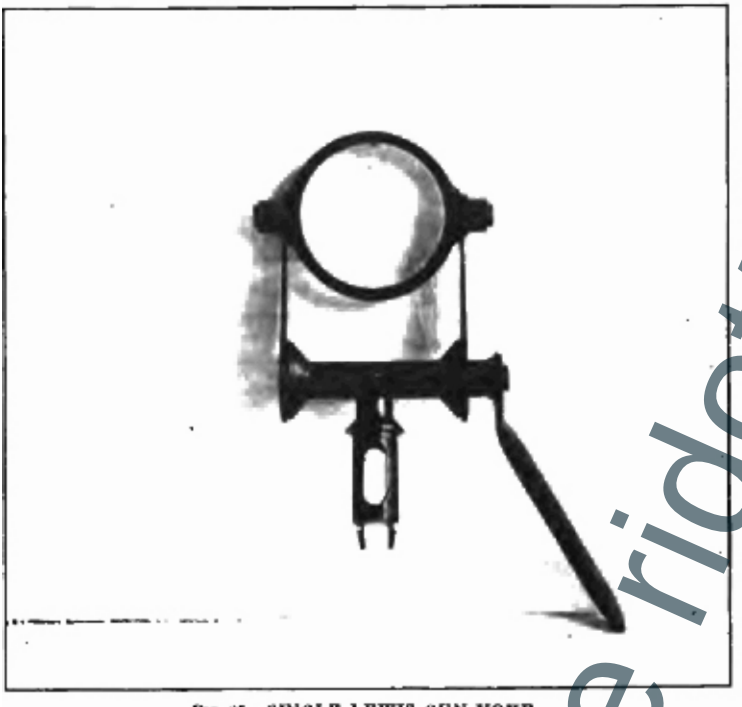


FIG. 25.—SINGLE LEWIS GUN YOKE.

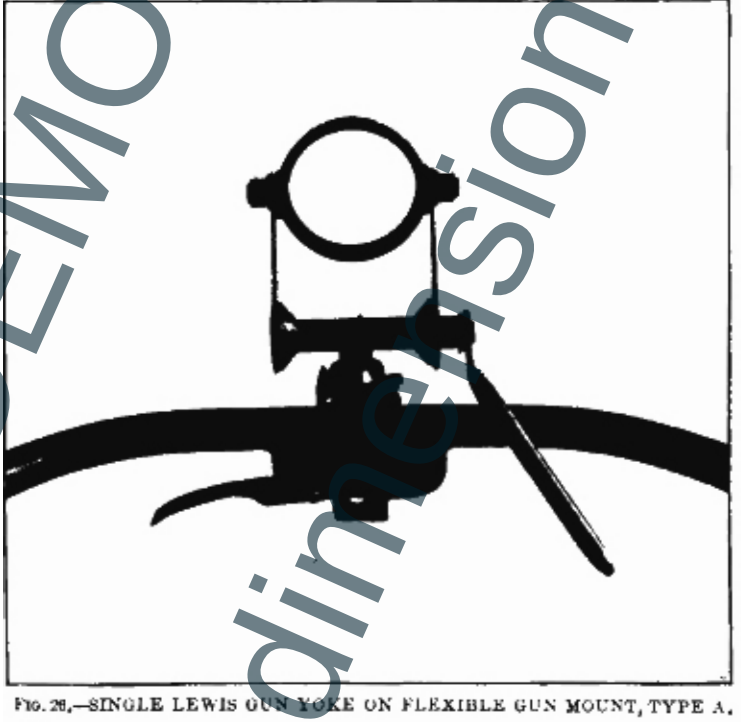


FIG. 26.—SINGLE LEWIS GUN YOKE ON FLEXIBLE GUN MOUNT, TYPE A.

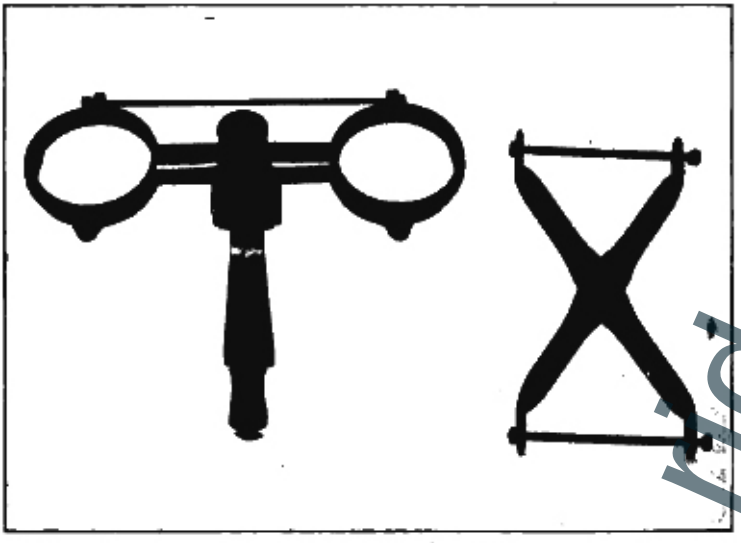


FIG. 26A.—Double Lewis Gun Yoke.

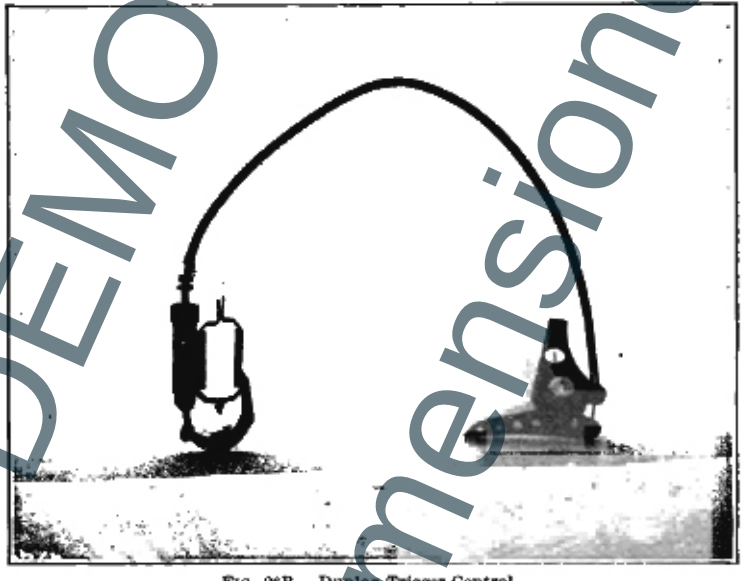


FIG. 26B.—Duplex Trigger Control.

DOUBLE LEWIS GUN YOKE.

The double Lewis gun yoke is designed for adapting two Lewis aircraft machine guns to the airplane flexible gun mount, as shown in figure 27. The yoke, which holds the two guns rigidly side by side, fits into the socket of the flexible gun mount and permits of the two guns being swung through a vertical arc of approximately 315° and through a horizontal arc of 90°, independent of the movement of the flexible gun

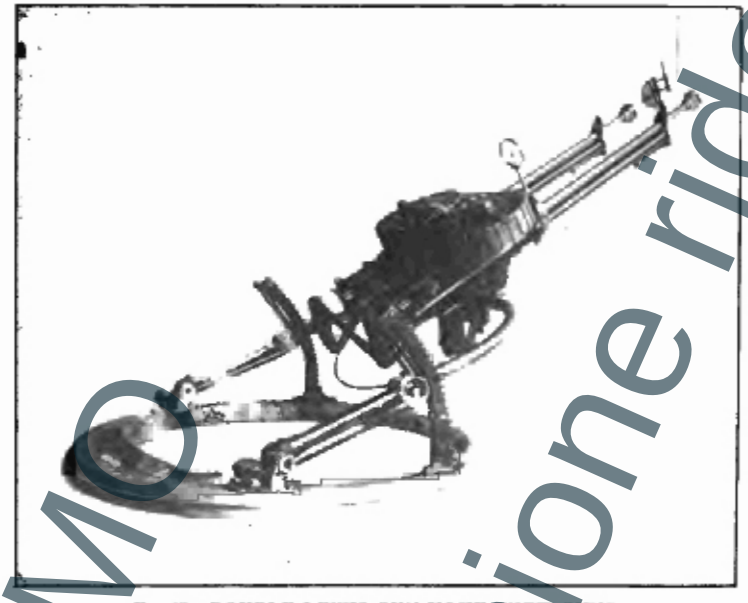


FIG. 27.—DOUBLE LEWIS GUN YOKE WITH GUNS.

mount. In addition to this, the two guns may be tilted to either side about 45°.

This yoke when used with the airplane flexible gun mount makes a very flexible combination, and taking into consideration the additional rate of fire and the increased efficiency of having two guns instead of one, this is an extremely effective and satisfactory mounting.

The Duplex trigger control connects the trigger of one gun by means of Bowden wire to a lever on the trigger guard of the second, so that the trigger of either gun, or both, may be released with one hand.

LEWIS MAGAZINE RACK.

The loaded magazines are carried on the DH–4 plane in a rack built in the rear of the gunner's cockpit and extending across the fuselage, as shown in figure 28. It is made of a

FIG. 28.—LEWIS MAGAZINE RACK.

sheet of aluminum, curved to fit the magazines, and fitted with wood separators forming compartments for eight magazines. A piece of elastic cord stretched between the sides of the fuselage in front of the rack holds the magazines in place and allows their quick removal.

WINCHESTER RIFLE, CALIBER .351.

The Winchester self-loading rifle, caliber .351, is sometimes used as an auxiliary weapon in aircraft. The action of the gun is semi-automatic as the name implies, and it is fed from a detachable box magazine holding five cartridges. One cartridge may also be carried in the chamber, giving a total of six shots.

The magazine is removed by releasing the magazine catch which extends from the lower edge of the right-hand side of the receiver, and is then loaded and replaced in the gun.

The first cartridge is then fed into the chamber by pressing in on the rod extending from the forward end of the forearm. The gun will now fire every time the trigger is pulled until the magazine is empty.

The safety consists of a small pin located in the forward part of the trigger guard. The gun is safe when the safety extends out from the right-hand side of the guard, and is made ready to fire by pressing the safety to the left.

COLT AND SMITH & WESSON REVOLVERS, CALIBER .45.

The Colt and Smith & Wesson revolvers have been made to handle the .45 caliber automatic-pistol ammunition. They may be used either as single or double action guns and each holds six rounds. In order to facilitate loading and ejection the cartridges are held in spring tempered steel clips each containing three cartridges, thereby making it possible to load the gun with two clips of cartridges. The clips are expendable and are ejected holding the empty shells. A shoulder in each chamber prevents the cartridges from dropping through when placed in the gun without the clips. In case this is done, however, it will be necessary to pull the empty shell out of the chambers, since there is no rim for the ejector to force against.

It should be remembered that the cylinder on the Colt revolver rotates in a clockwise direction, and that on the Smith & Wesson in a counterclockwise direction.

INDEX.

A.

	Page.
Aircraft ammunition	83
Aircraft ammunition, packing of	84
Airplane flare, Mark I	88
Armor-piercing ammunition	83
Incendiary	83
Tracer	84
Auxiliary sight	61
Ammunition, tracer	83
Ammunition, incendiary	83
Armorer's chest	14
Armorer's truck	15

B.

Bombs	66
Bombs, marking of	73
Bombs, packing of	74
Bomb-release mechanisms	75
Bomb sighting, theory of	79
Bomb sight, Mark I–A	81
Bombs, storage of	74
Books, list of reference	7
Browning machine rifle	92

C.

Cartridge gauges	85
C. C. interrupter gear	56
Colt revolver	93
Conversion tables	8

D.

Disintegrating link belts	42
Double Lewis gun yoke	52
Dummy bomb, Mark I	73

E.

Electric heater.	
For Lewis machine gun	31
For Marlin machine gun	20
For Vickers machine gun	37

F.

Fixed mounts	46
Flare, airplane, Mark I	88
Flare, wing tip, Mark I	89
Flexible mounts	47
Fragmentation bombs	69

G.

	Page.
Gauge, cartridge	85
Gauge, Lewis magazine	28
Gears, synchronizing	55
Gears, synchronizing mechanical	56
Guns, machine	10
Gun mounts	46

H.

Heaters, electric gun	20, 31, 37
High capacity drop-bombs	66
Hydraulic synchronizing gear	56

I.

Incendiary ammunition	83
Incendiary bombs	71
Interrupter gears	55

L.

Lewis aircraft machine gun	25
Lewis magazine racks	53
Lewis machine gun spares	31
List of reference books	7
List of bomb-release mechanisms	75
Loading handles, 30 Cal. Vickers	37

M.

Machine guns	10
Magazines, Lewis	27
Magazines, racks	53
Marlin aircraft machine gun	17
Marlin aircraft machine gun spares	22
Mechanisms, bomb release	75
Mechanical synchronizing gear	56
Metallic disintegrating link belts	42
Mounts:	
Fixed	46
Flexible	47
Machine gun	46
Sight	65

P.

Packing of aircraft ammunition	84
Packing of bombs	74
Pistol, 35 m/m aviation, Mark I	87
Post sights	61
Pyrotechnics	87

R.

Racks, Lewis magazine	53
Reference books, list of	7
Release mechanism, bomb	75
Release mechanism, list of	75