

Handbook No. 93800 G.

VICKERS
AUTOMATIC R.C. GUN, CLASS F.
OBSERVER'S GUN
FOR
AEROPLANES.

VICKERS LIMITED.

Vickers Automatic Rifle Calibre Gun.

(Class F.)

Special Features.

The Vickers Automatic R.C. Gun, Class F, is an air-cooled gun arranged to be supplied with ammunition from a drum-shaped magazine attached to the top of the gun.

The gun and ammunition being self-contained, this weapon forms a highly efficient arm for use in the gun cockpit of an aeroplane, where it is essential for the gun to be easily and freely manœuvred.

The magazine has a capacity of 97 rounds, and is easily attached to or removed from the gun.

The energy for working the gun automatically is obtained from the recoil of the barrel. Except for the feed, the action is the same as the well-tried standard Vickers R.C. belt-fed gun ; in fact, the recoiling parts, with the exception of the barrel, are exactly the same as the Vickers belt-fed R.C. gun.

An important feature is that, by the interchange of a few parts, the gun may readily be converted to a belt-fed weapon, and used by the pilot for synchronized fire through the propeller.

It will readily be seen that having both fixed and manœuvrable guns on an aeroplane of the same system, and having the majority of their components the same, fewer spare parts and tools are necessary, and instruction in the working and maintenance of the guns is simplified.

Note.—Since this gun is air cooled, it must be fired only in short bursts (not exceeding 100 rounds) on the ground, time being allowed for cooling between the bursts.

Vickers Automatic Rifle Calibre Gun.

(Class F.)

LIGHT MODEL FOR AEROPLANES.

General Description.

The gun may be considered as divided into three portions, the non-recoiling: the recoiling and the feed mechanism. It is worked automatically by two forces: the explosion of the charge, which forces the recoiling portion backwards, and a strong spring (called the fuzee spring) which carries it forward. The non-recoiling portion consists of the jacket and breech casing, and is attached to the aeroplane mounting by a trunnion pin.

NON-RECOILING PORTION.

Jacket.—The jacket around the barrel is of steel, perforated to allow the passage of air to keep the barrel cool when firing.

Breech Casing.—The breech casing consists of two outside plates, a bottom plate and a handle block, the whole being enclosed by two covers.

The outside plates are riveted to the jacket. In both plates are slots in which the crank bearings move, partly closed by filling-in pieces; on the inside of both are cams which control the path of the extractor. On the outside of the right-hand plate are the following fittings:—

Roller.—A roller, which revolves on a stud on the right filling-in piece, and is retained there by a washer

and a pin. On the outside of the left-hand plate are two studs for attaching the fuzee spring bracket.

Bottom Plate.—The bottom plate is riveted to the outside plates and carries a bracket in which a spring loaded plunger is fitted.

Handle Block.—The outside plates are connected at the rear end by a handle block, being held together by a screw pin which has a "T" shaped head to facilitate its removal. This pin is also used as a tool for assembling and disassembling the lock. The handle block is fitted with a pistol grip containing the trigger and safety catch.

Rear Cover.—The rear cover opens sideways, the cover hinges being on the left-hand side plate, parallel with the bore of the gun. The rear cover catch is on the top of the rear cover. It is operated by pressing inwards a spring-loaded plunger, to which is attached a lug which is thus disengaged from a corresponding hole in the right-hand side plate.

Running in slots on the underside of the rear cover is the trigger bar, which, when actuated by the trigger in the pistol grip, actuates the firing mechanism in the lock.

The trigger bar is kept in its normal position by a spring housed in the rear cover.

It will be seen that it is impossible to fire the gun by pulling the trigger if the rear cover should be open.

In the underside of the rear cover is a groove in which the top of the lock slides when the gun is working.

Attached to the inside of the rear cover, and projecting downwards, are the extractor guides, which, in conjunction with the cams on the side plates, control the path of the extractor.

A portion of the front of the rear cover is cut away in order that the lock may be actuated by a trigger motor should the gun be converted to fire ammunition fed by a belt for synchronized fire.

Trunnion Block.—The two side plates are connected together at their front extremities by a trunnion block which forms a bearing for the breech end of the barrel. A hole is drilled just beneath the barrel through both side plates and trunnion block, forming a bearing for the trunnion bolt, about which the gun is elevated or depressed. The jacket around the barrel is screwed in the front of the trunnion block.

Muzzle Attachment.—The muzzle attachment is screwed on the end of the jacket. It consists of a cylinder through which is a hole concentric with the bore of the barrel. Its object is to utilise the force of the escaping propelling gases from the barrel to increase the force of recoil and reduce the flash.

RECOILING PORTION.

The recoiling portion (which is mounted inside the non-recoiling portion) consists of the barrel and two recoil plates which carry the lock and the crank.

Barrel.—The barrel is formed with a square block at the breech end, and is provided with two studs (one at each side) called the barrel trunnions. By means of these trunnions the barrel is connected to the recoil plates. The muzzle end of the barrel is supported in the barrel sleeve.

Recoil Plates.—The recoil plates are each provided with a hole to receive the barrel trunnions, and also guides in which the flanges of the lock move. The left recoil plate is extended towards the front, and is formed at its end like a hook; this hook engages with the connecting link which operates the feed plate.

Crank Bearings.—The recoil plates each have a bearing through which the crank axis passes, thus connecting the latter with the barrel; these bearings move in slots in the breech casing.

Extractor Holding-up Springs.—The recoil plates are fitted with extractor holding-up springs near the barrel, the use of which is explained later.

Crank.—The crank is fitted on the right with a handle, the upper surface of which bears on the roller, and is of a special curved form; on the left it is fitted with a fuzee to which are attached two links. These links form the connections between the crank and the fuzee spring. The remainder of the crank is inside the breech casing.

Connecting Rod.—In the centre of the crank is a connecting rod which is free to revolve on the crank pin.

Fuzee Spring.—On the left of the breech casing is a strong spiral spring called the fuzee spring, the rear end of which is connected (as before described) with the crank, and the fore end is attached to the breech casing by means of the fuzee spring bracket and adjusting screw.

The action of recoil extends the fuzee spring and winds the links, which are attached, to it about the fuzee; so that when the crank handle is right forward, the fuzee spring is not only extended about one inch by the recoil of the barrel, but the winding of the links on the fuzee causes a still further extension.

As soon as the recoil is exhausted, the action of the fuzee spring is to pull the recoiling portion into the firing position, and to unwind the links from the fuzee, thereby causing the crank handle to fly back.

Lock.—The lock consists of the following parts :— frame, side levers, extractor, firing pin, safety sear with spring, tumbler, extractor levers, hand sear and lock spring, also axis pin for side levers, tumbler and hand sear. The axis of the safety sear is a part of the lock frame. The lock is attached to the connecting rod by a bayonet joint and, when in firing position, closes the breech. In this position it is held by the side levers, the crank (which bears against guides on the recoil plates) and connecting rod. The lock has a reciprocating motion communicated to it by the rotation of the crank, and is kept in position, during its backward and forward movements, by means of flanges working in guides on the recoil plates and by the grooves underneath the cover.

Extractor.—The extractor is attached to the fore end of the lock by guide ribs, upon which it slides, and is fitted with gib, gib spring and shutter. The projections on the gib, together with the cartridge grooves, form recesses which retain the cartridge in position.

Side and Extractor Levers.—The extractor is moved upwards by means of the side levers and extractor levers; and, when in its highest position, is retained there by means of two extractor holding-up springs, which ensure the hole for the firing pin being opposite the centre of the base of the cartridge when the lock is home.

The upward and downward movements of the extractor are regulated by guide ribs and stops; the upper and lower stops form part of the lock casing; the lower one regulates the drop of the extractor by limiting the travel of the extractor levers.

Feed Mechanism.

Magazine or Drum.—The magazine consists of a steel, pan-shaped drum, in the centre of which is an

aluminium casting which fits over the magazine post on the gun, and is held thereon by a catch on the drum engaging with a groove in the magazine post. The cylindrical wall of the pan is indented internally, with vertical grooves of sufficient width, to receive the base of the cartridge. To the intervening projections between the grooves, metal strips are riveted, the edges of which retain the base of the cartridge against the wall of the pan.

These grooves and projections cause corresponding grooves and projections on the outside of the pan which, when on the gun, are engaged by pawls.

The cartridge cases are also held in position by a series of pegs, which project downwards from the top of the pan.

The aluminium centre has an irregular, helical groove cut around its sides, into which the bullet ends of the cartridges project.

The pan is rotatable around the centre piece, but an automatic catch (actuated by the same lever that operates the catch holding the drum on the gun) prevents this when the drum is removed from the gun.

A convenient leather handle is provided for lifting the drum.

Feed Block.—The feed block is fitted over the breech end of the barrel. Its object is to present cartridges so that they may be readily removed by the extractor. A spring-loaded plunger is provided to retain the cartridge in position when the gun is elevated.

Cover Plate.—The cover plate is hinged to the gun by a pin passing through the side plates over the rear

of the feed box. It is held down by a catch, operated by pressing a knob on the left-hand side of the gun in front of the feed block, thus moving to the right an interrupted pin to disengage it from two lugs on the underside of the cover plate. Mounted upon the cover plate is the magazine post, the base of which forms an axis for the feed plate, which is oscillated by a connecting link mounted underneath the cover plate. The connecting link projects downwards into the gap in the recoil plate. The movement of the recoil plates is therefore transmitted to the feed plate.

Mounted upon the cover plate is the cartridge guide, which consists of a bracket containing the cartridge guide spring. The cartridges are guided by this device from the drum, through a slot in the cover plate, into the feed box.

Actuating and Retaining Pawls.—Mounted upon the feed plate, towards the rear, on the right-hand side, is the actuating pawl, which engages with grooves in the side of the magazine. On the cover plate are two retaining pawls, which also engage with the magazine grooves; one pawl is mounted towards the rear on the left-hand side, and the other, pointing in the opposite direction, at the front of the cover plate. This pawl is disengaged from the drum by a projection upon the feed plate.

Feed Pawl.—Mounted under the feed plate is the feed pawl, which, after the cartridge is placed in the feed box, pushes it into position opposite the extractor.

Action of Mechanism.

Action on Recoil.—Suppose the gun to have just fired, the explosion causes the recoiling portion to move backwards through a distance of about one inch, thereby causing the tail of the crank handle to press

against the travel under the roller, imparting a quick, upward movement to the handle, thus rotating the crank (thereby drawing back the lock); thus the greatest portion of the energy of recoil is transferred to the crank. When the lock moves backward, the extractor extracts the empty case from the barrel, and withdraws a fresh cartridge from the feed block. The extractor is kept in position by means of its horns, which move along the upper surface of the cams, inside the breech casing, until the cartridge is clear of the feed block. When it reaches the rear end of these cams, it is deflected downwards by the action of the guides, thus bringing the cartridge, drawn from the feed block, in line with the barrel, and ejecting from the gun the empty case drawn from the barrel.

Action of Fuzee Spring.—When the force of recoil is expended, the action of the fuzee spring comes into play, carrying the recoiling portion forward, and revolving the crank by the unwinding of the fuzee links, thereby forcing the lock to the front. As the recoiling portion travels forward, it moves the feed block slide to the left, and thus brings up automatically a fresh cartridge into position in the feed block.

Forward Movement of Lock.—As the lock moves forward into the firing position, the live cartridge is placed in the barrel chamber, and the empty case ejected. The extractor is moved upwards by the side levers acting on the extractor levers, thereby ejecting the empty case, also causing the live cartridge to slide over the gib until opposite the firing pin hole, and engaging a fresh cartridge which has been automatically moved into position in the feed block.

Final Movement of Lock.—The extractor reaches its highest position before the side levers have finished their travel; so that, during the latter part of their movement, their points press against the inclined

surface of the bents on the extractor levers, thus giving an additional forward motion to the lock, and thereby tightening up all the joints in the breech mechanism, and supporting it firmly against the breech at the instant of explosion.

Cocking Action.—The turning of the crank handle to the rear not only draws the lock away from the barrel, but also gives an upward motion to the connecting rod and rear end of the side levers, which latter, bearing on the tail end of the tumbler, rotate it on its axis; and the head of the tumbler, being engaged in a recess in the firing pin, forces the latter to the rear, compressing the lock spring. When the bent of the tumbler has moved below the bent of the hand sear, the latter is forced to engage with it by the action of the lock spring, and it thus holds the tumbler in cocked position. The continued motion of the tumbler carries back the firing pin until the safety sear (which is below, and is acted upon by the safety sear spring) is forced into the bent of the firing pin and retains it. The firing pin is thus prevented from flying forward by two actions, viz., that of the safety sear and that of the hand sear.

Firing Action.—On the crank handle returning, the lock moves to the front, and the connecting rod and rear end of side levers have a downward motion; so that when the lock is in the forward position, the latter depresses the safety sear, thereby disengaging it from the firing pin, which then moves slightly forward till stopped by the bent of the tumbler engaging the bent of the hand sear. If now the trigger is pulled, the trigger bar is drawn backwards, and, at the same time, a projection on the latter engages and draws with it the tail end of the hand sear, thereby releasing the tumbler; the lock spring then propels the firing pin on to the cap and explodes the cartridge. If pressure on the trigger is maintained as the lock moves forward, the upper end of the hand sear comes

in contact with the projection on the trigger bar, and its bent is thus withdrawn from the tumbler before the extractor has reached the firing position; the firing pin is therefore held by the safety sear only; and when the latter is depressed by the rear end of side levers, it is released, and is thrown forward on to the cap by the action of the lock spring. The release of the safety sear from the firing pin is so timed that it cannot take place until after the lock is in the firing position, and has been tightened up against the breech by the last movement of the crank, which causes the points of the side levers to engage the inclines on the bent of the extractor levers, as above described.

Action of Feed Mechanism.—When the barrel recoils, the lug on the left-hand recoil plate actuates the connecting link, thus causing the feed plate to move about its axis in an anti-clockwise direction through the medium of the connecting link. The actuating pawl on the feed plate slips over the projection around the drum, and engages with a groove. At the same time the front retaining pawl is brought out of engagement with the drum, by reason of the projection of the feed plate. On the return of the barrel, the feed plate returns to its original position; the actuating pawl being in engagement with the drum, the drum rotates with it a distance equal to the pitch of the grooves around its periphery. The drum is now held in this position by the retaining pawls on the cover plate. The rotation of the drum causes a cartridge to be forced out of the end of the helical groove in the drum centre, under the cartridge guide in the cover plate, and into the feed box. The cartridge is then pushed into the centre of the feed box by means of the feed pawls on the feed plate, where it is ready to be withdrawn by the extractor.

General Instructions.

Experience has shown that during ordinary firing the pieces most susceptible to wear are the firing pin and mainspring.

If, during a prolonged firing, a part such as the lock becomes worn out or damaged, it should be removed and replaced by the spare lock—an operation which only takes a few seconds. If, however, the lock is subsequently made fit for use by replacing the part worn out by a new part taken from the set of spare parts, it should be put back into use, and the spare lock (if still in good condition) should be returned to the spare part box.

To Load the Gun.—First, place the drum on the magazine post and turn clockwise until it stops. See that the drum is firmly held on the gun by the catch. Push loading plunger under the gun with left hand and turn crank handle until the tail is in contact with it. Continue to pull until the tail slips past the plunger which is still pushed with the left hand. Release the crank handle. Repeat the above operation and the gun is ready for use.

To Unload the Gun.—Operate crank handle twice without touching the loading plunger. During this operation, it is advisable to set the safety catch to "safe."

To Remove and Replace the Lock.—To remove the lock, open the rear cover, turn the crank handle as far to the rear as possible, and see that the extractor drops; then take hold of the upper extractor stop and raise the lock, allowing the crank handle to return slowly back; then, if there are any live cartridges in the extractor, remove them (while the latter is down); now seize the lock in front, give it one-sixth of a turn to either side, and lift it out.

When the lock is out of the gun, and it is necessary to release the lock spring, great care should be taken before doing so to see that the extractor is at the highest point. The firing pin hole will then be in line with the firing pin.

To replace the lock, see that the connecting rod is upright, then, after giving the lock one-sixth of a turn to either side, slip the rear end of the side levers over the end of the connecting rod as far as it will go, turn the lock to the front and lower it into the breech casing while turning the crank handle over to the rear; see that the lock flanges are engaging in their guides in the recoil plates, and let go the crank handle.

To Remove and Replace Feed Block.—To remove the feed block, lift up the cover plate; the feed block can then be lifted out by pulling it vertically upwards.

To replace the feed block: lift up the cover plate, and push the feed block down into position. It is unnecessary to remove feed block to remove barrel.

To Remove and Replace Fuzee Spring Bracket.—To remove the fuzee spring bracket, press forward until the lugs on it are clear of the keeper studs on the breech casing, then disconnect the fuzee links and remove the bracket with spring.

To replace the fuzee spring bracket, reverse the foregoing operations.

To Keep the Gun in Working Order.—Before taking a gun into action, the surfaces, on which all movable parts work, should be thoroughly well oiled, with anti-freezing oil, especially the following:—

(a) Bearing parts of barrel and all recoiling portions.

(b) The lock guides on the recoil plates, also the working parts of the lock itself. These include the internal components, which can be lubricated through the opening on the upper surface of the lock casing; and, in addition, the external parts, such as the levers and extractor.

(c) Faces of feed block, cartridge guide, feed plate and connecting link.

(d) Bearings of the crank, as far as they can be reached without stripping the gun.

Testing Friction of Recoiling Portion.—In order to see that the recoiling portion works freely, remove the fuze spring bracket, take out the lock, turn the crank handle upwards, take hold of it with the right hand and the fuze with the left, slide the recoiling portion backwards and forwards to see that it moves easily and also that the barrel goes right home.

Testing Weight of Fuze Spring as measured on the Crank Handle.—Weigh the fuze spring with the spring balance, proceeding as follows:—First, open the rear cover and remove the lock, then place loop of spring balance upon the knob of crank handle, and pull vertically upwards; the reading indicated, when the crank handle COMMENCES to move, will be the weight of the fuze spring as measured on the crank handle.

Points before Flight.

(a) Examine the barrel and see that the bore is clear. This can be easily done by removing the lock, and looking through the bore after the handle block has been turned downwards for the purpose.

(b) See that the spare lock is close at hand in case of need.

(c) Examine the ammunition and see that it is of the proper description, and that the drums are correctly filled with it.

Ranging the Gun.—If possible, a few rounds should be fired rapidly, and the results carefully watched through a glass. Groups of 15 to 30 rounds will be found effective.

Points to be attended to During Firing.

(a) That the drum is on no account to be handled when the gun is firing.

(b) See that the drums are refilled without delay.

Points to be attended to after Flight.

(a) That the gun is unloaded and drum removed.

(b) That the safety catch is in the safe position.

(c) That the barrel is cleaned out and oiled immediately after firing to prevent erosion.

(d) That the lock spring is released.

(e) That in collecting the empty cases there are no live cartridges amongst them.

(f) That the lock is taken out and the extractor, firing pin, and springs are examined to see that they are not damaged.

(N.B.—*It will not be necessary to strip the lock for this.*)

TO STRIP AND ASSEMBLE THE GUN.

To Strip the Gun.—Press cover plate catch pin, lift cover plate, and lift out feed block.

Open rear cover and remove lock.

Press fuze spring bracket forward and take off fuze spring, disconnect the fuze spring from the fuze and remove fuze from crank.

Unscrew and remove the " T " pin which fixes the back block, and turn down the back block.

Pull out filling-in pieces, right and left.

Draw out the barrel and recoil plate from the rear.

Unscrew the nut of the cover plate axis pin, withdraw this pin, and remove the cover plate.

Withdraw hinge pin from hinges on left-hand side plate, and remove rear cover.

Unscrew and remove the axis pin of the handle block, and remove handle block.

Withdraw the split pin from the roller collar and remove collar.

To Assemble the Gun.—Reverse the foregoing operations.

To Strip the Lock.—Remove the lock from the gun and, with the " T " pin from the back block, press out the side lever axis pin and spring pin ; remove the side levers, extractor levers, and slide off the extractor. Press the safety sear down and fire the lock ; then press out the tumbler axis pin and remove the tumbler ; press out the hand sear axis pin and remove the hand sear and the main spring ; press the safety sear down, and shake out the firing pin ; then raise the safety sear, unhook the same, and remove it. Push out the gib shutter on the extractor, and remove the gib spring and the gib.

To Assemble the Lock.—Insert the gib and its spring in the extractor and slide on the gib shutter. Slide the extractor on to the lock frame, insert the safety sear and the firing pin, place the tumbler and its axis pin, place the hand sear and its axis pin, and put on the extractor levers. Put on the side levers and secure them with their axis pin, then ease the firing pin right forward, insert the main spring and push it into place.

The Care and Preservation of Vickers Machine Guns.

It is very important that the bore and chamber should be oiled immediately after firing to prevent erosion.

Oil to be Used for Cleaning.—When cleaning the gun, turpentine or oil should be used ; on no account should emery cloth or any abrasive substance be used. It is a good plan before assembling the gun to try the parts in their place separately to see that they work freely.

Examination of Components after Practice.—The following course should be pursued after practice. The locks should be taken out, the extractors, firing pins, and springs should be examined to ascertain that they are all correct. It will not be necessary to strip the lock for this.

Monthly Examination.—Every machine gun should be thoroughly examined every month and left in a properly lubricated and serviceable condition.

The following parts should therefore be removed, properly cleaned, and re-oiled or greased :—

Lock, feed block, feed mechanism fuze, sprin

bracket and spring, handle block, filling-in pieces, muzzle attachment, barrel and recoil plates.

(N.B.—*It will not be necessary to strip any of these parts.*)

Object of Spare Lock.—The spare lock is provided to readily replace the one in the gun in the event of a broken spring or firing pin point. The exchange of locks can be so readily effected that the gun is only a moment out of action.

Failures that may Occur and how to Remedy them.

The following system is based on the fact that the Vickers Automatic Gun has the advantage of having all its mechanism in two principal components, namely, the feed block and the lock.

The feed block can be cleared readily in the event of a stoppage, but should the fault lie with the lock it is so easy to remove and replace with the spare one that this is the usual course to adopt.

When a stoppage occurs it is only necessary to know which of the two named parts is responsible and to act as suggested. Stoppages during firing may be classed under two headings.

(1) Temporary, which are due to:—

(a) Failure in the lock or faulty ammunition.

(b) Some cause which can generally be avoided by a high standard of training and a thorough knowledge of the gun by the firer.

(2) Prolonged, which are due to failure to some part which cannot be put right in the air, and which necessarily puts the gun out of action for a more or less prolonged period.

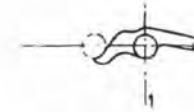


Diagram 1 shows the crank handle with the lock in the home position, and if the gun stops in this position, indicates:—

1. (a) Misfire.
- (b) Empty barrel.
- (c) Broken firing pin or main spring.
- (d) Defective ammunition.

To remedy, function the gun with the loading plunger in operation; by this action the defective cartridge, if any, is ejected, and a fresh one put into the chamber.

If this fails, the lock should be removed and replaced by the spare one.

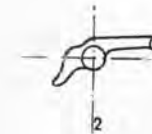


Diagram 2 shows the crank handle, with the lock nearly in the home position, and indicates that the extractor is unable to rise to its highest position owing to a light fuzee spring, want of oil, or faulty feed.

To remedy, strike down sharply on the crank handle with a glancing blow to prevent injuring hand. If this fails, raise the crank handle slowly until the horns of the extractor are retained by the recess in the cams. The feed block should then be examined. Allow crank handle to go forward and fire.

If both fail, examine feed block. The probable cause of the failure is due to the cartridge not passing freely through the feed block, or it may be due to faulty use of the loading plunger.

Pull the crank handle fully back with loading plunger in operation and let go.

If this fails, it is possible that a broken gib or gib spring is the cause. In this case the lock must be removed and replaced by spare one.

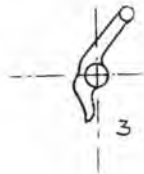


Diagram 3. This stoppage is probably due to a separated case. The front portion of the case is telescoped on to the next cartridge in the chamber.

To clear, raise rear cover, draw back crank handle and holding-up lock, push out cartridges from the extractor by butt end of clearing plug, close rear cover, release crank handle. Reload with the loading plunger in operation.

If the separated case remains in the chamber the clearing plug must be used.



Diagram 4. This is due to defective ammunition, such as weak charge or deteriorated ammunition, or excessive friction due to congealed oil.

To clear after a stoppage, pull back the crank handle on to the roller and let go. If failure recurs repeat until gun is warmed up.

It is obvious, to clear stoppage in the air, the gunner must be thoroughly trained in the mechanism of the gun and the causes of the various stoppages. In order to minimise the causes of stoppage the ammunition should be carefully tested, and only correct rounds should be filled into the drums.

The following extremely unlikely events would cause prolonged stoppages:—

- (1) Loose or broken muzzle attachment.
- (2) Broken fuzee or fuzee spring.

Points to be Observed Before, During and After a Flight.

- (1) See that the barrel is clean and dry.
- (2) *Oil the frictional parts lightly with a non-freezing lubricant, samples of which will be supplied on application.*
- (3) Check the weight on the crank handle with the spring balance. This must not exceed 6.5 kgs.

(4) Inspect the muzzle attachment. This should be clean and screwed on tightly.

(5) See that the drums are correctly filled.

(6) See that the sights are correctly adjusted and aligned.

(7) See that the clearing plug and spare lock are handy.

(8) See that the gun is ready loaded, and, if possible, fire a few rounds before commencing a flight.

During flight, fire occasional bursts to prevent the working parts becoming clogged by congealed oil. The gun should be unloaded before landing.

After Flight.—See that the gun is unloaded.

Remove recoiling portions, thoroughly clean and re-oil. Clean non-recoiling portion, removing clogged oil by means of spirits of turpentine or similar medium. Then re-oil.

Re-fill ammunition drums.

Examine sights.

Any defects, which have been noted during flight, should be immediately remedied.

Vane Sight

FOR

Vickers Automatic R.C. Gun

(Class F).

Correct sighting in the air requires judgment, experience and training, far beyond the ordinary ground service needs. Whereas the ground gunner is stationary while firing, the aerial gunner fires from a quickly moving platform, which moves at varying speeds from 50 to as much as 150 miles per hour. Then the ground target is more often stationary, or if not, the movement is comparatively slow and regular; whilst for aerial combat, the target is fast and always altering its position. On the ground, the range can be obtained by various well-known means; in the air, the gunner must depend mainly upon judgment, and training to estimate the rapidly changing range and direction, which prevents any preliminary calculation being of use, as the gunner's opportunities in the air occur suddenly and are of brief duration.

The Vickers Automatic R.C. Gun, Class "F," is generally fitted to a mounting, so that it may be freely elevated, depressed and traversed. As a result the gun commands a large field of fire, thus the sighting principles are somewhat more complicated than is the case with the Vickers Class "E" or "G" guns, which are rigidly attached to the aeroplane. In this case the line of sight always coincides with the line of flight. In the case of the Class "F" Gun, the target may be presented to the gunner in several ways, viz. :—

(1) It may be flying directly towards or away from him along his own line of flight.

(2) It may be flying along a line making an angle with that of his own, but such that his gun can be pointed along his own line of flight.

(3) It may be flying along a line parallel to his own line of flight.

(4) It may be flying along a line making an angle with his own, but in such a way that his gun cannot be pointed along his own line of flight.

In the first case, the gunner takes direct aim at the mark just as if it were stationary, for the target is always in the line of fire.

In the second case, it is necessary to take into consideration the speed of the target. The gun must be pointed in front of the target so that the bullet and the target arrive together.

The ring-sight fitted as a back-sight on the Class "F" Gun, automatically allows for the movement of the *target* along any line of flight at any practicable range.

For a detailed explanation of the ring sight, see Vickers Ltd. Handbook No. 89890G. on the Class "E" Gun.

In cases 3 and 4, however, another factor must be taken into consideration, the speed of the gunner's own aeroplane.

When the bullet is fired at an angle to the gunner's own line of flight, it is under the influence of two distinct forces when it leaves the gun. The propelling gases of the exploded charge gives it a muzzle velocity of, for example, 2,440 feet per second. At the same time, the momentum of the aeroplane from which the gun is fired imparts a force to the bullet in the direction

of the line of flight. The resultant effect is that the bullet is projected along a line oblique to the line of fire. The path of the bullet varies according to the angle between the line of flight of the aeroplane and the direction in which the gun is pointed.

The Vane Sight automatically makes allowance for the speed of the gunner's aeroplane. It consists of a pillar, which is free to rotate on a pivot attached to the muzzle, end of the gun. On one side of the pillar is mounted a bead, on the other side a pair of vanes. The bead support and the vanes are connected together by an arm, pivoted to the rotating pillar and the bead support.

In addition, the rotating pillar and the bead support are connected by another pivoted arm, in order that they may be always parallel to each other. The vanes are acted upon by the slip stream, causing the axis of the sight to be always parallel to the line of flight of the machine, no matter in what direction the gun is pointed.

The ratio of the distance between the ring-sight and the vane-sight, and the length of the pivoted arms between the rotating pillar and the bead support, is proportional to the muzzle velocity of the bullet and the speed of the aeroplane.

In using the sight, the bead is always aligned on the centre of the smaller ring, and the target viewed in the ring as with the fixed "Ring and Bead" Sight.

Nomenclature.

1. Lock Frame.
2. Safety Sear.
3. Safety Sear Spring.
4. Safety Sear Axis Pin.
5. Firing Pin.
6. Tumbler.
7. Handsear.
8. Handsear Axis Pin.
9. Main Spring.
10. Lifting Levers (Extractor Levers).
11. Lifting Levers and Tumbler Axis Pin.
12. Lower Stop for Extractor.
13. Side Levers.
14. Side Levers Axis Pin.
15. Side Levers Axis Pin Spring Pin.
16. Extractor.
17. Horns of Extractor.
18. Upper Stop for Extractor.
19. Groove for Extractor Holding Up Spring.
20. Gib.
21. Gib Spring.
22. Gib Spring Shutter.
23. Connecting Rod.
24. Connecting Rod Adjusting Nut.
25. Connecting Rod Adjusting Washer.
26. Crank.
27. Crank Pin.
- 27*a*. Crank Pin Securing Pin.
28. Crank Axis.
29. Crank Handle.
30. Crank Handle Knob.
31. Crank Handle Securing Screw.
32. Fuzee.
33. Fuzee Links.
34. Fuzee Spring.
- 34*a*. Fuzee Spring Hook.
- 34*b*. Fuzee Spring Nut.
35. Fuzee Spring Tension Screw.
- 35*a*. Fuzee Spring Tension Screw Vice Handle.
36. Recoil Plate (R.H.).
37. Extractor Holding Up Spring (R.H.).
- 37*a*. Guides on Recoil Plate for Lock.
38. Recoil Plate (L.H.).

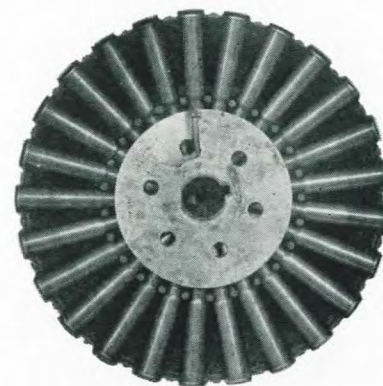
39. Extractor Holding Up Spring (L.H.).
- 39*a*. Rivets for Extractor Holding Up Springs.
- F40. Barrel.
- F41. Feed Block.
- F43. Cartridge Retainer.
- F44. Cartridge Retainer Spring.
- F45. Cartridge Retainer Securing Screw.
- F47. Cartridge Guide.
- F48. Cartridge Spring.
- F48*a*. Cartridge Spring Hinge Pin.
- F53. Cover Plate Hinge.
- F55. Back Block.
- F56. Grip Frame.
- F56*a*. Grip.
57. Handle Block Hinge Pin.
- 57*a*. Handle Block Hinge Pin Nut.
58. Handle Block Fixing Pin.
- F59. Trigger.
- F60. Trigger Axis Pin.
- F60*a*. Trigger Axis Pin Catch.
- F61. Actuating Bar.
- F62. Frame Bolt (top).
- F63. Frame Bolt (bottom).
- F63*a*. Frame Bolt Nut.
- F64. Safety Catch.
- F65. Safety Catch Axis Pin.
- F66. Actuating Bar Spring.
- S67. Rear Cover.
- S67*a*. Rear Cover Hinge, Part I.
- S67*b*. Rear Cover Hinge, Part II.
- S67*c*. Rear Cover Hinge Pin.
- S68. Rear Cover Catch.
69. Rear Cover Distance Piece Pin.
- S69*a*. Rear Cover Distance Piece.
70. Rear Cover Catch Spring.
- S70*a*. Rear Cover Catch Pin.
- S70*b*. Rear Cover Catch Bracket.
71. Lock Frame Grooves in Rear Cover.
72. Extractor Guides on Rear Cover.
73. Cover Plate Hinge Axis Pin.
- 73*a*. Cover Plate Hinge Axis Pin Collar.
- 73*b*. Cover Plate Hinge Axis Pin Collar Pin.
74. Trigger Bar.
75. Trigger Bar Spring.
76. Trigger Bar Projection.
- F77. Cover Plate.
- F78. Cover Plate Catch.

- F78a. Cover Plate Catch Cap Pin.
- F78b. Cover Plate Catch Spring.
- F78c. Cover Plate Catch Cap.
- F79. Magazine Post.
- F80. Outside Plate (R.H.).
- F81. Outside Plate (R.H.) Filling-in Piece.
- F82. Cover Plate (R.H.) Side Cam.
- F83. Roller.
 - 84. Roller Collar.
 - 84a. Roller Collar Securing Pin.
- F88. Outside Plate (L.H.).
- F89. Outside Plate (L.H.) Filling-in Piece
- 90. Outside Plate (L.H.) Side Cam.
- S91. Fuzee Spring Bracket.
- F92. Bottom Plate.
- F93. Trunnion Block.
- F94. Jacket.
- F95. Barrel Bearing Bush.
- F96. Muzzle Attachment.
- 124. Hole for Trunnion Pin.
- 126. Slots in outside Plates in which Crank Bearings move.
- 127. Crank Bearing.
- F128. Loading Plunger.
- F129. Loading Plunger Knob.
- F130. Loading Plunger Spring.
- F131. Pin Actuating Stop Pawl.
- F132. Front Guide.
- F133. Pawl Stop Drum.
- F134. Actuating and Retaining Pawls.
- F135. Feed Plate.
- F136. Feed Pawl.
- F137. Connecting Link.
- F138. Bracket Feed and Retaining Pawls.
- F139. Spring Peg.
- F140. Pawl Spring.

VANE SIGHT.

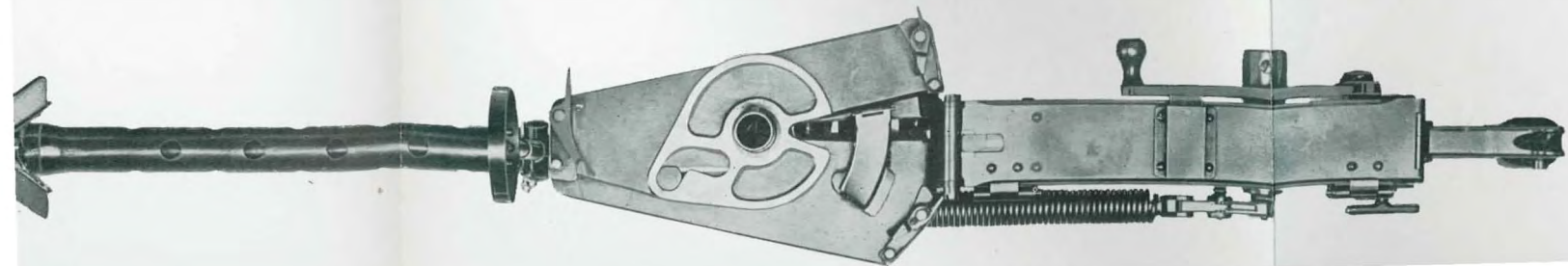
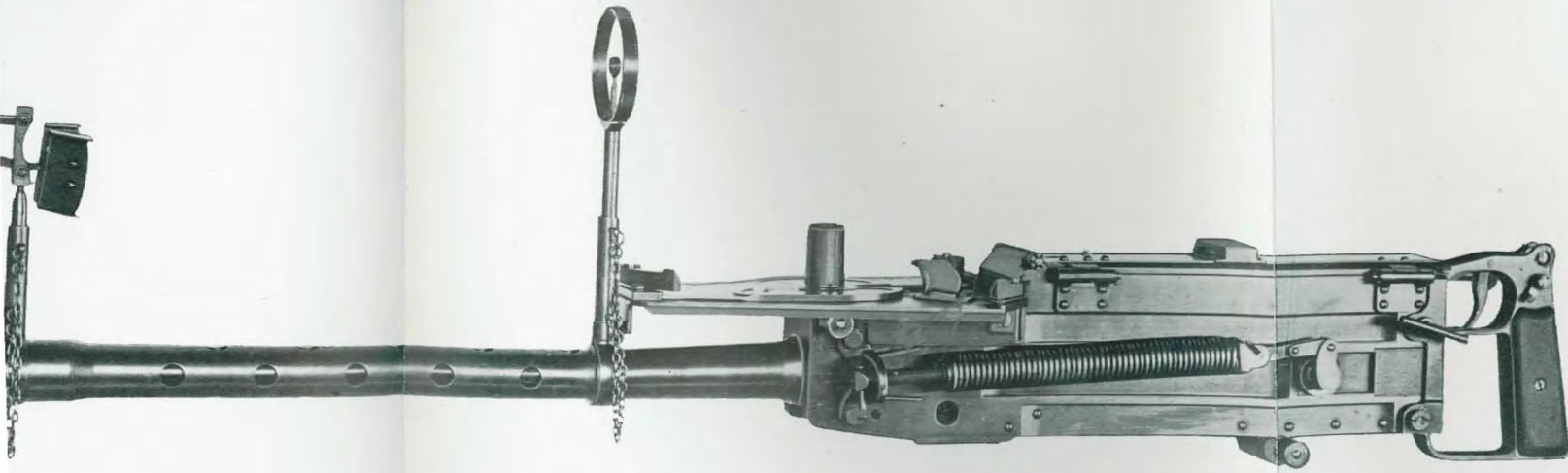
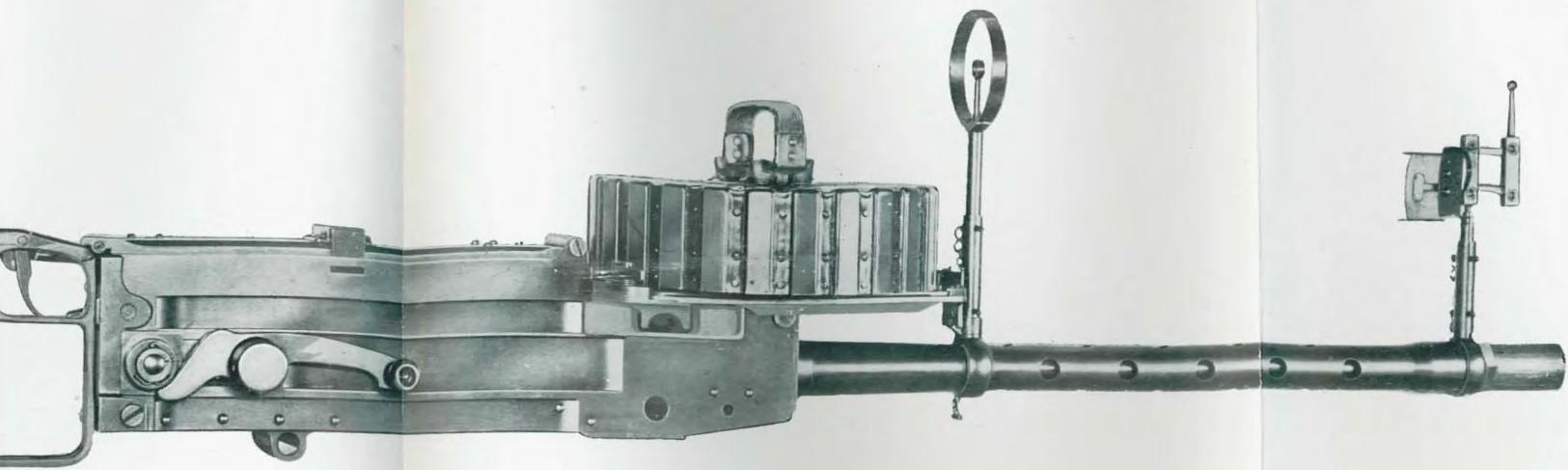
- F141. Foresight Pillar.
- F142. Foresight Bead Post.
- F143. Foresight Bead.
- F144. Foresight Upper Pivot Arm.
- F145. Foresight Lower Pivot Arm.
- F146. Foresight Stem.
- F147. Foresight Securing Ring.
- F148. Foresight Screws for Pivots.
- F149. Foresight Wind Vane.
- F150. Foresight Pivots.
- F151. Backsight Outer Ring.
- F152. Backsight Inner Ring.
- F153. Backsight Stem.
- F153a. Backsight Securing Ring.
- F154. Sight Stem Securing Screw.
- F155. Sight Securing Chain.

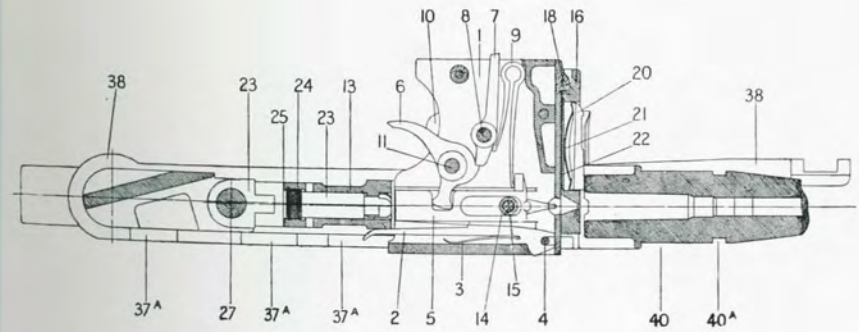
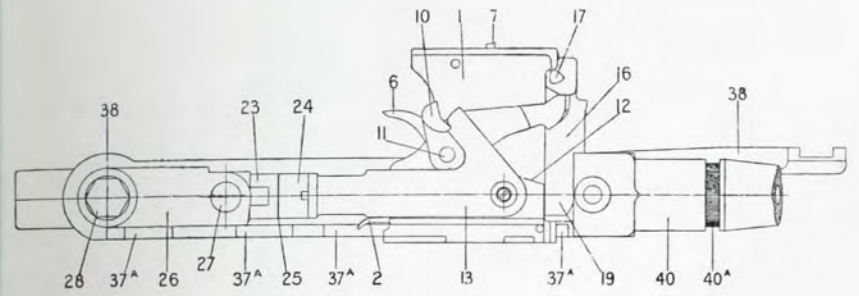
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CLASS F.
MAGAZINE.



VICKERS AUTOMATIC R.C. GUN, CLASS F.

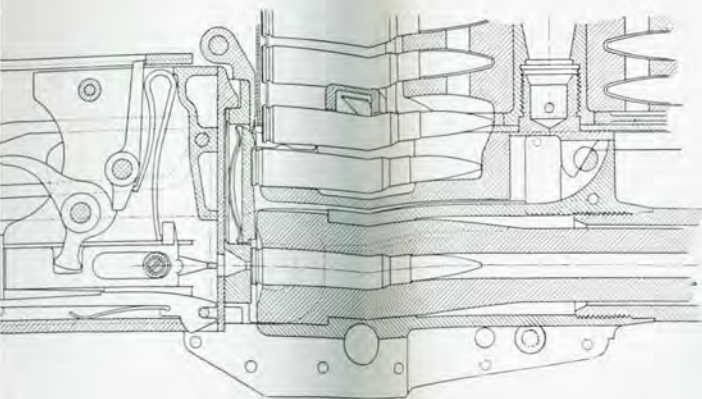
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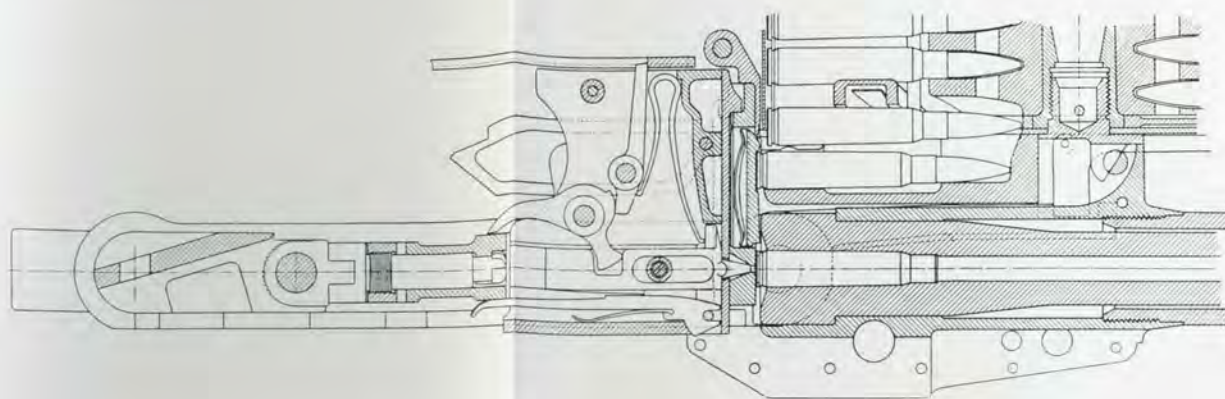
VICKERS AUTOMATIC R.C. GUN, CLASS F.

ACTION OF MECHANISM.



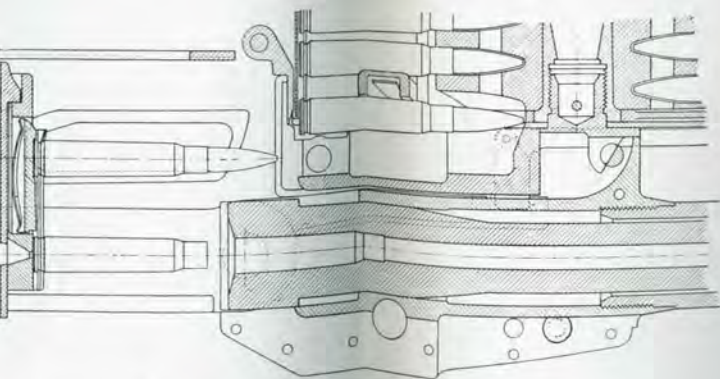
1.—Firing Position.

Lock fully home. Firing pin cocked on to handsear and extractor engaged with a live cartridge in the feed box and one in the barrel and one in the feed box.



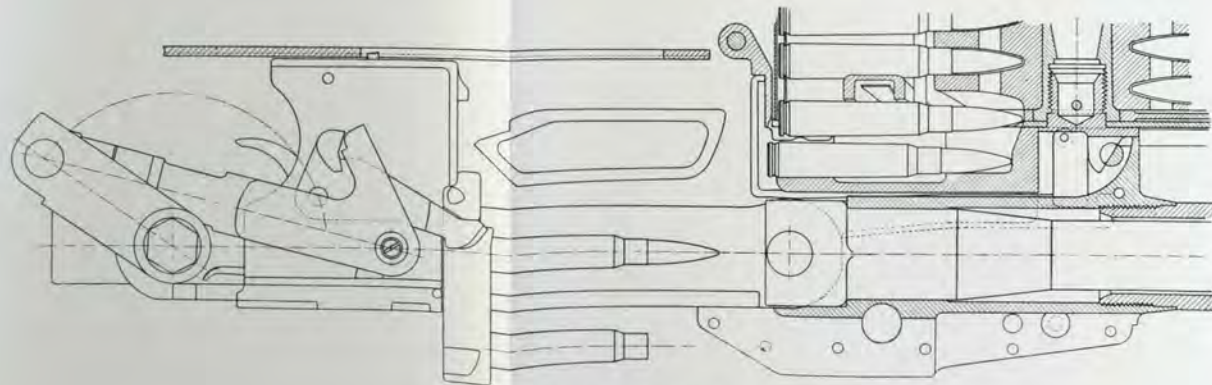
2.—Fired Position

Lock, barrel and recoil plates fully home, firing pin released and the extractor engaging with a live cartridge in the feed box and with the empty case in the barrel.



3.—Recoiling Position.

Firing pin released, and extracting the live cartridge from the feed box. Barrel and recoil plates fully recoiled and on the point of returning.



4.—Returning Position.

Lock fully recoiled and on the point of returning. Firing pin cocked on to safety sear. Extractor in dropped position bringing live cartridge in line with the chamber of the barrel. Barrel and recoil plates fully returned and new cartridge brought into feed box.