# PRELIMINARY PAMPHLET

FOR

# HEFAH (V) MACHINE GUN .303 INCH MARK I

ON THE TWIN MARK I MOUNTING

---

1943

---

H.M.S. Excellent,
Portsmouth.

## CONTENTS

Section 1. General Description of the Gun.

Section 2. Maintenance.

Section 3. The Mounting.

## PLATES

1. The Gun in operation

2. Mounting

3. Magazine

## SECTION I

### General Description of the Gun

This gun is of the light automatic class, is gas operated and fires all standard types of .303 inch ammunition.

The rate of fire is approximately 550 - 650 rounds per minute.

No cooling arrangements are provided.

The gun is fed by a Bren type drum magazine which is loaded with 99 rounds.

The rounds must be lightly coated with Cooper's grease No. 4 or D.T.D. 143C grease.

2. The easiest way to give ammunition a light and even coating of grease is as follows:-

Take a piece of cloth about two feet square and smear a handful of grease over it. Twist the cloth so that the grease is distributed over the whole of the cloth. Place 50 rounds or so of ammunition into the cloth, pick up the four corners and roll the ammunition in the cloth by moving the hands up and down for a few seconds. Grease only one type of ammunition at a time.

3. Magazines, after being loaded, must be tensioned or failure will result.

4. The guns are mounted in pairs on a universal type of mounting Mark I, with the magazine bracket uppermost.

The gun should only be fired on its proper mounting, which has a three point suspension, otherwise the casing extension interruptions for holding the extension on the breech casing will become distorted and loose.

5. No adjustments are provided either for gas regulation or return spring tension.

### Loading and Unloading

6. To Load a Magazine

(i) Remove all tension from the magazine spring by placing the magazine, mouth downwards, on the loading platform, the platform being screwed down.

Hold the magazine handle with the right hand and pull out the tension catch on top of the magazine with the left, easing off the tension on the magazine spring.

(ii) Lift off the magazine, a dummy round will be seen in the mouth, and place on the other end of the loading platform bottom upwards. Rotate the top plate of the magazine anti-clockwise by the two thumbs in relation to the body, sufficiently to load in one round at a time, repeating the operation until the magazine is fully loaded.

(iii) Place the magazine on the loading platform as in (1) and using the winding lever or, failing this, the handle, rotate in the direction of the arrow on the top cover to tension up the spring giving it five and a half complete turns. Then continue part of a turn until the tensioning key can be inserted to hold the spring. The magazine is now ready for use. Mark II magazines are provided with extension winding levers incorporated on the magazine.

NOTES

(a) Great care is necessary to ensure that the rounds are not loaded rim behind rim. Should a rim behind a rim stoppage occur, the magazine spring tension must be removed before it can be cleared.

A rim behind rim stoppage generally results in the front end of the mouthpiece being bowed forward, and this should be straightened by a gentle tap with a light hammer.

(b) Care must be taken not to dent and/or damage the magazines which are extremely fragile, particularly the lips of the mouthpiece.

Mouthpiece protectors should be used on ready use magazines whenever possible and a magazine should not be put down resting on its mouth. Whenever possible, magazines not in use, should be placed mouth downwards and in the dry.

(c) 100 round magazines suitable for this weapon will be marked on the underside (B & H↑) and on the side, stencilled in white paint "Bren and Hefah". This magazine should be fully loaded and then one round removed.

(d) When possible the tension on ready use magazines, should be reduced to one $\frac{1}{2}$ turn retensioning before use, to avoid over-stressing, which will result in mal-feed.

(e) From time to time the tension should be checked by means of a spring balance applied to the end of the winding handle. This should be $8\frac{1}{2}$ to $9\frac{1}{2}$ lbs. for the Mark II magazine. In the event

of it being less, the tension should be increased, one ½ turn being approximately equal to ½ lb.

7. To load the gun

(i) Place the safety catch to "SAFE", by swinging it forward to cover the trigger. Cock the gun by pulling back on the cocking handle until the moving parts are held by the sear.

(ii) Holding the magazine by the handle, mouth to the rear, insert the lug on the foremost part of the magazine into the recess in the magazine bracket. Then press down the rear of the magazine until the magazine catch is engaged.

8. To fire

Place the safety catch to fire and press the trigger.

Fire is continuous until the magazine is empty.

NOTE:- In the twin mounting, both gun safety catches are put to "FIRE", followed by the safety catch on the pistol grip of the mounting.

9. To re-load

The bolt remains in the forward position when the magazine is emptied, and so the cocking handle must be drawn back until the sear is engaged.

Put the safety catch on the mounting to "SAFE".

Press forward on the magazine catch, raise the rear of the magazine and remove the empty magazine.

Replace a fresh magazine as in "Loading".

10. To unload

With the gun to "SAFE". Remove the magazine, see that the chamber is clear, place the safety catch to fire and ease the springs.

## Stoppages

11. Immediate action in case of stoppages

(i) If the gun stops firing with the cocking handle right forward, recock and carry on. If the gun still does not fire re-cock and change the magazine.

(ii) If the gun stops with the cocking handle not fully forward, recock until the bolt is held by the sear and examine the ejection opening. If there is a round jammed in the feed way or partly in the chamber, clear it, and carry on. If the stoppage is repeated, change the magazine.

12. A stoppage with the cocking handle fully forward may be a missfire, an empty magazine, dirt on the bolt face or in the recess round the chamber mouth, a cap out, or a broken striker.

13. An insufficiently tensioned magazine will cause a double feed stoppage on the bolt under the waiting round in the magazine.

A separated case would cause the cocking handle to stop short of the forward position.

A broken extractor or extractor spring would position the cocking handle further back, or a round to be fed on top of the fired case. See also paragraph 26(8).

Mal-ejection is likely to be due to a weak extractor spring or to worn extractor horns.

See paragraph 6 Notes (a) re rim behind rim stoppage.

## Action of the gun in firing

14. Firing Movement

When the trigger is pressed, the bolt flies forward, picking up a round from the mouth of the magazine and carrying it to the chamber. When fully home in the chamber, the extractor is gripping the base of the round and the bolt is right forward and at rest.

15. Locking the Bolt

The piston rod is still moving forward and the locking ramp on the striker bears on the upper part of the locking tongue, forcing it downwards to the locked position. The locking tongue is then bearing up against the shoulders in the out-away portion of the breech casing.

When the locked position is reached, the firing pin held on the forward part of the striker, moves forward until it strikes the cap of the cartridge and the round is fired.

16. Backward Movement

When the bullet has passed the gas port in the bore, part of the

propellant gases pass through the gas block and strike the head of the piston, forcing it, together with the striker to the rear and starting to place compression on the return spring.

17. Unlocking of Bolt

As the piston rod moves to the rear the striker is withdrawn from the base of the cartridge, and the return ramp on the actuating block forces the locking tongue upwards to the unlocked position.

18. Extraction

The actuating pin on the actuating block reaches the rear of the bolt slot and the bolt is carried to the rear, extracting the empty case.

19. Ejection

The empty case is held on the face of the bolt as it moves rearwards until the ejector strikes the case and forces the case to the left through the ejection opening.

20. Buffering

The rearward movement is completed when the tail rod on the rear of the striker passes through the buffer tube and strikes the buffer plunger. At this stage the return spring is fully compressed, and the buffer gives initial assistance to the return spring in driving the parts forward again to pick up a fresh round from the magazine.

The cycle of operations is thus repeated until the magazine is empty, or the trigger is released.

## SECTION 2.

### Maintenance

21. The working parts of the gun should be kept free by working the cocking handle daily to and fro with the magazine removed.

If the working parts do not move freely a little G.S. mineral oil should be injected into the gas relief holes in the fore part of the gas cylinder and into the bolt way. See also paragraph 22(5).

Excessive oiling should be avoided.

If the gun is not worked by hand periodically after firing, action jamming in the forward position will occur: a sharp pull by means of a piece of cod-line will remedy this.

22. After exposure to bad weather or when for other reasons the gun needs attention the following procedure may be carried out without unshipping the gun from the mounting:-

(1) With the gun unloaded, unscrew the two nuts securing the gas block to the barrel. A pair of spanners are provided for the gas block nuts.

(2) Slide off the gas block to the front, taking care that the nozzle between the gas block and the gas cylinder which will fall out, does not get lost.

(3) Remove the gas cylinder. When cleaning, carbon should be scraped from the front end of the gas cylinder by means of a knife, and from the gas port in the gas block, by means of a $\frac{1}{8}$ inch twist drill, care being taken not to remove the metal and so enlarge the port.

(4) The barrel can then be sponged out, the piston cleaned and wiped with a lightly oiled rag. The gas cylinder can be cleaned and left almost dry.

(5) Lubricate the moving parts of the gun with G.S. mineral oil and ensure even distribution by moving the cocking handle to work the parts to and fro. When the air temperature falls below 20°F, D.T.D. 44 C or D is to be used.

(6) The outside of the gun should be lightly coated with Cooper's grease No. 4 or when the air temperature falls below 20°F, D.T.D. 143C, to enable ice to be easily removed.

NOTE:- When re-assembling in the reverse order, see that the nozzle between the gas block and the gas cylinder is fitted to the gas block. Care must be taken when sliding the gas block over the barrel threads or they will be damaged. The gas cylinder should revolve freely.

23. If the gun has fired more than a few rounds, in addition to the above, the face of the bolt and the recess around the mouth of the chamber should be examined, cleaned and oiled, and left free of dirt and fouling.

24. The forward magazine bracket is secured to the body of the gun by four screws these screws are drilled and wired to prevent them from working loose, and are also fitted with shakeproof washers.

25. The gun should be stripped as little as possible.

26. Stripping for a Complete Cleaning

Should complete stripping for a thorough cleaning be necessary, it should only be carried out by an ordnance artificer or skilled rating.

Proceed as follows:-

(1) With the breech closed, remove the casing extension by pulling back the casing extension catch and rotating the extension a quarter turn. Slide this extension off the breech casing and with it the return spring.

(2) Holding the trigger assembly with the trigger pressed, slide it back until it is disengaged from the breech casing. Slide off the magazine catch bracket.

NOTE:- The trigger assembly should not be bumped as it is of light construction and damage to it will result in a run-away gun. It should also be kept well lubricated with oil and free from grit or dirt.

(3) Draw back the cocking handle and pull it out. A strong pull is necessary to overcome the retaining plunger and spring. The spring and popple for holding the cocking handle in place, should not be removed as the end of the screw is riveted over.

(4) Slide out the piston assembly with the bolt and locking tongue taking care that the locking tongue does not fall out and get damaged. or lost.

(5) Slide off the actuating block cover.

(6) Remove the gas block and gas cylinder as in paras. 1 - 3 of maintenance.

(7) In this state the entire gun may be cleaned and oiled. Pay particular attention to the face of the bolt, and the recess around the chamber, and see that these parts are free from dirt and fouling.

(8) Oil the locking tongue and the ramps operating it, also the striker tail rod. To remove the extractor, lever up the forward end of the extractor spring with the point of a knife at the same time tapping the spring forward with a punch and light hammer. The extractor can then be lifted out. When fitting a spare spring, if too tight, slightly ease the corners that engage with the bottom corners of the dove tail slot in the bolt.

27. To Re-assemble

(1) Assemble the gas cylinder, gas block and retaining nuts as in "Maintenance".

NOTE:- In the event of the piston rod being unscrewed from the piston and actuating block, care must be taken to ensure a clearance of 0.02 to 0.03 inch, between the head of the piston and the gas block nozzle rear face, with the piston fully forward.

(2) Assemble the locking tongue to the bolt, and holding it in the unlocked position slide in the piston assembly, guiding the piston rod into the gas cylinder. The locking tongue must be flat side towards the centre line of the bolt; be sure that this is so.

(3) Slide on the actuating block cover, remembering that the slot for the cocking handle must be positioned for right hand or left hand guns as required.

(4) Push in the cocking handle until it is held by the retaining spring and plunger.

(5) Slide in the magazine catch bracket followed by the trigger assembly, engaging the rear end in the guides first, with the trigger pressed and ensuring that both ends engage.

(6) Place the return spring in the buffer tube, and thread the spring on to the striker tail rod.

(7) Push the casing extension home, and holding the catch clear, rotate the casing a quarter turn until the catch can be engaged, and the actuating block cover extension in line.

28. To remove the bolt and striker. (Ordnance Artificers only).

(1) The striker is carried on the actuating block by two actuating guide pins; the third and foremost pin controls the travel of the bolt, and there is no necessity to remove it.

(2) The two pins holding the striker to the actuating block are secured by taper pins in the actuating block which can be driven out from left to right, viewed from the rear with the bolt uppermost.

(3) With the taper pins removed, the pins, together with the striker, can be lifted out of the actuating block. The striker with the return spring guide rod can then be withdrawn from the bolt. The taper pins once removed will require new ones in lieu.

NOTE:- The taper pins securing the top and bottom end of the actuating rear guide pin are of special metal viz. silver steel; the remaining ones are of good commercial quality mild steel.

(4) The firing pin is situated at the fore part of the striker and secured by a taper pin. Drive out the taper pin from the side nearest the actuating block and the firing pin can be removed.

(5) The piston has a loose joint at both ends, and is screwed into the piston and actuating block and secured with a pin at each end.

29. To strip the buffer

Draw out the buffer tube from casing extension, then remove the screw securing the plug at the rear, unscrew the plug and remove the two buffer springs and the buffer plunger.

30. To re-assemble the buffer

(1) Insert plunger with small cupped end forwards.

(2) Place the two springs in the buffer tube, screw in the plug and replace securing screw.

(3) The parts should be lubricated with light oil during assembly.

31. To remove the barrel

After stripping as in paragraph 26, items 1. to 6:-

(1) Remove the wire from the 4 screws retaining the forward magazine bracket, take out the screws and washers, and remove the bracket.

(2) Remove the retaining plate for barrel locking nut which is secured by a grubscrew in the forward part of the breech casing. Slide out the locking plate.

(3) With the special spanner supplied, unscrew the barrel locking nut and pull out the barrel.

NOTE:- The other end of this special spanner is for the ejector nut.

32. To re-assemble

Assemble in reverse order to the above, the barrel has a slot to prevent rotation. Care should be taken to ensure that the flat on the barrel for preventing the gas block from turning is uppermost, i.e. the same side as the trigger.

The magazine bracket screws must be wired up securely after fitting the washers.

When a barrel has been removed care must be taken to ensure that the barrel sleeve and recess in the casing are free from dirt, otherwise the locking tongue clearance will be incorrect and this will effect the cartridge headspace.

The barrel locking nut must be screwed up tight and particular care must be taken to ensure that the serrations of the locking plate are engaging with the serrations in the locking nut.

If necessary, the locking plate should be slightly set to ensure correct engagements.

## SECTION 3

## THE MOUNTING

41. The Hefah Light Machine gun .303 inch Mark I Mounting is a twin mounting in which the guns are mounted upside down, one on each side of the gunner.

The mounting consists of a base plate which carries a tubular pedestal in the top of which is mounted a pivot bush, which in turn carries a shield structure, capable of being trained. On this is mounted a rocking frame which carries the guns and is capable of being rocked in elevation.

The mounting can be locked in the housing position by means of a pin which can be made to engage a housing bracket secured to the tubular pedestal and a lug secured to the shield structure.

The shield structure consists of two curved side plates set at an angle to each other the front edges of which are separated to form a sighting slot. These plates are mounted on a horizontal base plate from which is suspended a lower shield plate.

Secured to the rear edges of the curved side plates are two bearings in which the rocking frame is mounted.

The rocking frame consists of a cranked tubular frame having a centrally mounted sight bar, trunnions at each end and outside these, triangular piece plates which carry the cradles in which the guns are mounted. An elevating handle is also secured to the rocking frame.

On the sight bar a 200 knot eyeshooting foresight is provided.

A hand shield is fitted in front of the elevating handle and a face shield in front of the backsight.

The firing mechanism is operated by Bowden cable, both guns being fired from the common trigger.

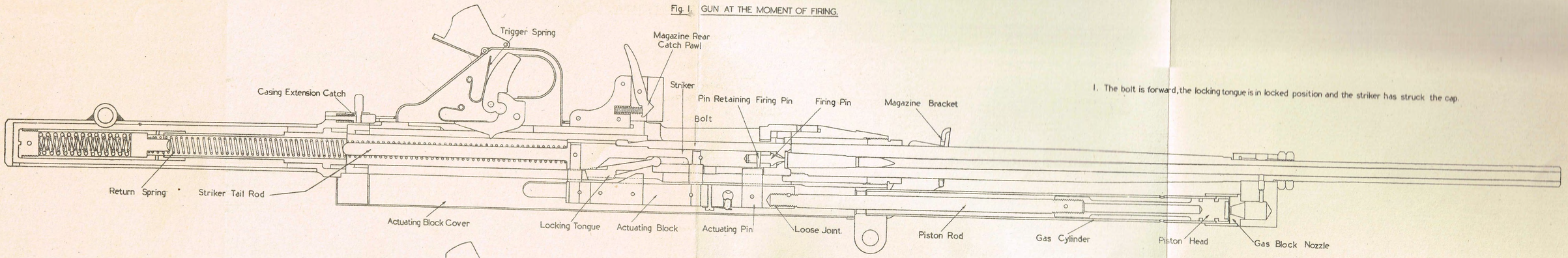
Secured to the horizontal base of the shield structure are adjustable arms which engage the gunner's body and by which training is effected.

A deflector hood is fitted to the right gun.

Brackets to carry spare magazines are provided inside the lower shield plate.

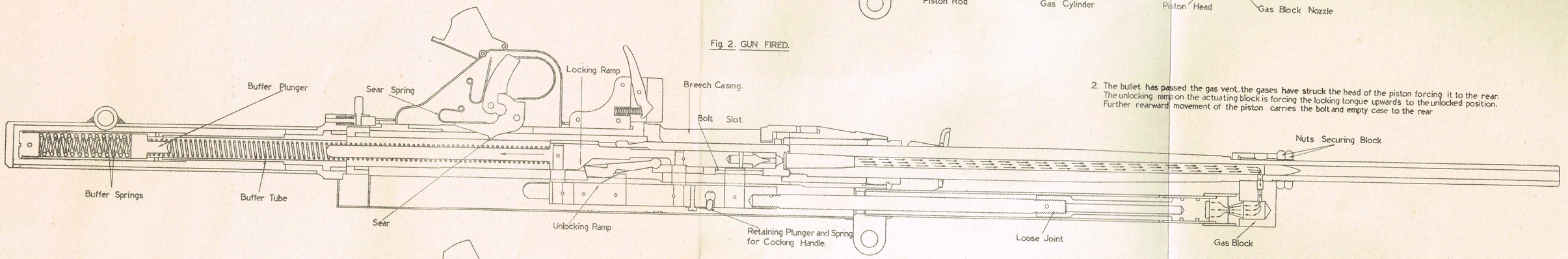
When mounting the guns, insert two securing bolts, and ensure that the gas block is touching the supporting "V" at the front end. If not, the barrel will be bent on tightening the front securing bracket and mal-functioning will result.

Fig. 1. GUN AT THE MOMENT OF FIRING.



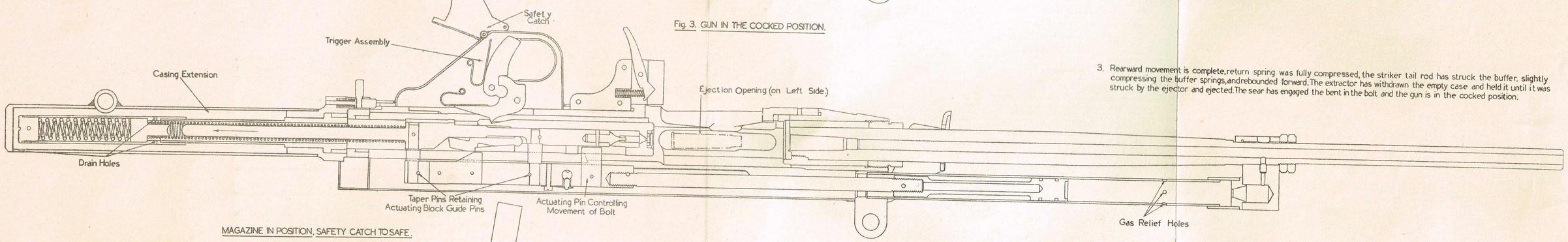

1. The bolt is forward, the locking tongue is in locked position and the striker has struck the cap.

Fig. 2. GUN FIRED.




2. The bullet has passed the gas vent, the gases have struck the head of the piston forcing it to the rear. The unlocking ramp on the actuating block is forcing the locking tongue upwards to the unlocked position. Further rearward movement of the piston carries the bolt and empty case to the rear

Fig. 3. GUN IN THE COCKED POSITION.

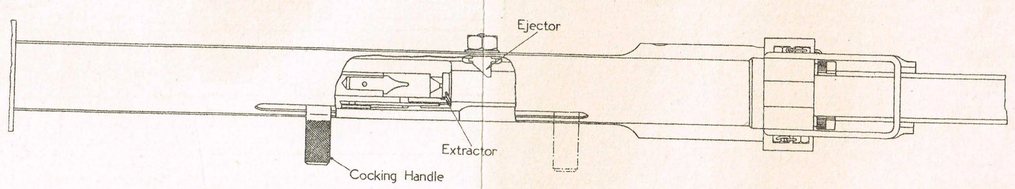



3. Rearward movement is complete, return spring was fully compressed, the striker tail rod has struck the buffer, slightly compressing the buffer springs, and rebounded forward. The extractor has withdrawn the empty case and held it until it was struck by the ejector and ejected. The sear has engaged the bent in the bolt and the gun is in the cocked position.

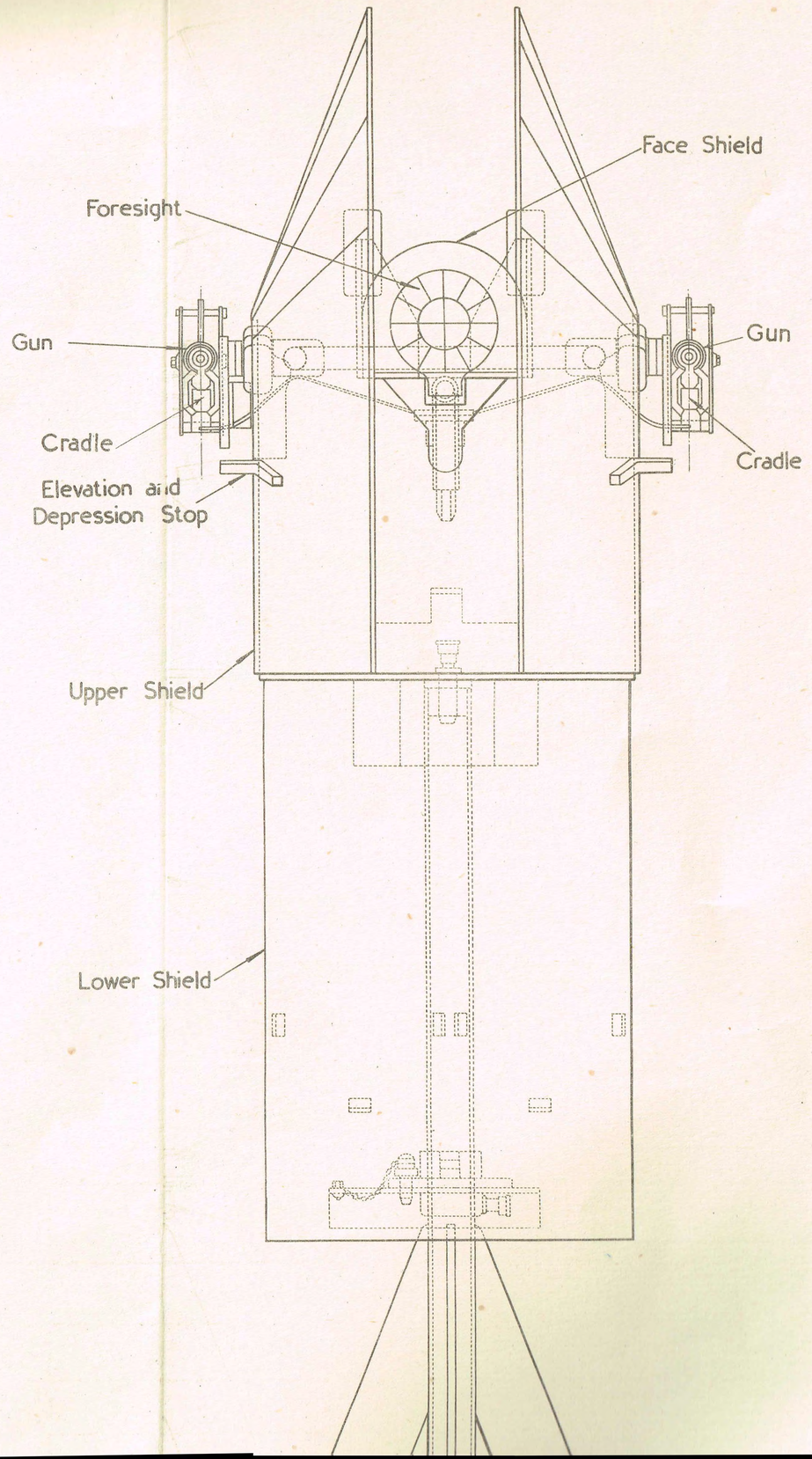
MAGAZINE IN POSITION, SAFETY CATCH TO SAFE.



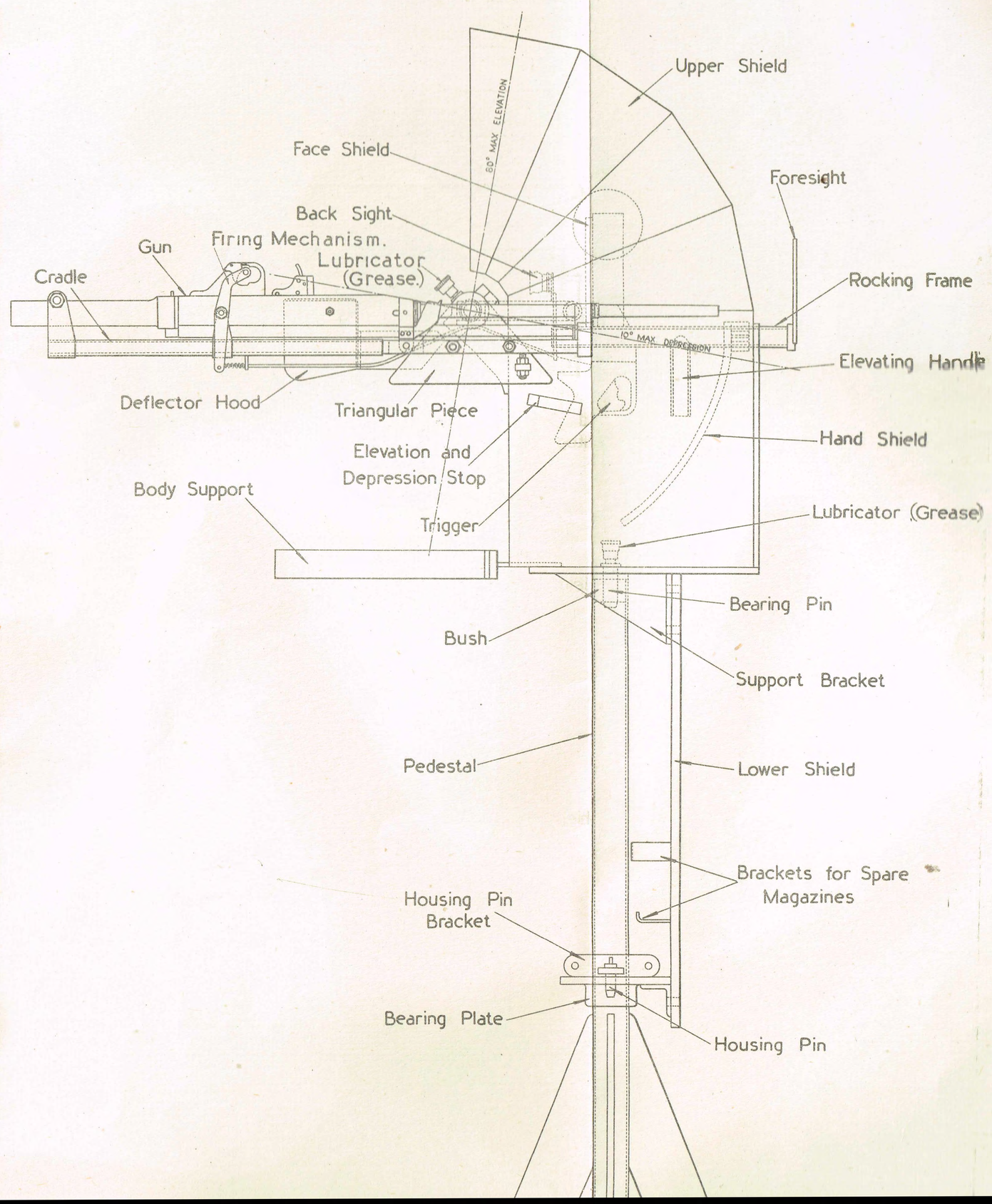

UNDERNEATH VIEW OF GUN SHOWING EXTRACTOR AND EJECTOR.

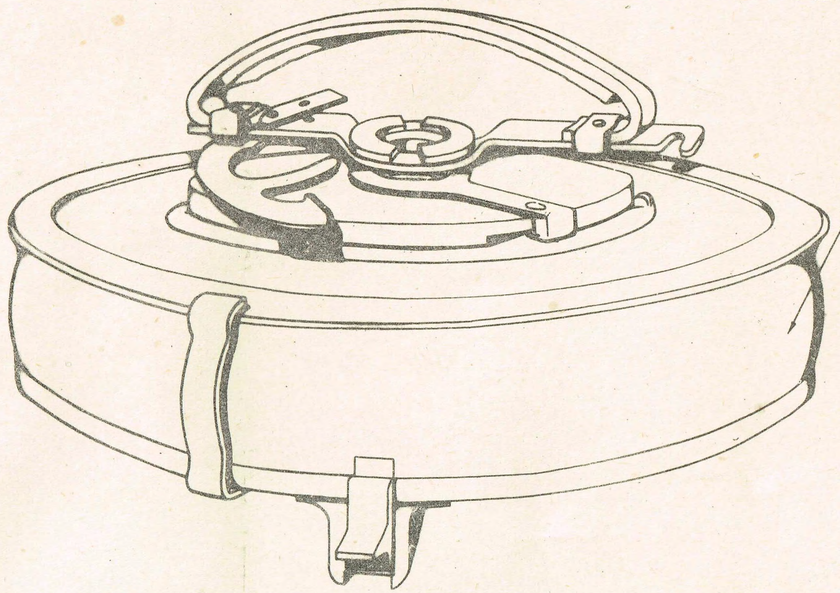


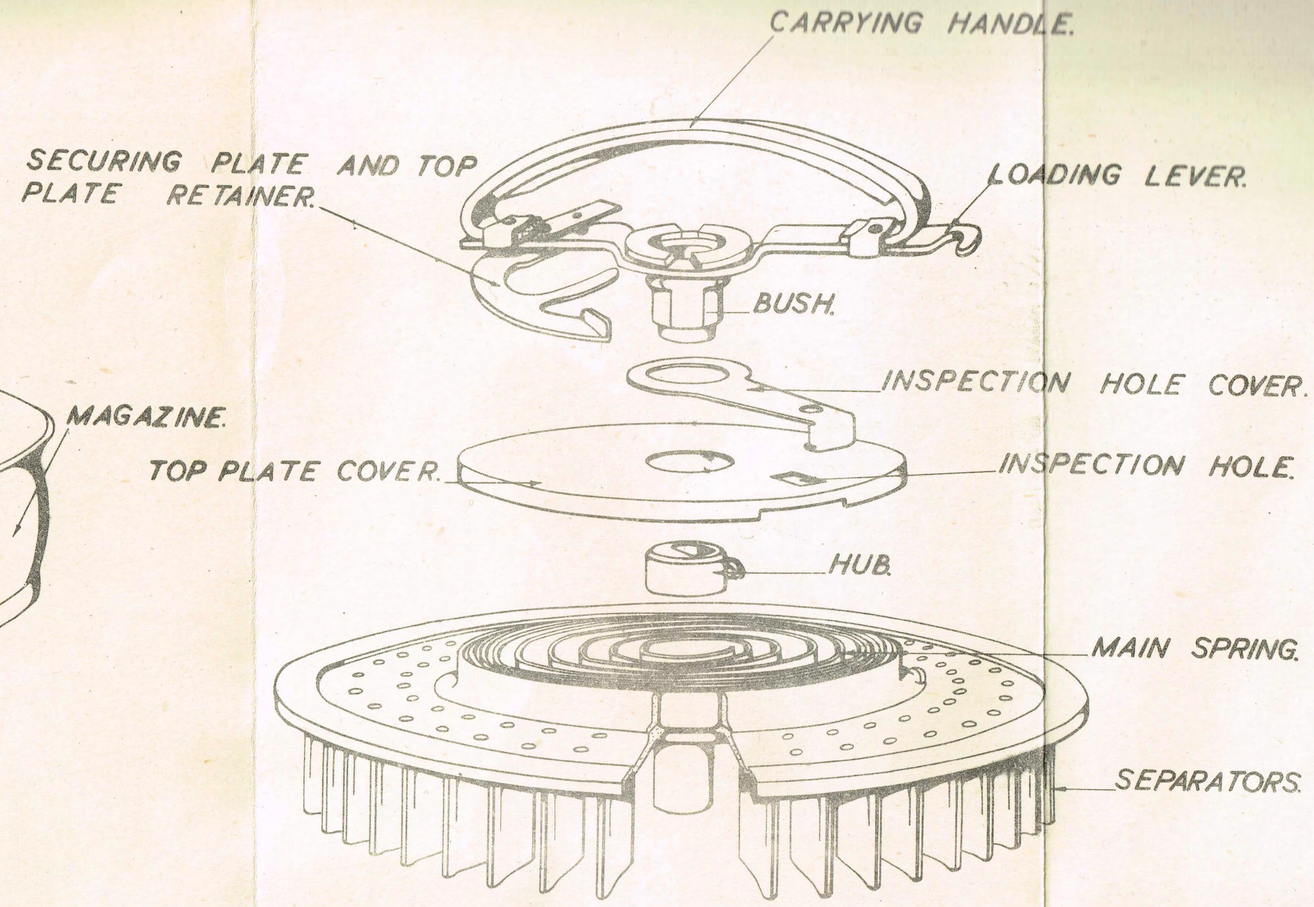
## FRONT ELEVATION



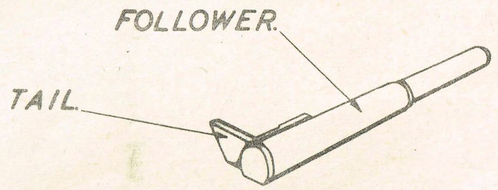

## SIDE ELEVATION

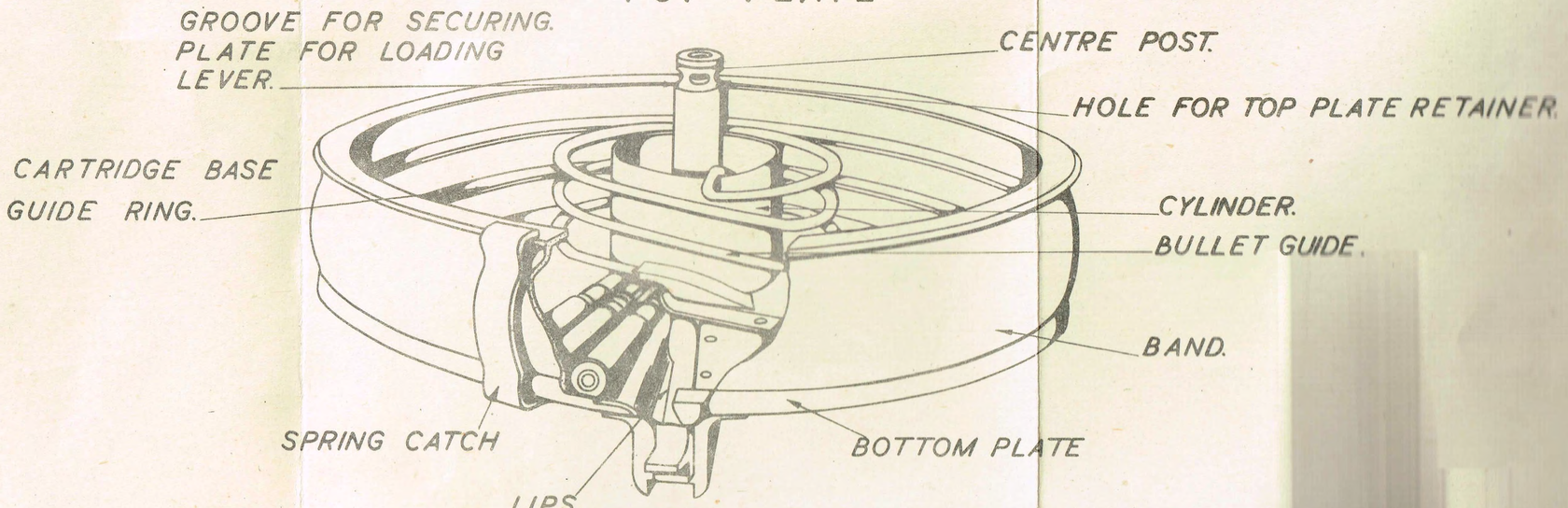



MAGAZINE.


CARRYING HANDLE.
SECURING PLATE AND TOP PLATE RETAINER.
LOADING LEVER.
BUSH.
INSPECTION HOLE COVER.
TOP PLATE COVER.
INSPECTION HOLE.
HUB.
MAIN SPRING.
SEPARATORS.

TOP PLATE


FOLLOWER.
TAIL.


GROOVE FOR SECURING. PLATE FOR LOADING LEVER.
CENTRE POST.
HOLE FOR TOP PLATE RETAINER.
CARTRIDGE BASE GUIDE RING.
CYLINDER.
BULLET GUIDE.
BAND.
SPRING CATCH
BOTTOM PLATE
LIPS.