ARMOURERS' WING PRECIS

VOLUME I

REME TECHNICAL TRAINING SCHOOL BAOR

ARMOURERS' WING PRECIS

VOLUME I

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British Army of the Rhine

R.E.M.E. TECHNICAL TRAINING SCHOOL

B.A.O.R.

ARMOURERS' WING PRECIS, VOLUME I

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DEFINITION OF SMALL ARMS AND MORTARS

Rifle

A fire arm which forms the primary personal weapon. Its size and weight must be such that it may be used in all types of country and be carried without undue fatigue for considerable distances.

Self Loading Rifle

A rifle in which the movements needed for re-loading it after each shot are performed by the energy obtained from the charge.

Anti-Tank Rifle

A rifle which is specially designed to fire ammunition possessing armour piercing properties. It can be carried into action by one man, needs a support when being fired and can be either hand or self loaded.

Pistol

This is a one hand firearm, normally used at the personal weapon for those not armed with rifle or carbine.

Self Loading Pistol

A pistol in which the re-loading after each shot is performed by the energy obtained from the charge.

Machine Carbine

An automatic fire weapon which normally fires some type of pistol ammunition. May be used to replace rifles, self-loading rifles or pistols as personal weapons.

Light Machine Gun

An automatic fire weapon normally fired from the shoulder with the aid of a rest. It can also be fired from a mounting.

Medium Machine Gun

An automatic fire weapon capable of producing a large volume of fire for long periods. Fired from a mounting.

ARMOURERS' WING

Heavy Machine Gun

An automatic fire weapon specially designed to fire ammunition for the penetration of armour or use against aircraft.

ORDNANCE

This is a term applied to weapons designed for the propulsion of missiles by explosive force and includes, guns, howitzers and mortars. The *MORTAR* has a low velocity and short range, normally muzzle loading and smooth bore.

THE MORTAR

The term "Ordnance" is applied to weapons designed for the propulsion of missiles by explosive force and includes guns, howitzers and mortars. Any one of such weapons may be referred to as a "piece" of Ordnance.

The GUN, generally speaking, has a long barrel, more powerful propelling charges, higher muzzle velocity and flatter trajectory than the howitzer or mortar.

The MORTAR differs principally from the gun and howitzer in being lighter and simpler in construction, it also employs a smaller propellant charge and a lighter missile. The chamber pressure and range of the projectile are considerably less than with artillery equipments.

The mortar also differs from modern guns or howitzers in being breech or muzzle loading. With muzzle loading mortars the projectile is rather smaller than the diameter of the bore of the mortar with a consequent loss of propellant gases.

The special characteristics of each type of weapon may be summarized thus:—

Gun	High Velocity	Long Range
Howitzer	Varying Charges	Steep Angle of Descent
Mortar	Low Velocity	Short Ranges

3" and 4.2" Mortars

Means of Firing

The breech end of the mortar barrel is fitted with a breech piece, which carries a striker stud. As the bomb slides down the bore on loading, a striker fitted over the cap of the primary cartridge in the base of the bomb is forced in, firing the cap, which in turn ignites the propellant charge. A disadvantage with this sort of ignition is that there may be a misfire if the bomb does not slide freely down the bore during loading .It is, therefore, important that the bore of the mortar, and the bands on the bomb should be free from rust.

The same applies to the firing of the 2" mortar except that the bomb is fired by means of a firing pin operated by a firing lever or grip, and the possibilities of misfires due to dirt are not as great.

THE MORTAR MOUNTING

The mounting required for mortars in the field must, of necessity be of a light and portable nature, capable of easy transport and rapid assembly.

For these reasons a mounting in the form of a bipod or tripod is employed as a support for the muzzle end of the mortar, the breech end being supported by a base plate.

Facilities for increasing the angle of elevation and for a limited amount of traverse are incorporated in the mounting.

THE MORTAR SIGHT

A sight is provided for laying the mortar and is designed to fulfil the dual purpose of a clinometer and reciprocating sight. A cross level bubble enables the sight to be aligned in the vertical plane by cross-levelling to compensate for difference in level of the legs or/and the effect of top traverse.

O.M.L. 2" MORTAR

General Information

There are two types of 2" Mortar designed for use by (a) Infantry (b) Carriers, and there are various Marks to each type.

All Infantry Mortars are fitted with Spades.

All Carrier Mortars are fitted with Base Plates.

For use with Universal Carrier	For use by Infantry		
2* 2** 7	7** 8*		

NOTE: Continuous threads on barrels to be re-introduced (L of C C 583 App. 45)

Difference in Marks

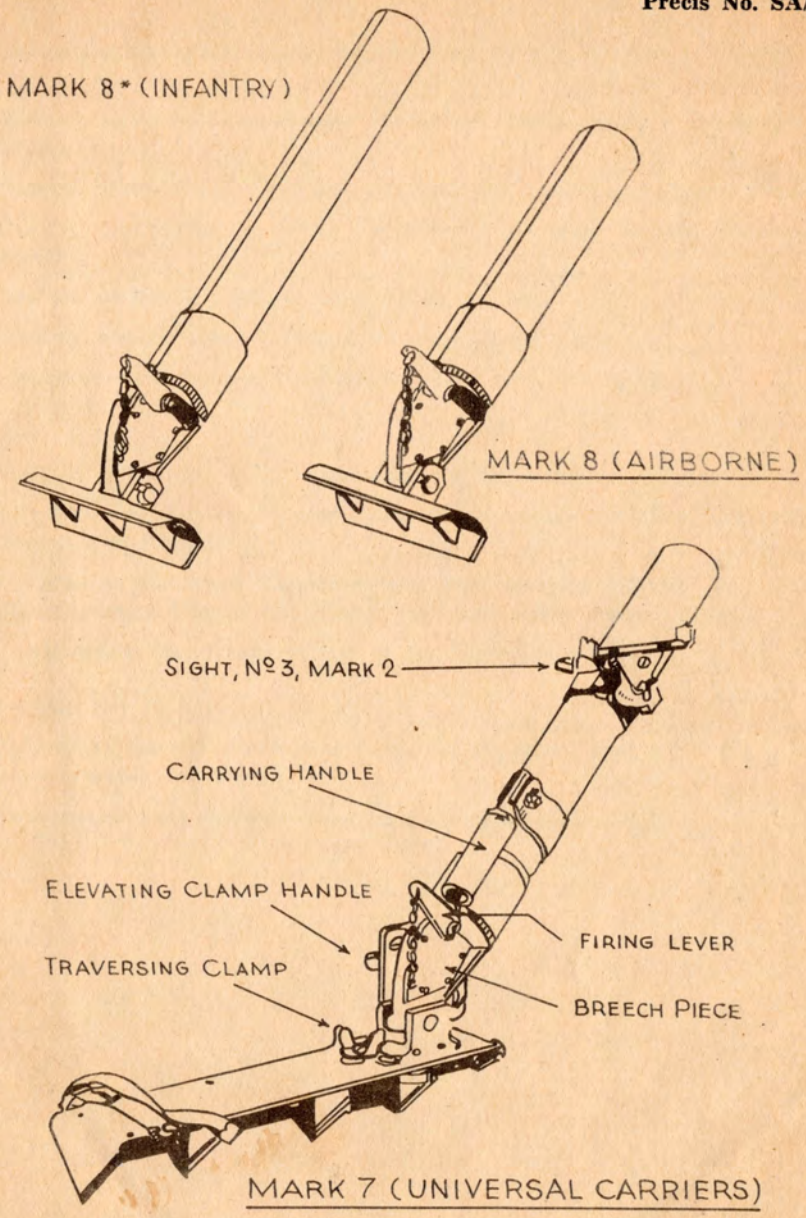
Mark 2 * Obsolescent	Modified Mk 2. Pin firing Assembly. Continuous Barrel Threads, 21"	Base Plate	Pistol Revolver No. 2. Action
Mark 2 ** Obsolescent	21" Barrel. Continuous Barrel Threads	Base Plate	Pistol Revolver No. 2. Action
Mark 7 Obsolescent	Interrupted Barrel Threads 21.37" Barrel (MR151)	Base Plate	Pistol Signal Mk 5. Action
Mark 7 **	Modified Mk 7*. 21.37" Barrel (MR151) Interrupted Barrel Threads	Spade	Pistol Signal Mk 5. Action
Mark 8			
Mark 8 *	Interrupted Barrel Threads 21.37" Barrel. Strengthened Breech Piece	Spade	Pistol Signal Mk 5. Action

The mortar fires H.E., Illuminating and Smoke Bombs, weight about 2 lbs. up to 525 yards. Rate of fire up to 20 rounds a minute, the bore should be cleaned if possible after every 10 rounds.

STRIPPING — Mks 2 * 2 **

1. Remove strap securing barrel to base and raise barrel.
2. Hold back Catch Barrel and unscrew Barrel—R.H. Thread.
3. Remove Front Bush, Firing Pin and Spring from front of Breech Piece.

NOTE: Do not snap the action with bush removed as spring and firing pin will shoot out and may be lost or cause an accident.


MARK 8* (INFANTRY)
MARK 8 (AIRBORNE)
SIGHT, Nº 3, MARK 2
CARRYING HANDLE
ELEVATING CLAMP HANDLE
TRAVERSING CLAMP
FIRING LEVER
BREECH PIECE
MARK 7 (UNIVERSAL CARRIERS)

4. Unscrew screw securing Handle Elevating Clamp. Remove Handle and Clamp.
5. Unscrew screw securing Handle Traversing Clamp. Remove Handle and Clamp.
6. Unscrew screw Hinge Pin, push out Hinge Pin and remove Breech Piece.
7. Remove screws fixing Plate Securing Traversing Bracket. Remove Bracket.
8. Unscrew screw Grip Firing. Remove Grip Firing.
9. Unscrew screws Cover Breech Piece and remove Cover.
10. Dismantle Action which is similar to Pistol Revolver No. 2.

Mk. 7

Same as for Mks. 2 * and 2 ** except for the following:—

1. **To remove Barrel:**—Hold back Catch Barrel, rotate Barrel 1/4 turn anti-clockwise and lift off.
2. **To remove Elevating Clamp:**—Undo Nut Securing Handle Elevating Clamp, remove Handle and Clamp with Collar, Washer and Spring.
3. **To Dismantle the Action:**—Same as for Pistol Signal Mk. 5.

Mks. 7 ** and 8 *

1. **To remove Barrel:**—Hold back Catch Barrel, rotate Barrel 1/4 of a turn anti-clockwise and lift off.
2. **To Dismantle the Action:**—Same as for Pistol Signal Mk. 5.

ACTION OF FIRING MECHANISM OF Mk. 2*, 2**

(Similar to Pistol Revolver No. 2—Rebound takes place *after* firing grip is released).

On rotating the firing grip to which is keyed the Sear, the Sear is rotated. The long arm of the lever spring main being engaged on a shoulder of the Sear is forced down compressing the short arm of the Spring Main. The nose of the Sear engages the Catch Hammer thus rotating the Hammer to the rear. The long arm of the Spring Main being attached to the Swivel Hammer is also compressed. Continued rotation of the Firing Grip causes the nose of the Sear to disengage from the Catch Hammer, allowing the Hammer to fly forward under the influence of the compressed long arm of the Spring Main, to strike the Pin Firing driving it forward compressing the Spring Pin Firing, to strike the cap, and fire the charge.

On releasing the Firing Grip, the short arm of the Spring Main reasserts itself, forcing the Lever Spring Main on to the Hammer. Rebound shoulder of the Lever Spring Main bears against the Rebound arm of the Hammer withdrawing the Hammer about 1/10" to the rebound position. The Spring Pin Firing reasserts itself and withdraws the Pin Firing. The long arm of the Lever Spring Main bearing on its seating on the Sear forces the Sear and Firing Grip to rotate to their normal positions. The nose of the Sear is drawn down the front face of the Catch Hammer, forcing the Catch Hammer inwards compressing its spring, until the nose of the Sear disengages the Catch Hammer which is returned to its normal position by its spring reasserting itself.

ACTION OF FIRING MECHANISM OF Mk. 7, 7 and 8***

(Similar to Pistol Signal Mk. 5.—Rebound takes places *before* Firing Lever is released).

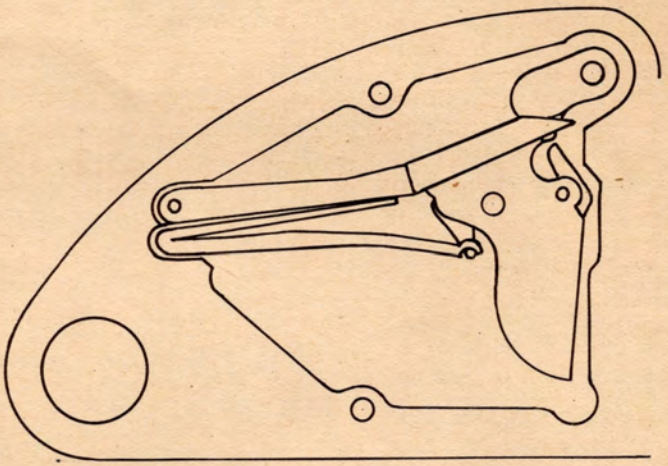
On rotating the Firing Lever, to which is keyed the Sear, the Sear is rotated tensioning the Spring Sear. The nose of the Sear engages the Catch Hammer and rotates the Hammer which bears against the long arm of the Tumbler forcing the Tumbler to the rear compressing the Tumbler Main Spring.

Continued rotation of the Firing Lever causes the nose of the Sear to disengage the Catch Hammer, the Tumbler Mainspring reasserts itself and forces the Tumbler forward, its long arm bearing in its recess in the back of the Hammer drives the Hammer forward to strike the Pin Firing, driving it forward compressing the Spring Pin Firing, to strike the cap, and fire the charge. Towards the end of the forward movement of the Hammer, the long arm of the Tumbler becomes disengaged from its recess, and the short arm becomes engaged thus partially tensioning the Tumbler Mainspring. When the cap has

Ordnance, M.L. 2" Mks. 2, 2*, 2**, 2***.

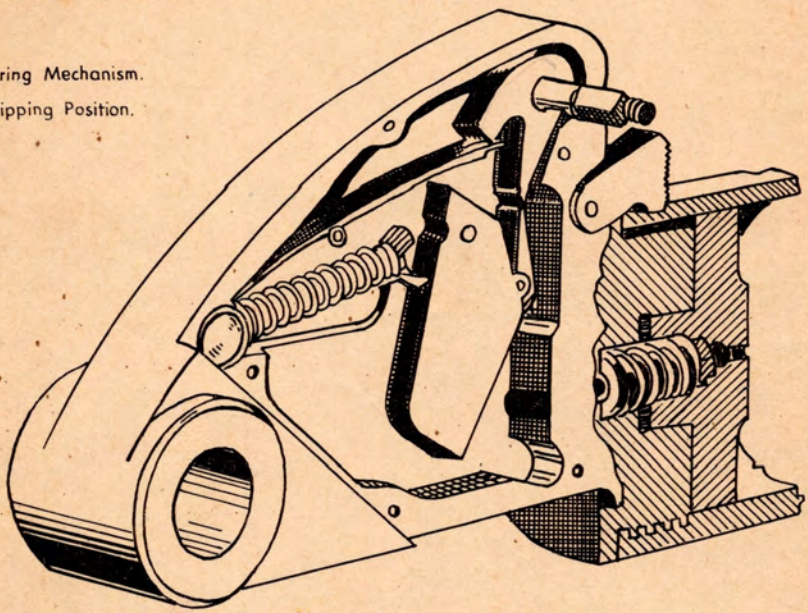
Firing Mechanism.

Rebound. Position.



Ordnance, M.L. 2" Mks. 7, 7*, 7**, 8, 8*

Firing Mechanism.
Tripping Position.



been struck, the Hammer is withdrawn to the Rebound position by the action of the short arm of the Tumbler bearing in its recess in the back of the Hammer. The Spring Pin Firing reasserts itself and withdraws the Pin Firing.

On releasing the Firing Lever, the Spring Sear reasserts itself and rotates the Sear and Firing Lever to their normal positions, the nose of the Sear rides down the front of the Catch Hammer compressing the Spring Catch Hammer until, the sear nose disengages the Catch Hammer when the Spring Catch Hammer returns the Catch Hammer to its normal position.

EXAMINATION, TESTS AND ADJUSTMENTS

Mks 2*, 2 and 7**

1. Ensure there is no bomb in the barrel.
2. Tighten all screws.
3. Check that barrel screws up tight and is retained by the Catch Barrel.
4. Remove Barrel and Test functioning of Firing Mechanism.
5. Test Firing Pin Protrusion .125" .136" Gauge No. 27.
6. Examine bore for pitting, cuts, puckers etc. and test for straightness using Gauge Testing Straigthness of Bore. Item No. 320. (See NOTE at end).
7. Test Breech Piece for condition, and freedom of rotation in Base Plate, Elevating Guide Plate and Traversing Bracket.
8. Ensure Base Plate is not distorted.
9. See E.M.E.R. Armt. R 203 pp. 4 and 5.
10. Test handle clamp Traversing for correct position. When clamped position, should be at "9 o'clock", unclamped at "3 o'clock".

    NOTE: Where the Wing Nut type of Handle Clamp Traversing is fitted, it should be adjusted so that when clamped the wings are in line with the Base Plate, so that the Breech Piece will position between the wings when in the folded position.
11. Ensure that all modifications have been carried out.

Mk 7 and 8***

1. Ensure that there is no bomb in the barrel.
2. Tighten all screws.
3. Check that barrel is screwed up tight and is retained by the Catch Barrel.
4. Remove Barrel and Test functioning of Firing Mechanism.

5. Test Firing Pin Protrusion. .125" .136" Gauge No. 27. (Action must be stripped in Mortars Mk 7 — 8 *).

6. Examine bore for pitting, cuts, puckers etc. and test for straightness using Gauge Testing Straigthness of Bore. Item No. 320. See NOTE at end.

7. Test Breech Piece for condition, straightness and fit in Spade.

8. Examine Spade and Hinge Pin for wear and distortion.

9. Ensure all modifications have been carried out.

NOTE: Examination as under will normally be carried out only by an E.M.E., but where an E.M.E. is not available authority for examination may be delegated to some other qualified REME Officer or Armament Artificer (vide EMER Armament A 520).

1. *Test force of blow of Striker* using Gauge Testing Blow of Striker M.L. 2" Mortar Mks 2—2 ** Mortar Mk I Item No. 218. or Gauge Testing Blow of M.L. 2" Mortar Mks 4—7 Mk I Item No. 217.

2. Measure the Bore using Gauge Measuring Bore No. 35 Item No. 150, at the following points:—
2", 6", 12" and 18" horizontally and vertically from the muzzle. The Bore Diameter is 2.025" and the Piece will be provisionally condemned when the bore reaches 2.045" *at any one point.*

Each .005" of wear constitutes 1/4 of life thus:—

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
2.025"	2.025"	2.025"	2.025"
+	+	+	+
0—0.005"	.006—.010"	.011—.015"	Wear greater than .015"

All relevant details of the examination will be entered on AF G875A in accordance with instructions contained in EMER Armament A 520. Examination of Ordnance—General Procedure.

P.C. = Provisionally Condemned

✓ = Serviceable.

Unserviceable: Always to be written in full.

REPORT ON EXAMINATION OF O.M.L. 2" - INCH BOMB THROWER / - INCH MORTAR } * ANNUAL EXAMINATION

Army Form G. 875A

Unit 6 Bn. R.S.F. **Station** B.A.O.R. **Date of Examination** 10 Jan. 1946

Description of Motar					Number of Rounds	Bore Measurements			Results of Examination and Remarks on Accuracy, &c. ††	Sentence	How left §
Designation	Mark	Maker	Registered No.	Barrel No.	Total rounds fired to date of examination (if known)	Inches from Muzzle †	Horizontal	Vertical			
O.M.L. 2" MORTAR	7	—	L/13245	—	Not Known	2" 6" 12" 18"	2.025 2.023 2.024 2.026	2.024 2.023 2.025 2.027	Barrel slightly pitted at muzzle for distance of 4" E.M.E.R. Armt R207/3 to be carried out.	3rd Quarter	Service-able

* State here "Annual examination", or other reason for examination.

† Bomb Throwers and Mortars are to be measured at distances as called for in War Office Technical Instruction (Art. Equipt.) Serial Nos. 207 and 302.

†† Full condition of Bomb Thrower or Mortar and parts to be given in this column.

§ Any repair or replacement of parts entered under "Sentence" that can be arranged for locally, will be completed, and condition of Bomb Thrower or Mortar after repair entered in this column before the form is forwarded to C. I. A.

Signature of Inspecting Officer
44 (L) Inf. Bde.

THE CHIEF INSPECTOR OF ARMAMENTS,
WOOLWICH.

Signature of Officer in Charge of

Signature of Officer Commanding Unit

D 54231-1 13.000 D/d 8350 12/44 P R P

SIGHTS O.M.L. 2" MORTAR

Sight 2" Mortar No. 1. Mk I

Consists mainly of a Casing, Worm Wheel Plug, Worm Wheel, Worm Spindle, Elevation Bracket, No. 1. Cased Spirit Bubble, Lensatic Sight Bracket and Lensatic Sight.

On either side of the slot in the casing, graduated range scales are engraved. On the LEFT side from "0" to 525 yards in black markings. The RIGHT side from 100 yards to 500 yards in black, and above that from 500 yards to 200 yards in red. (Red markings are used for High Angle fire and the black for normal fire).

Sight 2" Mortar No. 2. Mk I

Differs from the No. 1 in the following respects:—

1. The underside of the lensatic sight bracket is formed with a forked projection at each end.
2. The elevation bracket is formed at the front end with a projection to bear between the forked projections of the lensatic sight bracket.
3. The plunger and spring are located on the upperside of the rear end of the levating bracket.

Sight 2" Mortar No. 3. Mk 2

Consists mainly of a bracket with graduated suppporting plate leaf sight and spirit bubble.

The graduated supporting plate is quadrant shaped, graduated on low altitude side from "0" to 500 yards, each graduation representing 50 yards, being filled with white wax. On the high altitude side it is graduated from 500 yards down to 200 yards and filled with red wax or paint. The centre line of the plate is engraved 525. The sight is Obsolescent.

Sight Mortar 2" No. 3. Mk I

Differs from the Mk 2 only in that the method of construction of the bracket and leaf sight vary. The sight is Obsolescent.

Sight 2" Mortar No. 4. Mk I

The Sight is similar in principle to the Sight Mk 3, but incorporates the following improvements:—

1. A ferodo lined clamping band (MR7384) secures the Sight to the barrel.
2. A non-slip washer (MR7362) to obviate slipping of the Leaf Sight (MR1634) is interposed between the head of the leaf sight clamping screw (MR1005) and Supporting Bracket (MR7383).
3. Longer No. 8 B.A. steel round headed screws with lock nuts, to secure the Bubble, spirit, cased No. 1. Mk I to the Leaf Sight.
4. The Clamping Band Screw (MR7467) and Supporting Bracket (MR7383) are threated $^{5}/_{16}$" B.S.F.

LIST OF CHANGES

L of C	Date	Detail	Remarks
B2152	Jan 39	Ordnance M.L. 2" Mortar Mk 2	Intro.
B3209	Feb 40	Ordnance M.L. 2" Mortar Mk 3 Steel jointed for Tanks	Intro.
B3627	July 40	Ordnance M.L. 2" Mortar Mk 3 redesignated Bombthrower 2" Mk 1	Designation
B3813	Sep 40	Ordnance M.L. 2" Mortar Mk 2*	Conversion of Mk 2.
B3940	Oct 40	Ordnance M.L. 2" Mortar Mk 4	Intro.
B5290	Nov 41	Ordnance M.L. 2" Mortar Mk 2**	Intro.
B5415	Dec 41	Ordnance M.L. Mortar Mk 7	Intro.
C1209	Aug 45	Sights 2" Mortar No. 4. Mk I	Intro.
		Sights 2" Mortar No. 3 Mks I, I* and 2	Obsolescent.
C583	Apr 45	Continuous Threads in Barrels	Re-Introduced.
C3572	Oct 48	Breech Piece MR 2104 (Int. Threads) for Mk 8* Mortar	Obsolete.
C3968	Dec 49	O.M.L. 2" Mortar Mk 2	Obsolete.

ARMY COUNCIL INSTRUCTIONS

Para	Date	Detail
1655	1941	Sight 2" No. 2 Mk I
1812	1941	Ordnance 2" Mortar Mks 2, 2* and 2**
760	1942	Ordnance 2" Mortar Mk 2*
1755	1942	Sight 2" Mortar No. 3 Mk I for Mks 2, 2* and 4
33	1944	Ordnance 2" Mortar—Firing at 90^0
203	1944	Ammunition prematures.
1317	1944	2 . 2* 2** — new type of carrier mtg.
1105	1946	Fitting of hand grip to barrel (U/S Bomb case).
19	1947	Mazik tails on Bombs — Breakages.
42	1947	Fuzes No. 161 and 162 — Air dropping.

EME Regulations

Number	Detail
Armt R 200 (21 A.G.)	Data Sheet detailing main differences between O.M.L. 2" Mortar from Mk I to 8.

EME Regulations

Number	Page	Detail
R203	1	Sight 2" Mortar No. 3 Mk 2. — Screw Clamping Band
	2	Sight 2" Mortar No. 3. Mks 1, 1* and 2 — Method of securing Spirit Bubble Case.
	4	O.M.L. 2" Mortars Mk 2*, 2** 7 and 7a. Adjustment of elevating clamp.

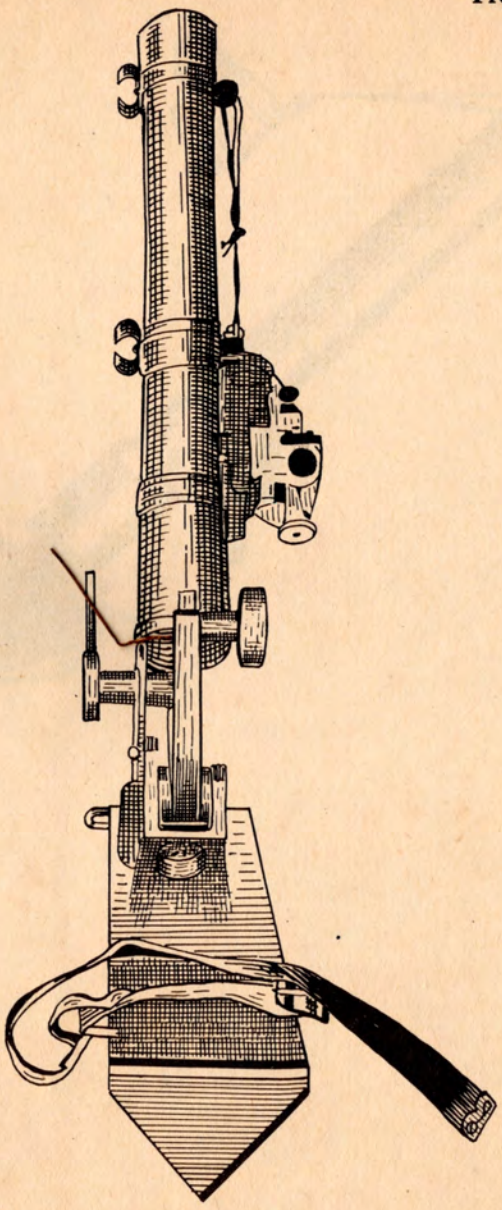
Mod. No.	Issue No.	Detail
0	1	Mortars Mks 2***, 7* and 8. Obsolete.
1	1	Summary of previous modifications.
2	2	Cancellation of instruction authorising the strengthening of the spade MR.2108.
3	1	Cutting of additional serrations on Mks 7, 7*, 7**, 8 and 8* barrels.
4	1	Strengthening of the base plate traversing brackets.
5	1	Replacement of the firing lever thong and ring by a line lanyard.
6	2	Replacement of plain washers on Mks 7, 7*, 7**, 8, 8*, firing levers.
7	1	Fitting of carrying sling to Mks 2***, 7*, 7**, 8 and 8*.
8	1	Modification of firing pins to prevent burring.
9	1	Chamfering of the No. 2BA hole in the breech pieces.
10	2	Fitting of an Infantry type spade.
12	1	Modification of spare covers MR 1007 to suit breech piece MR 5840.
13	2	Cancellation of instruction authorising the addition of a traverse scale to base plate.
14	2	Cancellation of instruction authorising the modification of the box.
16	1	Fitting of additional clamp to sight to prevent slipping.
17	1	Fitting of a serrated washer to the sight leaf clamping screw.

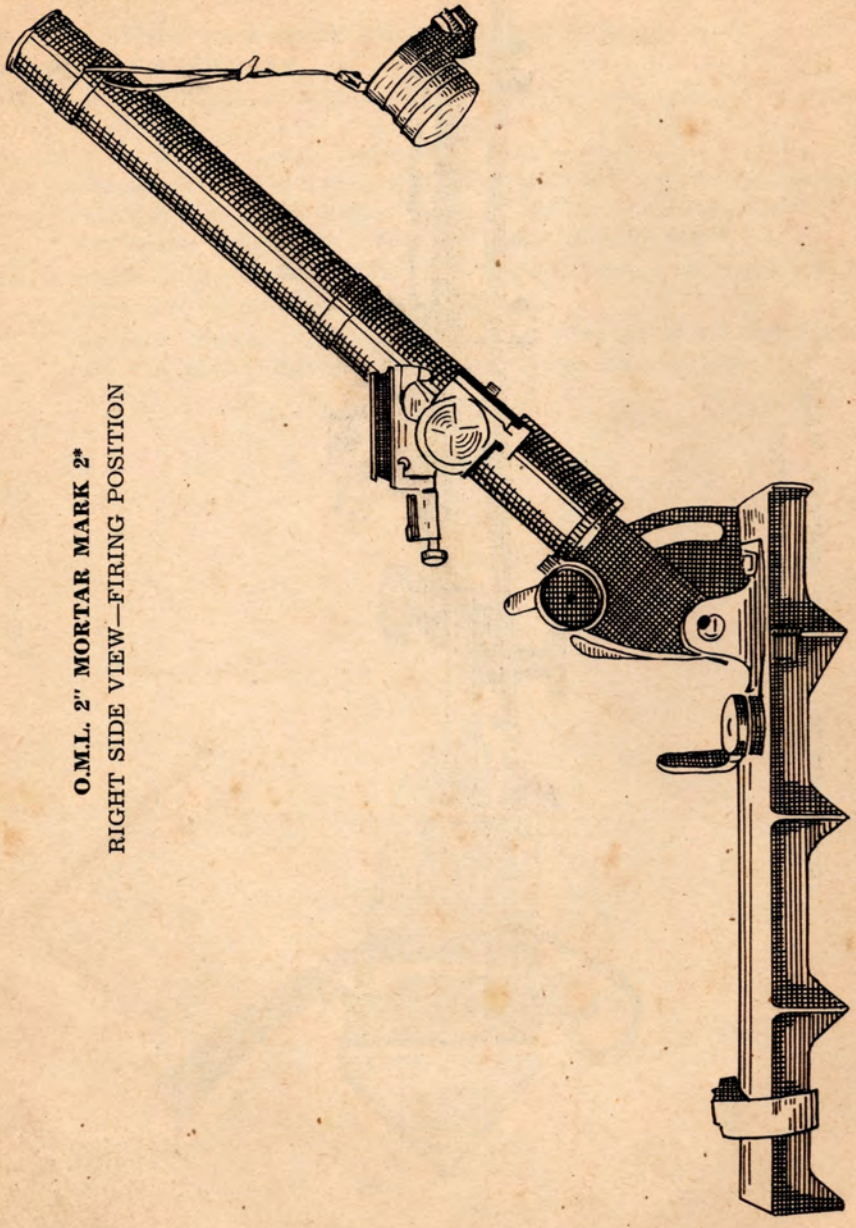
21 ARMY GROUP AND RHINE ARMY TECHNICAL BULLETINS S.A., M.G. AND MORTARS

Para	Detail
9	Shortening of Bren Cylinder Cleaning Rods of 2" Mortar Equipments. Sights 2" Mortar No. 3, Leaf Sight "T" Bubble — Method of Securing. Provisional Parts List for O.M.L. 2" Mk 7 1944 approved.
24	Sights 2" Mortar No. 3. Mks 1, 1* and 2* — firing of a clamp to all mortars using either of these Sights.
161	Sights 2" Mortar No. 3 Mks 1, 1* and 2 — fitting of serrated washer between head of Clamping Screw and Range Scale Quadrant.

ORDNANCE, M.L. 2-INCH MORTAR, MARK 2*

REAR VIEW—FIRING POSITION





O.M.L. 2" MORTAR MARK 2*
RIGHT SIDE VIEW—FIRING POSITION

O.S.B. 4.2" MORTAR

GENERAL INFORMATION

Introduced by L of C para B 7009 Dec 42.

There are three Marks of 4.2" Mortars in the Service, Mks 1, 1* and 2, all being Infantry heavy support weapons which may be mounted on either the Mounting Mk 1, 1*, 2 or 3, using one of the following Base Plates, No. 2, No. 3 Mk 1 or the Plate Base Mobile 4.2" S.B. Mortar Mk 1. There is also a No. 1 Mk 1 Base Plate for use for practice loading only. An Auxiliary Base Plate is provided for use on boggy ground.

The Mortar fires H.E. and Smoke Bombs weighing approximately 20 lbs, for a distance of up to 2,780 yards on Charge I, and up to 4,100 yards on Charge II.

Maximum Elevation on the Mounting Mk 1 is 80°.
Minimum Elevation 45°.

Angle of traverse right and left of zero is 5° without movement of the legs of the mounting.

Difference in Marks

Equipment	*Differences*
MORTAR Mk 2	Consists of barrel, breech cap, breech piece, stud striker and copper washer. There is no clinometer plane. The registered number, mark, part number, and makers initials with year of manufacture are engraved on the breech end of the barrel.
MOUNTING Mk-1	The tripod is similar in construction to the bipod of the Mounting 3" Mortar, but a third leg is introduced and attached to an extension of the rear trunnion of the Tube Elevating. The leg stays are not jointed as with the 3" bipod but are connected, each at its inner end, to a bracket carrying a sleeve, which is free to slide along the Tube Elevating and held in position by a locking screw, when packed for transit, the rear leg having a plate pierced with a hole to receive a pintle on the sleeve, being further secured by a strap.
MOUNTING Mk 1*	Is the Mk 1 which has been converted to assimilate the Mk 2.

Equipment	*Differences*
MOUNTING Mk 2	The Mounting Mk 2 is generally similar in principle to the Mk 1 except that the Elevating Gear is located in the front leg, there being two legs at the rear and one in front.
MOUNTING Mk 3	Introduced by L of C para C 431 March 45. In principle similar to the Mounting Mk 2, it is of specially lightened design and has a simplified pattern of tripod. The tripod consists of three tubular steel legs, each with a spiked foot. A Stay Bracket is welded to each rear leg, and a staple, leg support and locking pin boss, to the front leg. A web strap on the front leg secures the legs in the closed position for transportation. The locking pin boss is provided for use when transporting the mounting in conjunction with the O.S.B. 4.2" Mortar on the Plate Base Mobile 4.2" S.B. Mortar Mk 1. The front leg has a bracket near the top, to accomodate a leg hinge, with clamp. The rear legs are connected by means of a hinge pin, to the leg hinge and stays, attached to the Stay Brackets, and hinged at the centre and provided with a locking pin. The Cradle (MR 126 MA for Sight Mk 1 or MR 109 MA for Sight Mk 3) supports the Barrel and Sight Bracket and has a periphery which engages the Sight Cross Levelling Worm Spindle. A lug formed below the Cradle is fitted with fixed and adjustable bushes, screw threaded internally, to receive the Screw Traversing. The Traversing Gear Yoke carries the Screw Traversing and provides attachment for the Elevating Gear. The Elevating Gear comprises the Tube Elevating (upper part of front leg) and Screw. The gear is operated by a Handle, Pinions and Nut Operating. The following components are of new design:— Nut Operating, Sleeve, Bush Elevating, Cap Tube Elevating, Grip Traversing, Handle Elevating and Cradle.

Equipment	*Differences*
PLATE BASE No. 1 Mk 1	Is used with the practising loading apparatus.
PLATE BASE No. 2 Mk 1	After being strengthened by gussets welded to the plate and having material removed from the webs cylinder and piston, is generally similar to the No. 3 Mk 1.
PLATE BASE No. 3 Mk 1	The No. 3, Mark 1, base plate consists of a central socket to which are welded seven triangular-shaped steel plates. Webs are welded between the plates and at right angles to them to provide a stable platform for the mortar. The central socket of the base plate is suitably shaped to receive the rebound socket, the lower portion having an internal diameter of 2.3 in to accommodate the stem, spring nut and collar of the rebound socket whilst the upper portion is so dimensioned internally to enable the upper portion of the rebound socket to move freely up and down during rebound and on return to the normal position. Externally the lower end of the socket is coned to ensure a firm anchorage for the base plate when in action. The interior of the central socket is suitably recessed to receive the collar which retains the rebound socket in position, the collar being prevented from turning and becoming disengaged by a screw that passes through the wall of the central socket. An internal groove is provided along one side of the socket which terminates at the upper end into a hole that leads to the exterior, this groove prevents a cushion of air forming below the enlarged portion of the rebound socket during rebound and thus avoid a sluggish recovery to the normal firing position. The rebound socket consists principally of an upper cup-shaped portion to receive the rear end of the mortar barrel whilst the lower end is of much less diameter and forms a stem on which are assembled a collar, washer, helical spring and nut. The upper portion has two projections below which is a spherical recess; the rear end of the mortar barrel is

Equipment	*Differences*
	inserted between the projections and then turned through 90 degrees thus locking it to the base plate. The collar, of mild steel, is positioned on the upper portion of the stem of the rebound socket. The lower portion has two segmental projections which engage similar projections in the central pivot thus preventing its upward movement on rebound. V-shaped vertical slots are filed around one half of the periphery of the collar in order that a suitable tool can be inserted through the hole in the side of the central pivot and by engaging the V-slots the collar can be turned to its correct position to receive the securing screw. The washer, of mild steel, is passed over the stem of the rebound socket and is positioned below the collar. The spring is a helical compression spring with a free length of 3.7 inches and is passed over the stem of the rebound socket below the collar, being finally held in position and placed under slight initial compression by a ring nut which is screwed on to the lower end of the rebound socket stem, the nut being retained by a set screw.
PLATE BASE MOBILE 4.2" S.B. MORTAR Mk 1	Introduced by L of C para C 1207 June 45. Consists of Base Plate, Stub Axle Brackets, Pneumatic Wheels, Towing Bar and Lifting Bars, for use in conjunction with the Mortar Mk 2 and Mounting Mk 3. The complete equipment when in transport being towed by a "Jeep" or similar vehicle. Total weight is 970½ lbs. The Base Plate, of steel, has flanged sides with sleeves for housing locking plungers and the pintles of stub axles brackets, also blocks, for securing, positioning and supporting the brackets in the travelling position, and hooks for drag ropes to be attached when in transport. A cylinder centrally situated in the plate is furnished with a socket, for the reception of the rounded end of the breech piece

Equipment	*Differences*

of the mortar and a stop to limit the traverse of the mortar. Two hinged barrel bands surmounted by "U" shaped brackets and a locking pin, are furnished with clamps and retaining catches, to house and secure the mortar and mounting to the plate ready for transportation. A bracket at the rear end of the plate is for the attachment of the towing bar. Another bracket, and two square shaped pockets, at the front end of the plate are for the attachment of a shackle, and the insertion of the small diameter end of the lifting bars, to facilitate lifting the plate when deeply embedded in the ground. A number of tubes and holes in the plate permit use of the lifting bars to displace earth clinging to the underside of the plate after lifting.

The stub-axle brackets, formed with a pintle block, recess for plunger, stub axle and tube, have their pintles housed in sleeves at each side of the plate and secured by locking nuts. The blocks interlock with, and are supported by similar blocks on the plate when the brackets are locked in the travelling position by plungers engaging the recesses in the brackets. The stub axles carry the pneumatic wheels, and the tubes permit the insertion of the large diameter ends of the lifting bars used for turning the bracket and bringing the plate to the travelling position.

The pneumatic wheels mounted on the stub axle brackets have hubs with plates and studs on which detachable wheels are secured by coned wheel nuts.

The towing bar, a hinged bar with locking pin, towing eye, and folding handles, is attached by a hinge bolt to a bracket on the plate and secured by a nut and keep pin. By withdrawing the locking pin before lowering the plate, the bar is free to hinge upwards as the plate embeds itself in the ground, leaving the bar free from strain. The folding handles, for use in transport, are secured in the open or closed position by locking pins.

Equipment	*Differences*
	The lifting bars are housed in spring clips on the plate and have a large and small diameter end for insertion into the tubes of the stub and brackets, and the pockets at the rear end of the plate, from the ground and bringing the brackets to their travelling position.
PLATES BASE AUXILIARY 4.2" S.B. MORTAR Mk 1	Designed for use underneath the No. 2 or No. 3 Base plant when firing on soft or boggy ground. An upper plate recessed to accommodate the underside webs of the base plate, with a carrying handle at each corner, a projection is formed at right angles to the plate at its rear, to form an "eye" for attachment of a tow rope to facilitate removal after firing. A recess at its front end is provided to allow clearance for the rear leg of the mounting Mk 1 when firing at high elevation. Plates are welded to its underside to form a frame and the whole structure is strengthened by webs.

STRIPPING — ELEVATING GEARS

MOUNTING Mk 1

As for the Mounting O.M.L. 3" Mortar Mks 2, 2*, 3 and 5.

MOUNTINGS Mks 1*, 2 and 3

1. Remove Split Pin and Handle Elevating.
2. Undo nuts and Bolt retaining Plate Locking Pinion Housing Cap and remove the latter.
3. Unscrew Cap Pinion Housing and withdraw the Pinion Elevating Gear.
4. Unscrew Cap Tube Elevating.
5. Unscrew the Screw Retaining Bush Elevating Gear and remove the Elevating Gears complete.
6. Remove the Washer Packing Pinion.
7. Undo Screw Stop Elevating and remove the Stop Elevating.
8. Slide off the Bush Elevating Gear.
9. Unscrew and remove the Nuts Operating.
10. Slide off the Sleeve and Cap Tube Elevating.

To Assemble, reverse the Stripping sequence watching the following points:

(a) When assembling the Sleeve to the Elevating Screw ensure the stud is to the top.

(b) When inserting the Elevating Gear in the Tube Elevating ensure that the stud on the sleeve engages correctly with its recess in the Tubes Elevating.

(c) Watch for correct adjustment of the Caps Tube Elevating and Cap Pinion Housing to ensure minimum amount of freedom of operation coupled with the minimum of play.

STRIPPING — TRAVERSING GEARS

MOUNTINGS
Mks 1, 1*, 2 and 3.

1. Remove Split Pin, Washer and nut securing Grip (or Handle) Traversing, and remove the latter.
2. Screw the Screw Traversing through the Cradle and remove the Cradle and Screw from the Yoke.
3. To remove the Bracket Supporting Sight, traverse it fully in one direction until the worm becomes disengaged. Slacken off the two retaining screws and lift off the Bracket.

To Assemble reverse the Stripping sequence watching the following points.

(a) When assembling the Cradle to the Yoke, ensure that the Screw Traversing is passed through the adjustable Bush first. Otherwise the Cradle will be incorrectly positioned.

STRIPPING — PLATE BASE MOBILE 4.2" S.B. MORTAR Mk I

Lower the Base Plate to the ground as follows:—

1. Remove the Pin Locking Mounting, slightly raise the tripod legs and slide the mounting to the rear until the Cradle is free of the Barrel.
2. Release the Spring Catches from engagement with the hinged Barrel Bands, unclamp the Barrel Bands and lift off the barrel.
3. Withdraw Pin Locking Towing Bar, undo nut and Bolt retaining Towing Bar and lift off the Towing Bar.

4. Remove the two Lifting Bars from their clips.
5. Disengage the Plungers from their recesses in the Stub Axle Brackets.
6. Insert the Lifting Bars in the rear end of the tubes of the Stub Axle Bracket and push forward to lower the Base Plate to the ground.
7. Undo the Locking Nuts and withdraw Stub Axle Bracket and Wheels.
8. Undo Screw Retaining Rebound Socket, rotate the Rebound Socket through 180° and lift out.

NOTE:—The Stripping sequence as detailed above may be varied according to the following order:— 4. 5. 6. 1. 2. 3. 7. 8.

PLATES, BASE, MOBILE, 4.2-IN. S.B. MORTAR Mk I
Consisting of base plate, stub-axle brackets; pneumatic wheels; towing bar and lifting bar,
and
MOUNTINGS, 4.2-IN. SB. MORTAR, Mk 3
Consisting of tripod; cradle with sight supporting bracket; and traversing gear.

NOTES ON HANDLING

Stowage for Towing

1. The barrel is placed on first with the breech towards the towing bar, the rear clamp actually engages over the breech cap.
2. The bipod is then placed on the barrel with the single leg downwards, and positioned sufficiently far back to allow the securing pin to be engaged.
3. It will be noted that the Barrel Clamps cannot come undone if the bipod is correctly towed.
4. If the barrel clamps are too tight, these may be adjusted by two nuts on the right hand side. This adjustment should ensure that the clamps give an easy but positive locking action.
5. Ensure that the stub axle bracket locking plungers are fully home. If not this may be due to dirt on the plunger or its housing or dirt between the two blocks situated on the inside of the quadrant and the outside of the plate proper.
6. Ensure that the towing bar is in its lowest position and secured by the locking pin. The man-handling handles should be folded and locked parallel to the towing bar.

Firing Position

1. The ideal position for the Tripod Mounting is for the legs to form an equilateral triangle on the ground, with approximately 6" of elevating screw exposed. This will ensure that the maximum changes in elevation are available either on the Elevation Mechanism and/or the movement of the front leg.
2. The front leg should always be positioned in prolongation of the Line of Fire thus ensuring maximum RIGHT & LEFT Traverse without movement of the mounting.
3. In conjunction with the above, and especially when firing from slopes, the tripod must be so positioned to ensure there is ample length of barrel protruding through the Cradle.
4. During firing the wheels should be left unlocked and folded back in the direction of the tow bar, which is situated at the rear of the plate in the firing position.
5. The towing bar should be left unlocked during firing, otherwise it is liable to damage if the plate beds in to any extent. The locking pin should be stowed in the spare hole provided in the towing bar, and the man-handling handles in the folded position.
6. The barrel clamps should be locked and secured by their spring catches during firing to prevent damage by the inertia of firing. The transit joint pin securing tripod leg should be also replaced in its housing.
7. Always ensure that no part of the mortar or mounting fouls the base plate during firing, this is particularly important when firing at large switches.
8. The mortar, if possible, should always be bedded in on Zero line (i.e. the Base Plate at 90^0 to the L of F), prior to making large switches, this will ensure better stability and accuracy.
9. Ensure that the socket of the base is free to rotate, this should be maintained in the normal manner as for the ground pattern Base Plate.
10. If the Base Plate assumes an unnatural tilt during firing, this can often be corrected by standing one or two of the crew on the Base Plate on the opposite side to the tilt for a few bombs.
11. The base plate can be brought into action with the barrel and mounting in place, but it is safer if time permits to remove these items to ensure they do not foul the ground when tilting the base plate during the unlocking of the stub axle brackets.
12. On uneven ground it is advisable to dig a small hole for the tripod leg or legs to level up the cross head, thus ensuring greater stability.

13. It is possible to tow the Base Plate out by means of a Lloyd Carrier — this should be done with the shortest tow rope possible and in a forward direction **only.**
14. Care must be taken that the wheels do not bear directly on to the ground with the quadrants vertical, otherwise the full recoil will be taken by the wheel. This is caused by the sinking or tilting of the base-plate and can be overcome by digging away the ground immediately below the wheel assemblies.

Coming out of Action

1. If it is impossible to move the base plate by means of the lifting bars in the wheel quadrants, the handspikes should be inserted into the two rectangular slots in the two top front corners of the plate and the whole eased upward out of the ground.
   If it is still impossible to move the B/Plate by hand it may be towed out by means of a carrier and tow chain attached to the tow eye on the front plate. (If moving by hand the Towing Bar should be re-locked).
2. The barrel and mounting should always be removed before coming out of action.
3. When cleaning the base plate, it should not be tipped completely upside down as this will damage the stowage fittings. Usually the earth falls out during towing, but the surplus can easily be cleaned either by pushing out from the top through the holes, or from below by tilting the plate on to its forward edge.
4. If any difficulty is experienced in re-locking the wheels, look at the points previously mentioned.

Maintenance

1. Always keep all moving parts well greased.
2. Examine and tighten all nuts frequently, this is most important in the case of the wheel nuts which should always be examined after a long firing programme.
3. Ensure the shear bolt of the Tow Eye is correct, and that the Tow Eye is free.
4. Whenever practical the Canvas Cover should be fitted over the equipment when on tow.

ACTION OF THE REBOUND SOCKET

On firing, the shock of discharge is absorbed by the Base Plate, which should be embedded firmly in the ground. The resistance, offered by the base plate to the downward thrust causes a rebound action and the mortar with the rebound socket moves in a direction opposite to the thrust, thus compressing the rebound spring between the Nut and Collar.

As son as the emergency of rebound is exhausted, the spring reasserts itself and returns the mortar to the normal position of firing.

NOTE:— The above action does NOT apply to the Mobile Base Plate.

ACTION OF THE ELEVATING GEAR

MOUNTINGS Mks 1, 1*, 2 and 3	The same as for the Elevating Gear of the Mounting O.M.L. 3" Mortar Mks 2, 2*, 3, 4 and 5.

EXAMINATION, TESTS AND ADJUSTMENTS

MORTAR Mk 2	1. Unscrew the Breech Piece, remove the Stud Striker and Copper Washer, and examine for condition. 2. Unscrew the Cap Breech and examine the bore visually for pitting scratches, cracks, puckers and corrosion. Test for straightness, using the "Gauge Testing Straightness of Bore 4.2" Mortar" if available, passing it from muzzle to breech. 3. Screw on the Cap Breech and Breech Piece ensuring that they screw up fully home. 4. Ensure that all modifications have been carried out.
MOUNTINGS Mks 1, 1*, 2 and 3	As for Mountings O.M.L. 3" Mortar Mks 1, 2, 2*, 3, 4 and 5.
PLATES BASE No. 2 Mk 1 and No. 3 Mk 1	1. Examine for distortion, condition of Rebound Socket and Carrying Handle. 2. See that all welded joints are serviceable. 3. Ensure all modifications are carried out.
PLATE BASE MOBILE 4.2" S.B.MORTAR Mk 1	1. Examine for distortion, condition of Rebound Socket. 2. Serviceability of all clips, locking pins and clamps. 3. Condition of the "shear" pin on the Towing Bar. 4. Stub axles for straightness and freedom of rotation. Security of Locking Nuts. 5. Wheels for freedom and tyre pressure, security of wheel nuts. 6. Check Tyre Pressure — 18 lbs/sq. ins.

7. Freedom and security of Plungers when wheels are locked in the travelling position.
8. Ensure all welded joints are serviceable.
9. Ensure all modifications are carried out.

NOTE:— Examination as under will normally be carried out only by an EME, but where an EME is not available, authority for examination may be delegated to some other qualified REME officer or armament artificer (vide EMER ARMAMENT A.521.)

Measure the Bore. Using "Gauge Measuring Bore" No. at the following points 2", 4", 20", 28", 35", 44", 50", 59½" horizontally and vertically from the muzzle.

The Estimated life of the Barrel is 4.000 rounds. The Bore diameter is 4.200", and the Piece will be provisionally condemmed when the bore reaches a diameter of 4.220 **at any one point.**

Each .005" of wear constitutes one quarter of life, thus

1st QUARTER	2nd QUARTER	3rd QUARTER	4th QUARTER
4.200"	4.200"	4.200"	4.200"
+	+	+	+
0—.005"	.006"—.010"	.011"—.015"	Wear greater than .015"

All relevant details ofthe examination will be entered on AF G 875 A in accordance with instructions contained in EMER Armament A520—Examination of Ordnance—General Procedure.

P.C. = Provisionally Condemned.

⩚ = Serviceable.

For a specimen AF G875A see Chapter on O.M.L. 2" Mortar.

FITTING OF NEW BUSHES TRAVERSING

As for Mountings O.M.L. 3" Mortar.

SIGHTS 4.2" MORTAR Mk 1

The Sight is in all respects similar to the Sight 3" Mortar Mk 1 except that the Range Scale Strip is engraved in yards from 1,050 yards to 2,780 yards in multiples of 25 yards for Charge I and from 1,500 yards to 4,100 yards in multiples of 25 yards and 50 yards for Charge II.

There is also a Range Scale Strip for use with Chemical Warfare Bombs engraved in degrees from 45° to 80° at intervals of 5°.

TO TEST FOR RANGE (INF)

(a) Stores required—Field Clinometer.

(b) Method.

(i) Lay the mortar at the elevation corresponding to 3,000 yards (Charge II). This is done as at (ii) to give an accurate reading for 3,000 yards range and to reduce inaccuracies of the range scale, at other readings, to reasonable limits.

(ii) Lay the mortar for elevation at an angle of 66° 10'. To do this set the Clinometer at the corresponding figure and place it on the mortar barrel. Position the latter by the operating handle until the clinometer bubble becomes central.

(iii) Bring the longitudinal bubble central. The sight should now read 3,000 yards on the Charge II scale. If it does not give this reading, adjustment is necessary.

TO ADJUST FOR RANGE

Position the Range Scale Reader for full charge, slacken the wing nut of the Range Scale Slider and bring the longitudinal bubble of the sight central. Tighten the wing nut, slacken the four screws adjusting the Range Scale Reader and position the Reader to read 3,000 yards on the full charge scale.

Tighten up the adjusting screws and check that the bubble is still central.

NOTE:— The screws adjusting the Range Scale Reader are positioned two on each side of the Range Scale Slider and pass through elongated slots in the Range Scale Reader.

TO TEST AND ADJUST FOR RANGE (C.W.)

As for the Sight 4.2" S.B. Mortar (Inf) except that all references to Range and Elevation should read 65 degrees.

SIGHTS 4.2" MORTAR Mk 3

See Chapter on Sights 3" Mortar Mk 2.

LIST OF CHANGES

LOFC	*Date*	*Detail*	*Remarks*
B 7009	Dec 42	O.S.B. 4.2" Mortar, Mounting and Base Plate	Intro.
B 7010	Dec 42	O.S.B. 4.2" Mortar, Stud Striker	Mod.
B 7680	May 43	Plate, Base 4.2" S.B. Mortar No. 3 Mk 1	Intro.
		No. 2 Mk 1	Mod.
C 431	Mar 45	Mountings 4.2" S.B. Mortar Mk 3	Intro.
C 923	Mar 45	Sights S.B. 4.2" Mortar Mk 3	Intro.
		Sights S.B. 4.2" Mortar Mk 1	
C 1207	Aug 45	Plates Base Mobile 4.2" S.B. Mortar Mk 1	Intro.

ACIs

Para	*Date*	*Detail*
1584	1944	O.S.B. 4.2" Mortar — Damage to Striker Studs and Breech Pieces

EME REGS

No.	*Page*	*Detail*
ARMT R 453	1	**Base Plate 4.2" Mortar No. 2 Mk 1 and No. 3 Mk 1 (MR 1583 and 2131)** Radiusing of holes for rope loops in baseplate.
	2	**Mountings 4.2" S.B. Mortar Mks 1, 1* and 2—Cradle (MR 1526)** Removal of grit etc. from blowholes.
	3	**Mountings 4.2" S.B. Mortar Mks 1, 2 and 3—Bracket Supporting Sight B (MR 384A)** Instructions to guide fitting of wedge type Sights.
	5	Removal of burrs from edges of Cabound socket.
	7	Replacement of clamping bolt on Mk 3 Mtg.
	8	Cracked barrel cap defect.
	9	Cracked breech-pieces.

EME REGS

No.	*Page*	*Detail*
ARMT R 454	1	**Mounting 4.2" S.B. Mortar Mk 1—Bracket Supporting Sight (MR 1531)** Setting of Sight Bracket.

EME REGS

No.	*Mod. Inst.*	*Detail*
ARMT R 457	1	**Ordnance 4.2" S.B. Mortar Mk 1—Barrels Mk 1 B (MR 1274)** Mod to enable use of Base Plate No. 2 Mk 1.
	2	**Mounting 4.2" S.B. Mortar Mk 1—Base Plate No. 2 Mk 1 (MR 1583)** Welding of strengthening gussets.
	3	**Plates Base No. 2 Mk 1 and No. 3 Mk 1—Collar Securing Spring (MR 1584)** Mod to ensure correct assembly and fitting of longer Screw (MR 2461).
	4	**Piece Breech (MR 1793)** Fitting of a locking device to prevent barrel from turning in the rebound socket. See also 21 AG Tech Bulletin para 58.
	5	**Plates Base No. 2 Mk 1 and No. 3 Mk 1—Collar (MR 2462) and Screw (MR 2461)** Mod to prevent shearing of the screw spigot during firing.
	6	Mod to "gauges testing straightness of bore".
	7	Issue 1. Page 13. Cancellation of M. I. No. 1. Cancellation of M. I. No. 2.

EME REGS (RHINE ARMY)

No.	*Page*	*Detail*
R 457	Mod Inst No. 1	**Plates Base Auxiliary 4.2" S.B. Mortar Mk 1 (MR 4529)**
21 A.G.	Issue 2	Deepening and widening of the recesses as necessary to enable Base Plate to seat correctly. Fitting of transverse webs to the Auxiliary to prevent it sliding backwards during firing.
	Mod Inst No. 2	**Plates Base No. 2 Mk 1 and No. 3 Mk 1 (MR 1583 and MR 2131)**
	Issue 2	Strengthening of the Base Plate to prevent distortion due to shock of discharge particularly when used in conjunction with the auxiliary.
	Mod Inst No. 3	**Piece Breech O.S.B. 4.2" Mortar Mks 1* and 2 (MR 1793 and MR 3169)**
		Fitting of a block catch to the breech piece to prevent the barrel turning independent of the Rebound Socket when Traversing and during firing.
	Mod Inst No. 4	**Plates Base No. 2 Mk 1 and No. 3 Mk 1 (MR 1583 and MR 2131)**
		Replacement of the Rope Carrying Handles by metal type.

21 A.G. and RHINE ARMY TECHNICAL BULLETINS
SA, MG and MORTARS

Para	*Detail*
8	Strengthening of underside of web of Bracket Supporting Sight. Replacement of steel hinge spring of the Lensatic Sight Bracket by a phosphor bronze spring. See also para 93.
10	Wear of Bushes Traversing and Screw Traversing. See also paras 44, 77, 121.
11	Report on overheating.
44	Wear of Bushes Traversing and Screw Traversing. See also paras 10, 77, 121.
45	Sights 4.2" Mortar—Investigation of the fracture of the actuating Lever of the Deflection Worm Spindle.
58	Cancellation of EMER R 457.
77	Traversing and Elevating Gears—report on defects. See also paras 10, 44, 121.
78	Distortion of the flanges of the Rebound Socket.
80	Sights 4.2" Mortar—distortion of Deflection Dials.
93	Strengthening of Bracket Supporting Sight—Cancellation of detail in para 8.
95	Approval for fitting of Chain Handles in lieu of Rope.

OML 3" MORTAR

General Information

There are three Marks of 3" Mortar at present in use in the Service, Mks 2, 4 and 5, all being Infantry Support Equipments which may be mounted on any one of the following Marks of Mountings:—Mks 1, 2, 2*, 3, 4 or 5, in conjunction with any of the following Base Plates; No. 4 Mk 1, No. 5 Mk 1 or No. 6 Mk 1.

The Mortar fires H.E. and Smoke Bombs which weigh approximately 10 lbs for a distance of up to 1,400 yards on Charge I and up to 2,700 yards on Charge II.

Maximum Elevation . . . . . 80°.

Minimum Elevation . . . . . 45°.

Angle of Traverse right and left of zero is 5° without movement of the Mounting.

Difference in Marks

Equipment	*Differences*
Mortar Mk 2.	The Barrel is a parallel steel tube, tapering at the breech end and threaded to receive the Breech Piece. The Breech Piece forms the means of attaching the Barrel to the Base Plate and houses the Stud Striker and Copper Washer. The Stud Striker is provided with "flats" to permit the use of a spanner when tightening or removing it from the Breech Piece. A Copper Washer is fitted between the Stud Striker and Breech Piece to form an effective gas seal. At the muzzle end of the Barrel, a Clinometer Plane and Sighting Line are machined. This Mortar is Obsolescent.

Equipment	*Differences*
Mortar Mk 4.	The Barrel is a parallel steel tube, reinforced at the breech end and threaded to receive the Breech Piece which houses the Stud Striker and Copper Washer. The Stud Striker is shorter than that of the Mortar Mk 2. A Copper Washer is fitted between the shoulder on the breech end of the Barrel and the shoulder on the inside of the Breech Piece to form an effective gas seal. At the muzzle end of the Barrel, a Clinometer Plane is machined. This Mortar is Obsolescent.
Mortar Mk 5.	The Barrel is lighter than the Mk 4 and has no Clinometer Plane. The Breech Piece, Stud Striker and Copper Washer are all of the same pattern as those of the Mk 4, and are interchangeable.
Mounting Mk 1.	Has a "broad" Crosshead. The Elevating Gear is operated by a centrally located Handle Operating. The Leg Stays are of the "toggle" type. This Mounting is Obsolescent.
Mounting Mk 2.	Has a "narrow" Crosshead. The Elevating Gear is operated by a side located Handle Operating. The Leg Stays are of the type which slide on a Sleeve up the Tubes Elevating when folded. NOTE:—These Leg Stays should be removed and replaced by the toggle joint type vide EMER R307/1 when the mark of the Mounting as advanced to Mk 2*. This Mounting is Obsolescent.

Equipment	*Differences*
Mounting Mk 2*.	See Mounting Mk 2. This Mounting is Obsolescent.
Mounting Mk 3.	Is the same as the Mounting Mk 2* except that the Tube Elevating is of different design at its lower end for the location of the toggle joint type Leg Stays. This Mounting is Obsolescent.
Mounting Mk 4.	Introduced by L of C Para. C921 of June 1945 for use with OML 3" Mortar Mks 2, 4 and 5. Generally similar to the Mk 5 except that it differs in being of a specially lightened design and has a simplified pattern of Bipod. The Bipod consists of a pair of tubular legs, each with a spiked foot and Stay Bracket. The upper end of each Legs is attached by a hinge pin to the upper portion of the Elevating Tube, and folding Stays are attached by hinge pins to the leg brackets and a sliding connecting bridge mounted about the middle portion of the Elevating Tube.
Mounting Mk 5.	Introduced by L of C Para. C1204 of August 1945, this mounting is similar to the Mk 3 except for the following components:— 1. The Screw Elevating. 2. The Stop Elevating which is thicker. 3. The Screw Fixing Stop Elevating which is of larger diameter. 4. The Tube Elevating. 5. The Handle Operating which is similar to a car starting handle. (No Counterweight.) 6. The Screw Traversing. 7. The Grip Traversing replaces the Handle. 8. The Yoke is fitted with replaceable Bushes.
NOTE:—	There are two types of Cradle which may be fitted to any of the above Mountings, according to whether a Sight Mk 1 or Sight Mk 2 is used.

Equipment	*Differences*
Plate Base 3' Mortar No. 4 Mk 1.	This type of Base Plate has the appearance of being a series of transverse webs welded together to a steel plate frame fitted with spiked feet. It has no Carrying Handles.
Plate Base 3" Mortar No. 5 Mk 1.	Has a flat steel plate top, its underside being formed with webs which are pointed to form a grip and seating in the ground. The Breech Piece Socket is formed in the centre, and a rope Carrying Handle is fitted to the forward end. There are four small holes bored in a semi-circle on the top plate in front and behind the Breech Piece Socket.
Plate Base 3" Mortar No. 6 Mk 1.	Similar in all respects to the No. 5 Mk 1 except that the holes bored in the top plate are of larger diameter thereby lightening the Base Plate. Those of future manufacture will have chain handles fitted in lieu of rope.

STRIPPING—ELEVATING GEARS

Mounting Mk 1.

1. Screw the Elevating Screw right down.
2. Remove the Pins Handle and Handle Operating.
3. Remove the Screws Cover Elevating Bracket and lift off the Cover.
4. Remove the Bevel Pinion.
5. Remove the Screw Stop Elevating and Stop Elevating from the lower end of the Tubes Elevating.
6. Unscrew the Screws Elevating complete and lift clear of the Elevating Bracket.
7. Remove the Ring Packing and Bevel Wheel.

Equipment	*Differences*
Mounting Mk 2, 2*, 3 and 5.	1. Screw the Elevating Screw right down. 2. Remove the Pins Handle and Handle Operating. 3. Undo the Screw and Nut, and remove the Plate Locking Pinion Housing Cap. 4. Unscrew the Cap Pinion Housing and remove the Pinion Elevating Gear with the Washer Thrust Pinion. 5. Disengage the Strip Supporting from its recess in the Cap Tube Elevating and unscrew the Cap Pinion Housing. 6. Withdraw the Elevating Gear complete. 7. Remove the Screw Stop Elevating and the Stop Elevating. To Assemble reverse Stripping sequence.
Mounting Mk 4.	As for the sequence detailed in the Chapter on OSB 4.2" Mortars for the Mounting 4.2" SB Mortar Mks 1*, 2 and 3.

ACTION OF THE ELEVATING GEAR

Mounting Mk 1.

The Elevating Gear consists of an Elevating Screw, Bevel Wheel, Ring Packing, Stops Elevating and Bevel Pinion to which is keyed and pinned the Handle.

The Ring Packing bears on a shoulder in the Tubes Elevating and forms a bearing for the Bevel Wheel. The upper surface of the flange on the Bevel Wheel forms the upper bearing surface in the Tubes Elevating, thus permitting rotation but not vertical movement of the Bevel Wheel, through which is screwed the Elevating Screw. The Bevel Pinion meshes with the Bevel Wheel, so that when the Handle is rotated in an anticlockwise direction, the Bevel Pinion is rotated which in turn rotates the Bevel Wheel. This causes the Screws Elevating to

Equipment	*Differences*
	rise, thereby elevating the Mortar, because the ScrewElevating cannot rotate being firmly held by the Yoke. Excessive elevation is prevented by the Stop Elevating contacting the shoulder in the Elevating Tube.
Mountings Mks 2, 2*, 3, 4 and 5.	The Elevating Gear comprises an Elevating Screw, Nut Operating, Sleeve, Pinion, Elevating Gear to which is keyed and pinned the Handle (or Grip), and a Bush Elevating, Stop and Screw Stop Elevating. The Bush Elevating seats on a shoulder in the Tubes Elevating and forms a bearing for the Nut Operating. The Cap Tube Elevating bearing on the Sleeve forms the upper bearing surface thus permitting rotary but not vertical movement of the Nuts Operating, through which is screwed the Screw Elevating. On rotating the Handle (or Grip), the Pinion Elevating rotates and being meshed with the Nut Operating, rotates it thereby screwing the Screws Elevating up, or down, according to the direction in which the Handle is being rotated, because it cannot rotate being firmly held by the Yoke. Excessive elevation is prevented by the Stops Elevating contacting the lower end of the Bush Elevating Gear.

EXAMINATION, TESTS AND ADJUSTMENTS

Mortar Mks 2, 4 and 5.	1. Unscrew the Breech Piece, remove the Stud Striker and Copper Washer. Examine these components for condition. 2. Examine the bore visually for pitting, scratches cracks, puckers and corrosion. Test for straightness by passing the "Gauge Testing Straightness of Bore 3" Mortar" from the muzzle to the breech. Examine the Ring Buffer.

Equipment	*Differences*
	3. In the case of the Mk 2 and Mk 4 **only** examine the Clinometer Plane for condition. 4. Screw on the Breech Piece and tighten it up fully. Examine for the correct position of the Breech Piece flats in relation to the muzzle Clinometer Plane (Mks 2 and 4) and in relation to the top 33/64 in. hole at the breech end of the Barrel (Mk 5). In the case of the Mk 2 they should screw up parallel with the Barrel Clinometer Plane. On the Mk 4, they should screw up to between 10 degrees underscrew and 15 degrees overscrew, in relation to the Barrel Clinometer Plane, and in the case of the Mk 5, between 10 degrees underscrew and 15 degrees overscrew in relation to the top 33/64 in. hole at the breech end of the Barrel. 5. Examine the Spring Recoil for serviceability, and tighten all screws. 6. Ensure that all modifications have been carried out.
Mountings Mks 1, 2, 2*, 3, 4 and 5.	1. Examine the Legs for distortion and dents, the shoes for security, and serviceability of all welds. 2. Test the toggle joints for security and ease of operation. 3. Slacken the Clamping Handle and test the Crosshead for freedom of movement without excessive "play" in the joints. 4. Fully elevate the Screw Elevating by means of the Handle, ensure that elevation is smooth and that the Stop Elevating is functioning correctly. 5. Examine the Screw Elevating for straightness and wear, also for the security of the Securing Nut and Yoke.

Equipment	*Differences*
	6. Apply upward pressure to the Yoke, testing for play between the Screw Elevating and Bevel Wheel, and between the Bevel Wheel, Ring Packing and their seatings (in the case of the Mk 1). In the case of the Mks 2, 2*, 3, 4 and 5, the test is for play between the Screws Elevating and Nuts Operating, and between the Sleeve and the Caps Tube Elevating. There should be the minimum of play conducive to the maximum freedom of operation. If play is excessive, fit Washers or new components. 7. Examine the Cradle for distortion and condition of the Worm Segment, the Bracket Supporting Sight for condition and the fit of the Sight. 8. Rotate the Handle (or Grip) Traversing, and pass the Cradle along the whole length of the Screws Traversing ensuring that undue effort is not required due to either a bent Screw Traversing or tight Bushes Traversing. Test the Cradle for the fit of the Bushes on the Screw Traversing, ensuring that there is only the minimum of play present. Adjustment being made by unscrewing the Screw Plate Locking, removing the Plate Locking and screwing either in or out, the Bush Adjustable until a satisfactory adjustment is made, i.e. minimum amount of play with the maximum freedom of operation. It may be necessary to "wear in" the Bushes after adjustment to ensure freedom of operation throughout the length of the Traversing Screw. 9. Ensure that all modifications are carried out.
Plates, Base.	1. Examine for distortion, condition of the Breech Piece Socket and Carrying Handle. See that all welded joints are serviceable. 2. Ensure that all modifications are carried out.

Equipment	*Differences*

NOTE:—

Examination as under will normally be carried out only by an EME, but where an EME is not available, authority for examination may be delegated to some other qualified REME officer or Armament Artificer (vide EMER Armament A.521).

Measure the Bore. Using "Gauge Measuring Bore No. 39" at the following points:— 2", 14", 23", 32", 35", 40", 45½" horizontally and vertically from the muzzle. The estimated life of the Barrel is 4,000 rounds. The Bore diameter is 3.206", and the Piece will be provisionally condemned when the bore reaches a diameter of 3.226" **at any one point.**

Each .005" of wear constitutes one quarter of life, thus:—

1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
3.206"	3.206"	3.206"	3.206"
+	+	+	+
0-.005"	.006"-.010"	.011"-.015"	Wear greater than .015"

All relevant details of the examination will be entered on AF G875A in accordance with instructions contained in EMER Armament A520—Examination of Ordnance—General Procedure.

P.C. = Provisionally Condemned.

⩚ = Serviceable.

For a specimen AF G875A see the Chapter on OML 2" Mortar.

FITTING OF NEW BUSHES TRAVERSING

1. Remove the Cradle from the Mounting.
2. Remove both Bushes from the Cradle.

3. Select a pair of Bushes which are a good screw fit into the Cradle.
4. Screw the Bush Fixed fully home, and mark on it the position for the recess to house the Screw Retaining.
5. Remove the Bush and file the recess, replace the Bush and screw in the Screw Retaining.
6. Screw in the Bush Adjustable until is fully home, then insert the Screw Traversing through the Bush Fixed and unscrew the Bush Adjustable until the Screw Traversing can be screwed right through without excessive play.
7. Mark off the position for the Spanner Flats, ensuring that the maximum allowance is made for subsequent adjustment.
8. Remove the Bush Adjustable and file the Spanner Flats.
9. Re-assemble complete and re-test.

NOTE:—

1. When replacement of Bushes is necessary, always fit both Fixed and Adjustable Bushes, and not one without the other.
2. Before fitting new Bushes ensure that it is the Bushes and not the Screw Traversing which is unserviceable.
3. The same procedure applies equally to Mountings OSB 4.2" Mortar, Mk 1, Mk 2 and Mk 3.

SIGHTS 3" MORTAR

Sight 3" Mortar Mk 1

General Description

The Sight consists of a Range Scale Bracket, Worm Wheel Bracket, Collimator Bracket and Range Scale Slider.

The Range Scale Bracket, of manganese bronze, consists of a body in the form of a segment having a dovetailed groove on its periphery for the reception of a Range Scale Strip. A semi-circular projection on the lower side of the body is recessed to fit over the supporting pillar on the Sight Supporting Bracket and is bored transversely for the reception of a Locking Pin. The projection is engraved with a direction arrow and the words "TO LOCK", the engraving being filled in with black wax.

The Locking Pin consists of a spindle with latch the spindle being cut away to engage the supporting pillar when the Sight is in position on the

Mounting. The latch is provided with a spiral spring and hardened steel ball, the latter engaging in one of two holes on the outer face of the semi-circular projection according to whether the spindle is in the locked or unlocked position.

The Range Scale Strip (MR 2454) is engraved with two yard scales, one for full charge and the other for reduced charge. The full charge scale is graduated in yards from 1,000 to 2,700 in multiples of 25 yards, and the reduced charge scale from 600-1,400 also in multiples of 25 yards.

The Worm Wheel Bracket, consists of a manganese bronze body with a Worm Wheel and an aluminium alloy Deflection Dial.

The Body is circular in shape with two lugs formed on its upper surface for the attachment of a Collimator Bracket. It is bored vertically through the centre for the Worm Wheel Pivot and has three slotted holes for the attachment of the Deflection Dial. Two slotted holes are also provided for the attachment of the Worm Wheel.

The Worm Wheel is secured to the underside of the Body and is pivoted to the Range Scale Slider to permit of all round movement of the Collimator Bracket for the purpose of "laying back" if necessary.

The Deflection Dial is secured to the Body by three screws working in the slotted holes which permit of adjustment of the Dial. It is graduated from 0 to 180 degrees Right and Left in multiples of 10 degrees, the right graduations being marked with the letter "R" and the left with the letter "L" to signify right and left deflection respectively. The engraving is filled with black wax.

The Collimator Bracket consists of a manganese bronze Body formed with fore and back sights. It is hinged at the front to the lugs on the Worm Wheel Bracket, the hinge pin being fitted with a spiral spring to take up play. The rear end of the Bracket is provided with an adjusting screw having a knurled head. The lower end of the adjusting screw bears on the top surface of the Worm Wheel Bracket and provides the means for adjusting the line of sight in the vertical plane. Two screws are provided for the attachment of the No. 1 Collimator.

The Range Scale Slider consists of a manganese bronze or aluminium alloy Body, Deflection Worm Spindle Bearing and Spring Plunger Deflection Worm Spindle, Deflection Clicker and Steel Clamping Bolt.

The Body is in the form of a segment. It is formed with a circular recess at the front end to receive the Worm Wheel and Bracket, a boss formed in the centre of the recess being bored and threaded to receive a steel pivot for the Worm Wheel. A projection on the left side of the recess has a socket for the reception of a longitudinal level employed in conjunction with the Elevating Gear of the Mounting. When the Bubble is brought

to the centre of its run by operating the Elevating Gear the Mortar is layed at the quadrant elevation applied to the Sight.

The underside of the Body is dovetailed to form a Slide and fits over the Range Scale Bracket, being clamped to the latter by the Clamping Bolt. A transverse projection about midway on top of he Body has socket for a Cross—Levelling Bubble employed with the Worm Spindle on the Sight Supporting Bracket of the Cradle to compensate for difference in the level of the Legs. A lug is formed on he Body, above the transverse projection, for the attachment of the Deflection Worm Spindle Bearing.

An adjustable reader is secured to the lower end of the Body by screws. Two arrow heads on the reader provide the means of reading the Scales. The Reader is dovetailed on the underside to slide along the transverse bar marked FULL and RED, a Clamping Screw with a knurled head clamping the Reader in the required position.

The Deflection Worm Spindle Bearing, of aluminium alloy, is bored transversely to receive the Worm Spindle and is formed with two lugs on the underside for attachment to the Range Scale Slider Body by means of a hinge pin. A recess in the underside forms a seating for a plunger and spiral spring to keep the Worm Spindle engaged with the Worm Wheel. The Spring Plunger also forms a means for throwing the Spindle out of gear with the Worm Wheel for quick and approximate settings of large deflection angles by hand, the Worm Spindle being employed for deliberate and final setting. A thumbpiece formed on the rear of the Spindle Bearing enables the Bearing to be depressed against the Spring Plunger when disengaging the Worm Spindle from the Worm. A slot in the thumbpiece accommodates the upper end of a Spring Catch screwed to the Range Scale Slider Body. A Stop Piece, rivetted to the rear face of the Spring Catch, engages the underside of the thumbpiece and prevents the Worm Spindle from being disengaged from the Worm Wheel on shock of discharge.

An arrow is engraved in the centre of the Bearing, towards the front, for reading the Scale on the Deflection Dial and an arrow on each side, marked "R" and "L" respectively, act as Readers for the Deflection Drums of the Deflection Worm Spindle. The arrows and letters are filled in with black wax.

The Deflection Worm Spindle, of rolled bronze, is formed with a thread to engage the Worm Wheel of the Range Scale Slider Body. The right end of the Spindle is enlarged to form the right Deflection Drum and the left end is screw threaded to receive the left Deflection Drum after the Spindle has been assembled in the Deflection Worm Spindle Bearing. The Drums are graduated from 0 to 10 degrees in multiples of a degree, subdivided in multiples of 30 minutes. They are engraved with the letters "L" and "R",

to signify left and right deflection respectively, the graduations and letters being filled in with black wax. The Drums are knurled on their outer edges.

The inner surface of the right Deflection Drum is prepared with a circle of twenty equally spaced holes to engage with the ball of the Deflection Clicker. Provision is made, also on the Spindle, for the use of a Spring and Plain Washer to take up backlash.

The Spindle is retained in its Bearing by two nuts which also secure the Left Deflection Drum to the Spindle. A plain Spring Washer on the Worm Spindle, interposed between the Left Deflection Drum and the Worm Spindle Bearing, takes up any backlash.

The Deflection Clicker, consists of a steel ball and spiral spring housed in a recess in the right side of the Deflection Worm Spindle Bearing in a position to enable the ball to engage the holes in the Right Deflection Drum. When the Drum is revolved to apply deflection to the Sight, each successive engagement of the ball with a hole in the Drum produces an audible click which represents an angular movement of 30 minutes on the Deflection Drums.

The Clamping Bolt, of steel, is provided with a wing nut to clamp the Range Scale Slider in any required position on the Range Scale Bracket.

THIS SIGHT IS NOW OBSOLESCENT.

SIGHTING

The Sight must be handled with great care at all times and frequently inspected to make sure it is free from damage. All parts are to be kept clean and working parts well lubricated with clean oil.

The Sight Supporting Bracket must be absolutely clean and free from burrs.

The Sight must not be stripped unnecessarily. If for any reason it is taken to pieces, it must be carefully treated in replacement and, if necessary, tested.

The Sight and Clinometer must be kept in perfect condition and adjustment. When not in use they must be kept in their respective cases.

SIGHT TESTS

The Sight should be frequently tested to prove that it is in adjustment both for Direction and Elevation.

Errors in Direction

These may be due to the displacement of the Worm Wheel Bracket.

Errors in Elevation

These may be due to the Range Scale Bracket or Range Scale Slider being bent or damaged.

TO TEST FOR RANGE

(a) Stores required—Clinometer Field.

(b) Method.

(i) Lay the Mortar at the elevation corresponding to 1,750 yards range for full charge (Charge II). This is done as at (ii) to give an accurate reading for 1,750 yards range and to reduce the inaccuracies of the Range Scale, at other readings, to reasonable *limits.*

(ii) Lay the Mortar for elevation at an angle of 70 degrees 05 minutes. To do this, set the Clinometer at the corresponding figure and place it on the Clinometer Plane on the Barrel. Position the latter by the Operating Handle until the Clinometer Bubble comes central.

(iii) Bring the longitudinal bubble of the Sight central. The Sight should now read 1,750 yards on the full charge scale. If it does not give this reading, adjustment is necessary.

TO ADJUST FOR RANGE

Position the Range Scale Reader for full charge. Slacken the wing nut of the Range Scale Slider and bring the longitudinal bubble central. Tighten the wing nut.

Slacken the four screws adjusting the Range Scale Slider and position the Reader to read 1,750 yards on the full charge scale.

Tighten up the adjusting screws and check the bubble is still central.

NOTE:—The screws adjusting the Range Scale Reader are positioned two on each side of the Range Scale Slider and pass through elongated slots in the Range Scale Reader.

TO TEST FOR DIRECTION

(a) Stores Required—Four Direction Posts (these are required to suspend the plumb lines).

Two Plumb Lines.

(b) Method.

Choose an Aiming Point, preferably a distant one, on to which the Mortar can be layed. Suspend two Plumb Lines about five yards apart; and align them accurately on to the Aiming Point selected.

Mount the Mortar at a distance of about ten yards in front of the Plumb Lines. The Base Plate must be moved and the Barrel traversed until the Plumb Lines accurately bisect the Barrel throughout its length. The Barrel is now vertical and layed on the same point as the Plumb Lines.

Set all Sight scales to Zero,

Now bring the Cross-levelling Bubble central, and check the aim with the Sight. If the Sight is in adjustment, the aim will be on the same point as the Plumb Lines. If it is not, the Sight requires adjusting for Direction.

TO ADJUST FOR DIRECTION

Loosen the three screws in the elongated slots in the Worm Wheel Bracket, and move the Collimator Bracket in the required direction until the Sight is layed on the Aiming Point. Having made the adjustment, tighten the screws. The aim should then be finally checked.

NOTE:—The three screws referred to are those of which the heads projejct above the Worm Wheel Bracket.

Sight 3" Mortar Mk 2

Introduced by L of C Para C 923 of June 1945.

In every respect similar to the Sight 4.2" Mortar Mk 3 differing only in the Range Drum being engraved to suit the ballistic characteristics of the 3" Mortar.

Fitting of the Sight to the Bracket Supporting Sight

(a) On receipt of Sights and Brackets Supporting Sights, fit the Sight to the Bracket as detailed below and stamp each with corresponding numbers, thus ensuring the same Sight and Sight Supporting Bracket are always used together.

(b) The Sight should be so fitted to the Bracket as to ensure that the top arm of the Locking Latch is fully forward when the Sight is home. If this does not occur, one of two remedies must be applied.

(i) If the base of the Sight wedge is clear of the toe of the Locking Latch, then the faces of the Sight Supporting Bracket wedge housing must be relieved until the Sight is fully seated.

(ii) If before or after the above has been carried out and the Sight is not fully home due to its being in contact with the toe of the Locking Latch, this defect will be rectified by removing sufficient metal from the affected end of the Lever (MR 4531) to allow the Sight to seat correctly in the Bracket.

With the Sight then in the correct position there should be sufficient clearance between end "B" of the Lever and the Sight Wedge to allow the Lever to rise fully and freely under the influence of its Spring, thereby retaining the Sight.

The adjustments will be carried out without dismantling the Lever and care will be taken when adjusting end "A" not to damage the dovetail surface of the Bracket.

See EMER Armament R 303 Page 3.

SIGHT TESTS

TEST FOR CROSS-LEVELLING

After fitting the Sight to its Bracket Supporting Sight, the Crosslevelling Bubble should be tested as follows:—

(a) Place the Sight Supporting Bracket with the Sight fitted, on a Surface Plate and adjust it until it is horizontal by a Spirit Level laid across its upper face.

(b) Move the Elevation Drum throughout its whole travel and note if there is any movement of the Cross-levelling Bubble from central.

(c) If the Bubble is not central to commence with, or if there is any undue movement during the movement of the Elevation Drum, the Bubble must be adjusted as follows:—

(i) Slightly unscrew the Left End Cap, then turn the Right End Cap until the Bubble is central and tighten up the Left End Cap.

(ii) Re-test the Sight and repeat (i) above as necessary.

TEST FOR ELEVATION

(a) Stores Required.—Clinometer Field.

(b) Method.

Set up the Mortar and lay the Barrel by the Clinometer at 60 degrees. Set the Range Drum of the Sight at 60 degrees with the Cross-levelling Bubble central.

If the Elevation Bubble is not central, adjust by the same method as for the Cross-levelling Bubble.

Test the Sight throughout the range of QE's and adjust as necessary to give the best "mean" reading.

TEST FOR AZIMUTH

(a) Stores Required.—Clinometer Field, Instrument Sight Testing or Plumb Lines.

(b) Method.

Choose a Distant Aiming Point (DAP) on which the Mortar can be laid. Suspend two Plumb Lines about five yards apart and align them accurately on the DAP selected.

Mount the Mortar about ten yards in front of the Plumb Lines, the Base Plate must be moved and the Barrel traversed until the Plumb Lines accurately bisect the Barrel throughout its length. The Barrel is now vertical and laid on the same point as the Plumb Lines.

Zero all readings on the Directional Mechanism of the Sight and ensure that the Collimator is in the latched position.
Level off the Elevation and Cross-levelling Bubbles.
If the Collimator is not aligned on the DAP, it should be adjusted by means of the two adjusting screws on the right and left of the front shoulders of the Collimator Bracket.
Test the alignment through the range of QE's.

General Points During Use

1. It may be found that a small percentage of the Sights may tend to stick in the wedge housing after the first initial firings.
   This defect will be remedied in the later issues, the cause being the excessive bedding down of certain of the wedges until they come in contact with the toe of the Latch.
   If the above occours, the following procedure should be adopted:—
   (i) If impossible to remove by the pressure of one thumb, try the use of both hands.
   (ii) If the above fails, loop the Strap of the Sight Case over the Thumbpiece of the Latch and give it a sharp, hard jerk.
   (iii) If the Sight still remains firm, use a piece of hard wood or similar material as a drift placed under the Wedge Casting of the Sight and repeat (ii) above.
   (iv) It is advisable during firing, to loosen the Sight periodically, this will prevent the jamming becoming too serious.
2. It will be found that the Range Indicator will not always slide from one charge setting to another. This is due to the indentations for the Detent not always coinciding on the two Scales. The Indicator can always be moved at the extremity of the Range Scale, and can be "felt" across at other points provided a pressure is kept on the Indicator whilst the Range Drum is moved, until the Indicator slides over.
3. It is pointed out for information that the "Azimuth" mechanism of the Sight is identical to that of the MMG Mk 3 Dial Sight and therefore all details of the Mechanism and Adjustments etc., apply.
4. The Elevation Mechanism is operated by a screw thread, this can be lubricated by the removal of the small round end plate on the front of the screw housing.
5. The Sight is issued in its Case complete with the following:—
   (i) A luminized Thimble, which is placed over the front end of the Collimator for **Night Firing Only.**
   (ii) A Screwdriver, with a Plumb Line attached.

6. The small round screw shaped fitting on the left rear of the Collimator, is the lateral adjustment of the Open Sight.

   The Line of Sight being taken through the groove of the "screw" thread.

7. **Replacement of Broken Bubbles**

   Unscrew the Left End Cap of the Bubble Housing and slacken off the Grub Screw until the Bubble is free to come out.

   Replace in the reverse order and adjust in accordance with the previous instructions.

APPARATUS, PRACTICE LOADING, ML 3" MORTAR MARK 2

General Description

The Apparatus consists of a Barrel Mk 1 converted for use in conjunction with the 3" Mortar Mounting and Base Plate for the purpose of practising loading.

A portion of the upper side of the Barrel near the breech end is cut away to provide an exit for the Drill Bomb. A hard wood block faced with a steel plate, is fitted to the Barrel adjacent to the opening to divert the Bomb from the vicinity of the Base Plate.

A Breech Piece and Copper Washer are fitted to the rear end of the Barrel and the latter is arranged for the attachment of the Recoil Spring Band, Recoil Stop Band and Cradle of the Mounting.

Preparation For Use

To prepare the ML 3" Mortar Equipment for use as an Apparatus Practising Loading, remove the Sight and Barrel.

Remove the Recoil Stop Band and Recoil Spring Band from the Service Barrel and assemble these, with the Ring Buffer, on the Apparatus Practising Loading Barrel. Insert this Barrel in the Cradle and Base Plate.

A mat should be used to avoid damage to the Base Plate and the Drill Bombs.

CLINOMETER FIELD

General Description

The Clinometer Field is designed to permit of its being quickly set to any required graduation.

The Clinometer Mk 6 consits of the following parts:—

Body, Arm, Plunger, Slider and Bubble Case, all being made of Gunmetal.

The Body has two plane surfaces at right angles to each other. A transverse hole is bored for the pivot of the Arm, opposite which is a toothed arc, each tooth representing one degree. The sides of the teeth are graduated in degrees on one side from 0 to 44 degrees, on the other from 45 to 89 degrees, an arrow on the side of the Plunger acting as an index. The surface forming the base of the Clinometer is marked with an arrow to indicate the direction of the Target, and with the words "USE THIS BASE FOR 0 TO 45°." The second surface has an arrow indicating direction of Target, together with the instruction "45 DEGREES TO 90 DEGREES."

The upper portion of the Body is slotted longitudinally to permit of observation of the Bubble when the arm is set at angles between 35 and 55 degrees.

The Arm, along which moves the Slider with the Bubble, is pivoted to the Body. It is slightly curved so that, as the Slider moves away from the pivot, the axis of the Bubble is placed at an increasing angle to the Base of the Clinometer, the total movement being equivilant to one degree. The arm is graduated on each side from 0 to 60 minutes, reading in opposite directions, and is bored from the outer end to take a Plunger and Spring. A small slot on the under surface, in conjunction with the Stop Screw of the Slider, limits the movement of the latter.

The Plunger, has a Spindle and Head in one piece. The Spindle portion fits in the arm against a spiral spring. The head is rectangular with teeth to engage the are on the Body. Side Plates are fixed to the head on each of which an index is engraved for the Degree Scale. The plates are roughened and project on each side of the arc.

The Slider and Bubble Case, is rectangular in shape and divided into upper and lower portions by a saw cut. The solid end is towards the pivot of the Arm and the open ends are connected by adjusting and clamping screws. The upper portion is bored longitudinally for the "Bubble, Spirit Glass, C", the upper surface being partly cut away to expose the lines on the Bubble. The ends are closed by Caps. The lower portion is prepared to slide along the Arm and has slots on each side to expose the Minute graduations, which are read by an arrow. A Clamping Screw, with milled head, and a Stop Screw are fitted to the underside, whilst a flat nickel silver spring lies between the Slider and Arm. The Slider can be clamped to any position on the Arm by the milled headed Clamping Screw. The graduations on the Clinometer are filled in with black wax the Body is nickel plated in parts and enamelled black elsewhere. The Instrument is carried in a wooden box.

The Clinometer Mk 5 differs from the Mk 6 in the form of the Slider and Bubble Case. The Case is a separate fitting and is secured in the Slider by End Caps. Three adjusting screws support and secure the Bubble Case at its inner end.

The Clinometer Mk 4 differs from the Mk 5 in the graduation of the Arc and Slider, these being identical on both sides i.e. 0 to 44 degrees on the Arc and 0 to 60 minutes on the Arm. No insxructions are engraved as to how to place the Clinometer on the Plane.

The Clinometer Mk 3 differs from the Mk 4 in the method of attachment of the Bubble Casing to the Slider. The Case is pivoted on trunnions at one end and is supported on a capstan headed screw at the other, the latter providing the means of adjustment. The upper portion of the Body is not slotted.

In ALL MARKS, suitable provision is made for effecting the necessary adjustments for index error.

TO SET THE CLINOMETER

Press in the Plunger and move the Arm until the Reader on the Plunger is opposite the required graduation on the Degree Scale. Release the Plunger, unclamp the Clamping Screw and move the Slider until the Arrow on it is opposite the required graduation on the Minute Scale. Clamp the Slider. The Degree and Minute Scales on the same side of the Clinometer must always be used in conjunction.

TO USE THE CLINOMETER

Great care should be taken to see that the Clinometer Plane on the Mortar is clean and free from grit, paint, etc., and that the Field Clinometer is in correct adjustment for index error, also that the Bubble Axis remains parallel to the longer axis. The instrument must be placed in the same position each time and must be correctly set, the elevation being set so that the Bubble is central each time.

CLINOMETER MORTAR

General Description

The Clinometer Mk 3 consists principally of an Arc, Bubble Slider and Spring, Bubble Case and Bubble.

The Arc, of duralumin, is prepared with a groove to take a Slider with Spring, a Stop Screw at each end of the groove preventing the Slider from over-running the Arc. A Scale, graduated from 0 to 90 degrees, is engraved on one side of the Arc, the graduations being read by means of an arrow engraved on the Slider. An arrow, indicating the direction of the Target, and the word "TARGET" is engraved on both sides of the Arc. All markings are filled in with black wax.

The underside of the Arc has a dovetailed groove to receive a steel base secured in position by screws.

The Slider, of gunmetal, is prepared on its upper surface to receive a brass Bubble Case with a No. 1. Glass Spirit Bubble, the Case being secured to the Slider by four Screws. The Slider is kept up to its work in the groove in the Arc by means of a steel Spring.

When not in use the Clinometer must be kept in its Case.

The Clinometer Mk 2 differs from the Mk 3 in not having a removable steel base.

COLLIMATOR No. 1

General Description

The Collimator No. 1 consists of a metal Body in which are mounted a Lens and wedge shaped Window. At one end of the Lens an arrow Point is marked which, being in the Focal Plane of the Lens, will, when seen through the Lens, appear to be at an infinite distance.

The wedge shaped Window transmits light into the Lens, thus illuminating the arrow point.

LISTS OF CHANGES

Para	*Date*	*Detail*	*Remarks*
B 2228	Feb 39	Mountings 3" Mortar Mk 1 — Elevating Gear	Mod
B 2482	May 39	Bags Tool 3" Mortar Mk 2	Intro
		Boxes 3" Mortar Equpt Mk 3	
B 2544	Jun 39	Harness Mortar No. 3 Mk 1	New Patt
B 2545	Jun 39	Sights 3" Mortar Mk 1—Sliders	
B 3120	Jan 40	Boxes 3" Mortar Equpt Mk 3	Mod
B 3814	Sep 40	Sights 3" Mortar Mk 1	Mod
B 4160	Dec 40	Mountings 3" Mortar Mk 1—Cradle and Bevel Wheel, Gear Elevating	Mod
B 6070	Apr 42	Boxes 3" Mortar Equpt Mk 3—Mod to accomodate Mounting Mk 1	Mod
B 6074	Apr 42	Sights 3" Mortar Mk 1—Bracket and Range Scale	Mod
B 6220	Jun 42	Sights 3" Mortar Mk 1—Conversion in Ordnance Factories for use with OSB 4.2"	Conversion
B 6221	Jun 42	Sigths 3" Mortar—Fitting New Pattern Bubbles	Mod
B 6390	Jul 42	OML 3" Mortar Mk 1	Obsolete
B 6395	Jul 42	Sights 3" Mortar—Fitting of the Lensatic Sight	Mod
B 7482	Mar 43	Plate Base 3" Mortar No. 4 Mk 1	Intro
B 9374		OML 3" Mortar Mk 4—Wrenches Breech	Intro
		Plates Base 3" Mortar No. 5 Mk 1	Intro
C 921	Jun 45	Mounting 3" Mortar Mk 4	Intro
C 922	Jun 45	OML 3" Mortar Mks 4 and 5—Adjustment of the angle of the Flats on the Breech Piece	Adjustment
C 923	Jun 45	Sights 3" Mortar Mk 2	Intro
		Sights 3" Mortar Mk 1	Obsolescent

Para	*Date*	*Detail*	*Remarks*
C 1204	Aug 45	Mounting 3" Mortar Mk 5	Intro
		Mountings 3" Mortar Mks 2* and 3	Obsolescent
C 1205	Aug 45	OML 3" Mortar Mk 5	Intro
		Plates Base 3" Mortar No. 6 Mk 1	Extension of use
C 1206	Aug 45	OML 3" Mortar Mks 4 and 5—Stud Striker	Mod
C 1208	Aug 45	Plates Base 3" Mortar No. 6 Mk 1 Chain Handles in lieu of Rope	Design
C 4403	Jan 51	Plugs Aligning Bore 3" Mortar	Intro

ARMY COUNCIL INSTRUCTIONS

Para	*Date*	*Detail*
1457	1941	Safety Precautions—3" Mortar Bombs.
863	1942	Mountings 3" Mortar Mk 1 and 2 Modified.
762	1943	Modification to Base Plates.
784	1944	Modification to Studs Striker to enable the firing of German and Italian 81 mm. Bombs.
1456	1944	Record on Spring Recoil Failures.
1034	1946	Sights 3" and 4.2" Sights Lensatic No. 2 Mk 1 tilting of.

EME REGULATIONS

No.	*Page*	*Detail*
ARMT R. 303	1	**OML 3" Mortar Mk 4** Seating of the Barrel on the Copper Washer, of the Breech Piece.
	2	**Mountings 3" Mortar Mks 1, 2, 2* and 3** Cradle (MR—384)—Removal of grit from Blow-holes.
	3	**Mountings 3" Mortar Mks 1, 2, 2* and 3** Bracket Supporting Sight B (MR 383A)—Instructions to guide the fitting of the Wedge Type Sights.

EME REGULATIONS

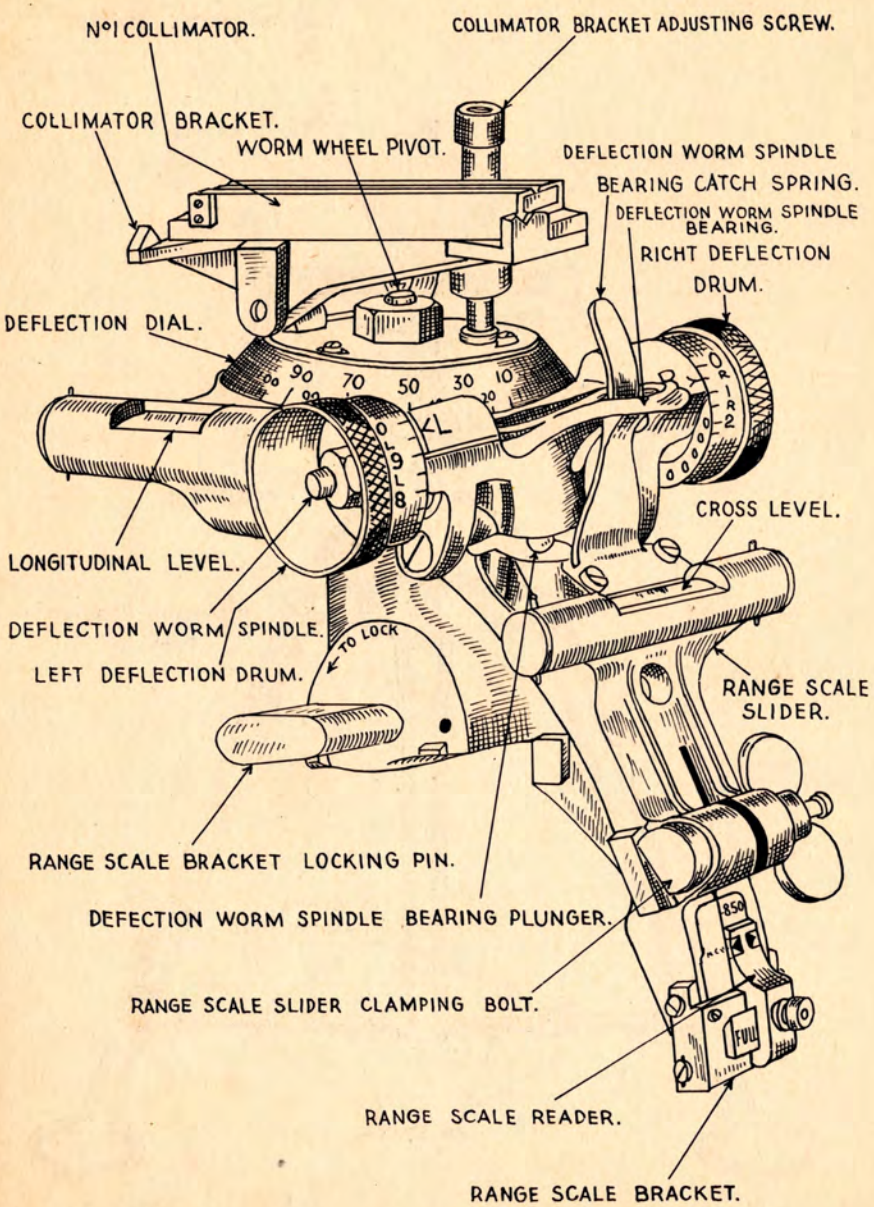
No.	*Page*	*Detail*
ARMT R. 304	1	**OML 3" Mortar Mk 2—Breech Piece MR 387 Washer MR 391** Machining and fitting of certain Breech Pieces.

EME REGULATIONS

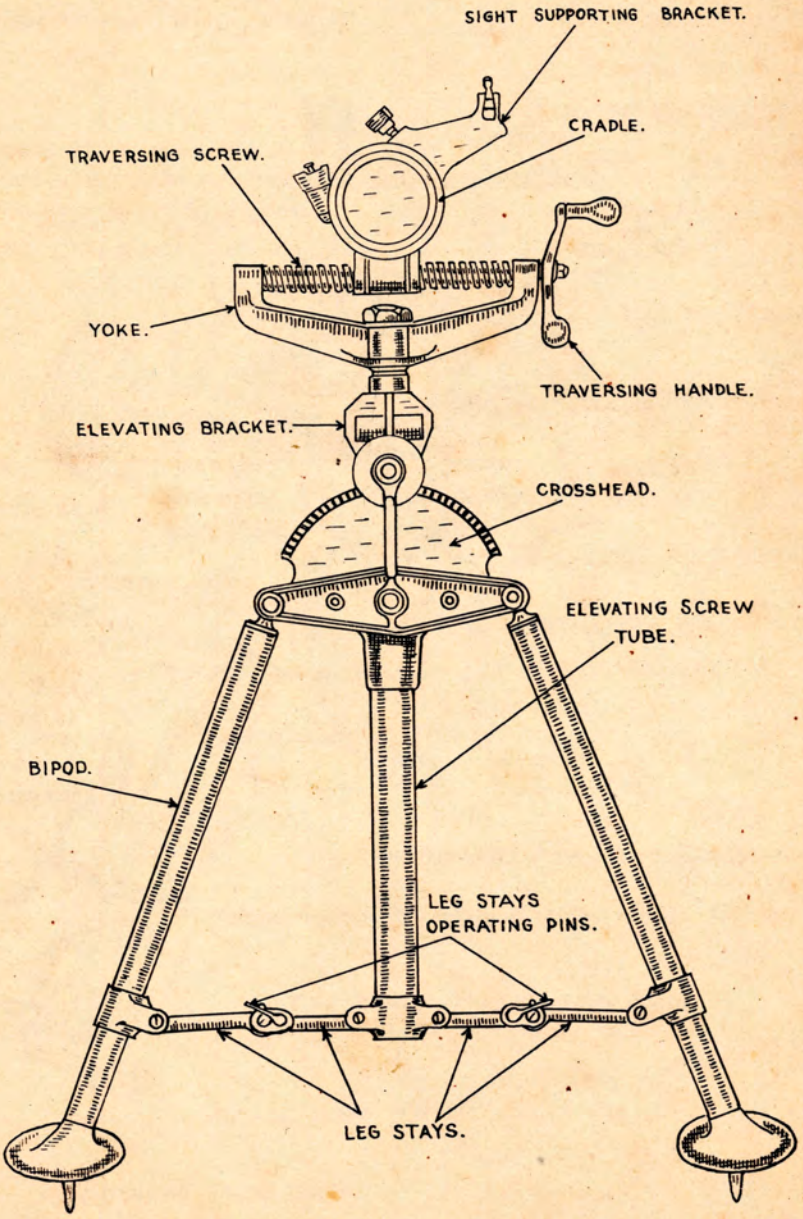
No.	*Mod. Inst. No.*	*Detail*
ARMT R. 307	1	Summary of previous modifications.
	1	**Mounting 3" Mortar Mk 2—Bipod (MR 11A)** Fitting of Toggle type Leg Stays.
	2 Issue 3	**OML 3" Mortar Mks 2 and 4—Studs Striker** Modification to permit the firing of German and Italian 81 mm Bombs.
	3 Issue 2	**Plates Base 3" Mortar No. 1 Mk 1B and No. 4 Mk 1** Cancellation of strengthening vide Issue 1.
	4 Issue 2	**Plates Base 3" Mortar No. 3 Mk 1** Cancellation of strengthening vide Issue 1.

21 ARMY GROUP AND RHINE ARMY TECHNICAL BULLETINS SA, MG AND MORTARS

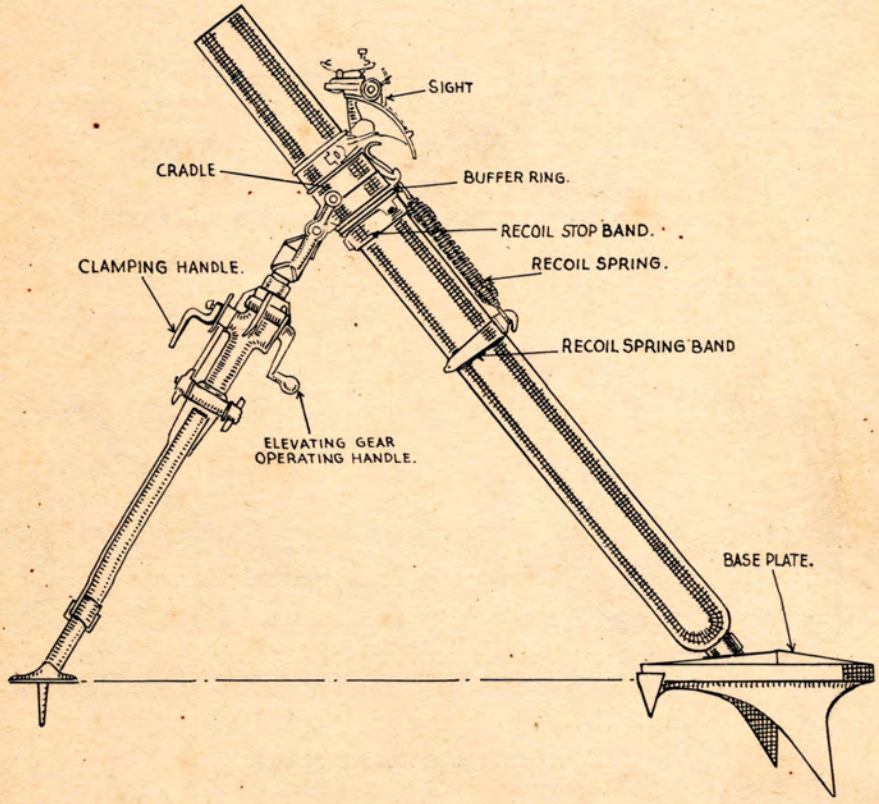
Para	*Detail*
8	Strengthening of the underside of the Web of the Bracket Supporting Sight. Replacement of the steel hinge spring of the Lensatic Sight Bracket by a phosphor bronze spring. **See also Para 93.**
10	Wear of the Bushes Traversing and the Screws Traversing. **See also Paras 44, 77, 121.**
44	Wear of the Bushes Traversing and the Screw Traversing. Further information. **See also Paras 10, 77, 121.**
45	Sights 3" Mortar.—Investigation of the fracture of the Actuating Lever of the Deflection Worm Spindle.
77	Traversing and Elevating Gears.—Report on defects. **See also Paras 10, 44, 121.**
80	Sight 3" Mortar—distortion of the Deflection Dial.
93	Strengthening of the underside of the web of the Bracket Supporting Sight. Cancellation of the detail in Para 8.
94	Springs Recoil.—Re-design detail.
121	Traversing and Elevating Gears.—Observations on defective equipment. **See also Paras 10, 44, 77.**
157	Springs Recoil.—Details of a new design. **See also Para 94.**
157	Experimental Auxiliary Base Plates.—Details.
158	OML 3" Mortar Mk 2 (MR 386)—certain Barrels are not to fire other than Charge I. Marking with a 2" White Band and superimposed with a Black figure "1".

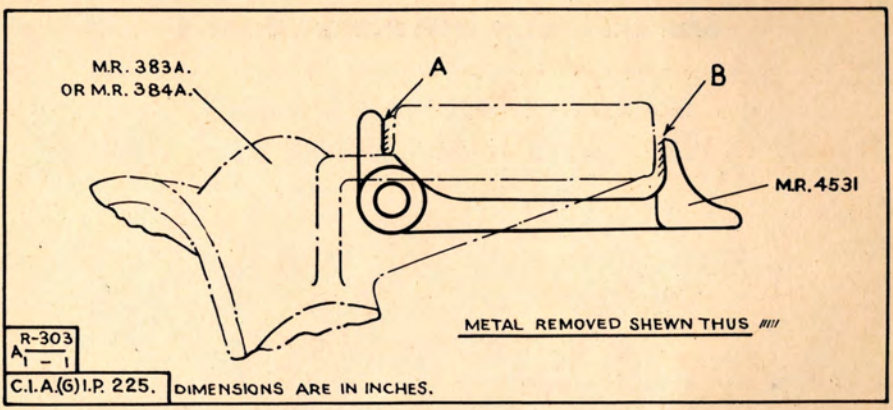

N°1 COLLIMATOR.
COLLIMATOR BRACKET ADJUSTING SCREW.
COLLIMATOR BRACKET.
WORM WHEEL PIVOT.
DEFLECTION WORM SPINDLE BEARING CATCH SPRING.
DEFLECTION WORM SPINDLE BEARING.
RICHT DEFLECTION DRUM.
DEFLECTION DIAL.
CROSS LEVEL.
LONGITUDINAL LEVEL.
DEFLECTION WORM SPINDLE.
LEFT DEFLECTION DRUM.
TO LOCK
RANGE SCALE SLIDER.
RANGE SCALE BRACKET LOCKING PIN.
DEFECTION WORM SPINDLE BEARING PLUNGER.
RANGE SCALE SLIDER CLAMPING BOLT.
RANGE SCALE READER.
RANGE SCALE BRACKET.

MOUNTING, 3-INCH, MORTAR, MARK I

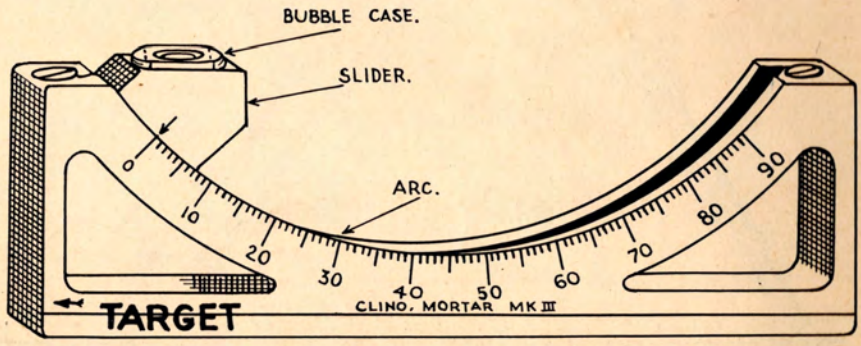


ORDNANCE, M.L. 3-INCH MORTAR, MARK 2
ON
MOUNTING, 3-INCH MORTAR, MARK I
GENERAL ARRANGEMENT

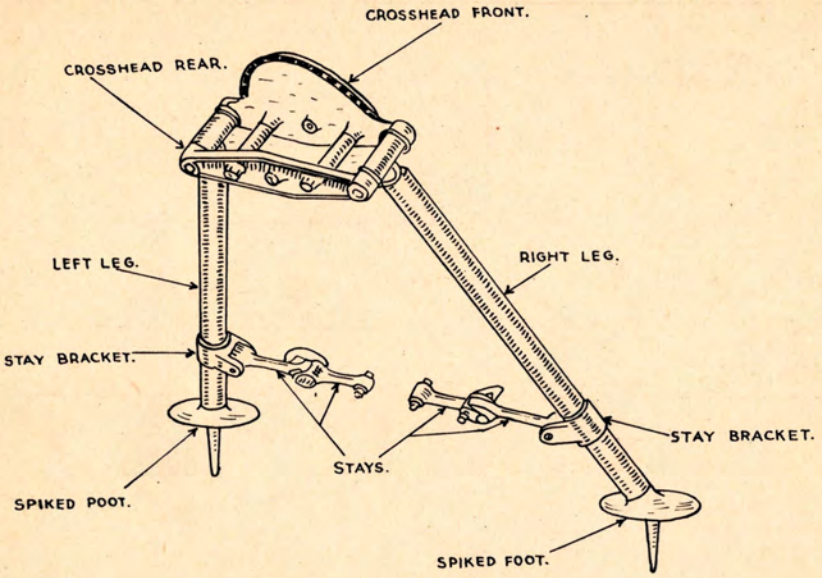




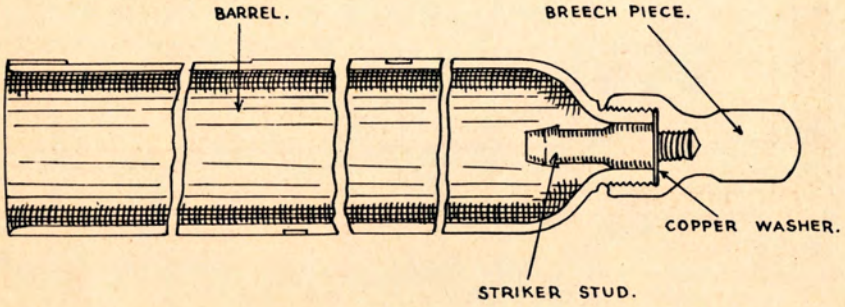
FITTING NEW WEDGE-TYPE SIGHT AND BRACKET



CLINOMETER MORTAR MARK 3



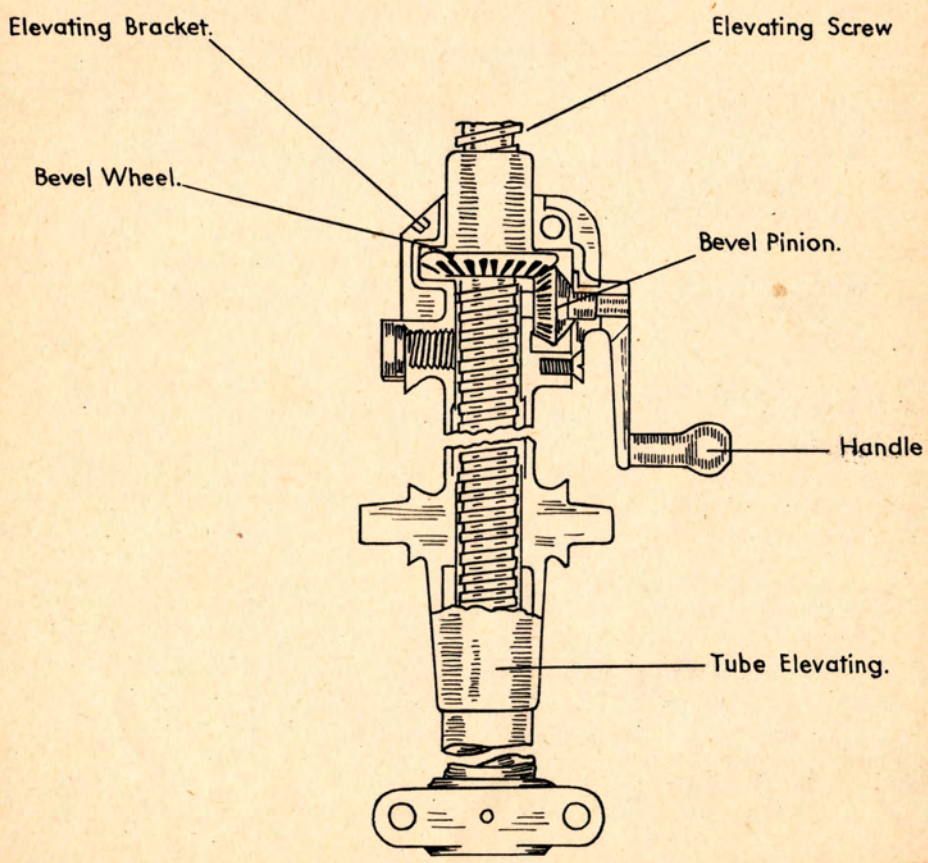
MOUNTING 3" MORTAR MARK 1



ORDNANCE 3" MARK 2

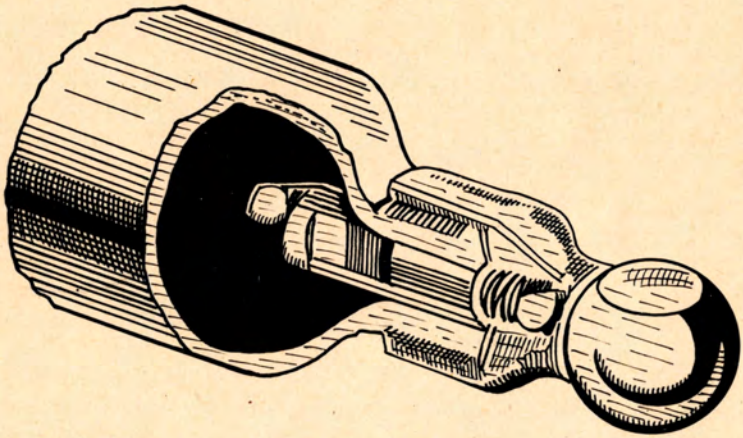
Mountings 3" Mortar Mk I.

Elevating Gear.

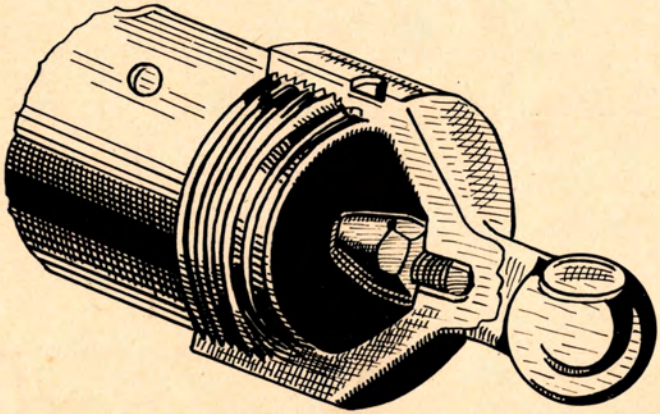


Ordnance, M.L. 3" Mortars.

Breech Pieces.



Ordnance Mk 2.



Ordnance Mk 4, 5.

DISCHARGERS SMOKE GENERATOR 4"

Dischargers Smoke Generators 4" are fitted to AFVs for the purpose of firing smoke. Normally fitted in pairs, the complete weapon can be fixed to a bracket on the turret and controlled by cable from inside the vehicle. On certain vehicles the barrel portion of the weapon is on the outside and the breech mechanism inside, doing away with the cable, the wall of the turret acting as a bracket.

There are two methods of locking to the bracket:—

(1) Lock Nut

(2) Pawl and serrated nut.

It will be found that the first method is the one normally used.

Sighting and Range

Direction is obtained by movement of the turret, there is no method of obtaining range either by regulation of gas or by a mounting, the range being approximately 125 yards.

Loading

The Smoke Generator No. 8 is inserted into the barrel portion from the muzzle and fired by a ballistite cartridge inserted into the chamber. The Generator emitting smoke for approx 1½ minutes starting a few seconds after being fired. As can be seen the method of reloading is a distinct disadvantage as the crew must expose themselves to carry out this operation.

Unloading

Ballistite cartridge removed from breech by breech mechanism. Generator withdrawn from barrel by medium of the lifting strap.

There are four main types of dischargers likely to be met with.

No. 2 Mk 1

Consists of a 4" diameter barrel approx 9¾" in length, the rear end screwed to receive the chamber portion (No. 1 Rifle) and the mechanism. The breech mechanism consists of the No. 1 Rifle action with a modified trigger guard and trigger, and locking bolt with the half moon portion of the stem removed. Its cable is controlled from inside the vehicle.

No. 2 Mk 2

Is similar in design to the No. 2 Mk I except there is no modifications to the components and the weapon is operated directly by hand inside the vehicle.

No. 3 Mk 1

Is similar to the No. 2 as far as the barrel portion is concerned but the breech mechanism is of a completely different design. The chamber portion is screwed at the rear end to accept a body, at the rear end of which is pivotted a breech block which in turn houses firing pin and spring. The breech block is held closed by the breech block locking lever. Mounted on the same axis as the latter is the extractor. Welded to the rear of the breech block is a grip housing the sear and sear spring. The weapon can be operated by cable or by direct release of cocking piece from sear.

No. 4 Mk. 1. Has Rifle No. 3 Action
STRIPPING — ENSURE THAT THE WEAPON IS UNLOADED

No. 2 Mks 1 and 2

Unscrew breech mechanism from barrel. Remove clamping nut. Strip breech mechanism as for Rifle No. 1.

No. 3 Mk 1

Unscrew breech mechanism from barrel. Remove clamping nut.

Unscrew grub screw retaining breech block axis pin, drive out axis pin, remove breech block, undo screws and remove extractor spring. Undo retaining screw of breech block locking catch axis pin, drive out pin, remove catch and extractor.

Remove cocking piece, firing pin, and main spring from breech block.

The sear is rivetted to the grip and rivets will only be removed for replacement of sear.

No. 4 Mk 1

ASSEMBLING

No. 2 Mks 1 and 2

Reverse of stripping.

No. 3 Mk 1

Reverse of stripping. Care must be taken to ensure that the recess and groove for retaining, and grub screws respectively, on axis pins are in line.

No. 4 Mk 1

ARMOURERS' WING
Précis No. SA/4

ACTION OF MECHANISM

No. 2 Mks 1 and 2

Mechanism as for Rifle No. 1.

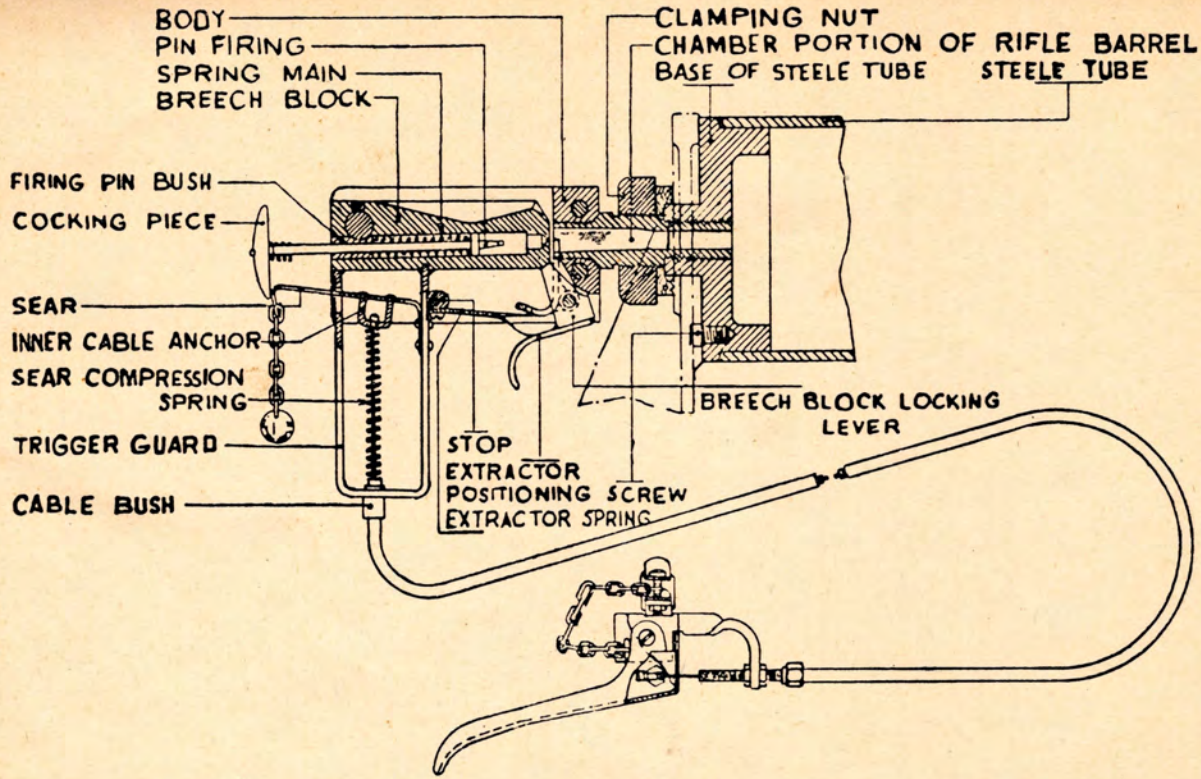
No. 3 Mk 1

Assume the weapon to have just been fired. Pressure on the trigger portion of the breech locking lever, disengages it from the breech block and compresses centre arm of extractor spring, the breech block being allowed to drop owing to its weight. Applying pressure to the grip further lowers the block until it comes in contact with the lower arm of the extractor, rotating the latter on its axis, compressing the two outside arms of extractor spring, the upper arm of extractor moving away from the breech exacting the case. The two outside arms of extractor spring re assert, the extractor resuming its normal position. The empty case is *not* automatically ejected. The breech block is prevented from dropping too far by stop in body. A fresh cartridge is inserted by hand. To close the breech block apply pressure to bottom rear of grip. The breech block rises until such time as the breech is closed and the locking lever, under the influence of the centre arm of the extractor spring, engages beneath it.

Withdraw the cocking piece, compressing the mainspring until the sear is forced by the sear spring into engagement with the cocking piece.

The weapon may be fired either by pulling the sear chain or pressure on firing lever, disengaging the sear from the cocking piece allowing firing pin to fly forward under influence of compressed mainspring. The cocking piece is withdrawn by the action of the spring beneath its head.

No. 4 Mk 1



DISCHARGER, SMOKE GENERATOR, 4 INCH, No 3, MK I

EXAMINATIONS, TESTS AND ADJUSTMENTS

ARMOURERS' WING
Précis No. SA/4

DISCHARGERS SMOKE GENERATORS

Regulation affecting the above weapon

E.M.E.Rs.

Issue 2. Armt. V 223 Page 1 Fitting discharger to bracket.

Armt. V 223 Page 1 Examination of chamber where small cone is omitted.

2 Identification of non-interchangeable components.

4 Protectun painting.

V 224 Page 1 Fitting of later pattern sears.

21 ARMY GROUP AND RHINE ARMY TECHNICAL BULLETINS

S.A. & M.G.

Para 106 Multi-barrel type — General Description.
107 Fitting Instructions.
160 Parts not interchangeable (Cocking Piece etc.)

ARMOURERS' WING
Précis No. SA/4

ARMY COUNCIL INSTRUCTIONS

1551	1942	Locking Device	L.M. action.
1806	1943	No. 3 Mk I	Fitting and adjusting new extractor.
885	1944	4" Nos. 1, 2 and 3	Nuts clamping.

LISTS OF CHANGES

B296 March 1937 4" Nos. 1 & 2 Introduction.

BOMB—THROWERS 2"

Two inch Bomb throwers are fitted to fire smoke emitting bombs from inside A.F.Vs, they are mounted in the roof of the turret either on the left or right of the co-axial mounting, normally secured to a bracket and held by four bolts.

There are three marks in use at the present time — Mks 1*, 1A* and 2.

Bomb throwers 2" Mks 1* and 1A*

The Mk 1* is generally similar to the Mk 1A* which differs from it in having certain details fabricated and simplified to facilitate manufacture. The range is governed by a gas regulator valve fitted to the side of the rear barrel, three positions are provided for the valve, short, medium, and long, giving respective ranges of 20, 70 and 110 yds approximately.

The Mks 1 and 1A are similar in design to the Mk 1* and 1A* respectively except that these have not a gas regulator fitted, range being governed by the bomb-thrower being housed in an adjustable mounting.

The M 3 Mortar (American) is the same as a 2" Bomb thrower Mk 1*.

To Load

Grip handle portion of junction nut, so releasing locking catch, rotate nut anti-clockwise and allow rear barrel to swing downwards. Insert bomb into front barrel. Raise rear barrel, bomb will slide down into rear barrel. Rotate junction nut clockwise ensuring locking catch engages.

To Unload

Open bomb thrower and lift out bomb by means of lifting strap.

General Description

The bomb-thrower is made of steel and has a total length, with breech-piece, of 23—24 ins., a front barrel of 10.5 ins., and a rear barrel of 9.7 ins. The firing mechanism is percussion.

The bomb thrower and its components are made up as follows:—

THE FRONT BARREL consists of a barrel screwed into a collar. A hinge bracket welded to the collar to attach it to the carrier, has four holes to bolt the bomb thrower in position on its mounting.

Mk 1A*

THE REAR BARREL consists of a barrel screwed at one end to a shrunk collar which is a seating for the junction nut. The rear end is screwed with a boss for a sleeve over which the breech-piece fits. Two holes, one each side of the barrel, permit gases to escape to the gas regulator valve.

A firing-hole bush is fitted into the sleeve. The underside of the barrel has a key-way to engage a key in the carrier. The bomb-thrower markings are on the rear barrel.

THE JUNCTION NUT has three segments which engage the front barrel, and has a handle provided with a lever incorporating a spring and hinge pin. This lever locks the barrels in position in the carrier.

THE CARRIER consists of a hinged steel frame which is slotted and drilled to clamp it on to the rear barrel, the pin being secured to the frame by a chain and screwed eye to prevent loss.

THE FRONT AND REAR BARRELS hinge together on the pin and are unlocked by releasing the safety catch on the handle of the junction nut from the slot in the carrier and turning it to the left. When open, the rear barrel drops through 90 degress.

The cone in the rear-barrel makes a gas-tight joint against the seating in the front barrel when closed. A steel cover houses a safety rod which is pinned in position. This safety rod has one end in a slot in the junction nut, the other end being pivoted to the upper portion of the safety crank.

Mk 1A*

THE BREECH PIECE consists of the following parts:— The piece is a pistol grip which is attached to the rear barrel by fitting over the sleeve and is secured by three countersunk screws. A firing hole bush fits into the sleeve.

The hammer is fixed to the breech piece by a stud and swivel pins, and is recessed for the hammer catch and hammer catch spring.

The main spring lever bears against a lug on the trigger at its upper end, while its lower end is screwed to the breech piece and operated by the mainspring.

The trigger pivots in the breech piece. It has two projections, the upper engaging the firing pin, the lower one engaging the toe of the hammer catch.

It is screwed to the safety link. The firing pin is recessed for the trigger. The safety link connects the trigger to the safety crank which is attached to the safety rod, protected by a cover.

THE GAS REGULATOR is fixed to either side of the rear barrel of the bomb thrower by a steel clip and plate and consists of a three way valve body and a valve plug, rotatable to one of three positions by a lever which is retained in position by a spring loaded bolt entering corresponding recesses in a cover plate.

The valve body communicates with the rear barrel of the bomb-thrower by the passage in the side of the barrel, the amount of gases by-passed on

firing being controlled by the valve, so determining the range. The clip embraces the gas regulator and a pair of annular seatings one for each passage in the barrel, a plug being used to close the passage not in use. The by-passed gases leave the regulator by the passage which is connected to an exhaust pipe. The cap closes the other end of the passage.

STRIPPING

Ensure that weapon is unloaded.

Open bomb thrower approximately 45°, this will bring the keyways on hinge bracket, and carrier in one line, turn hinge pin until feather is in line with keyways, pull out pin.

The hinge bracket will only be removed for replacement.

Remove split pin and lift off safety rod cover. Undo breech piece cover screws, remove cover. Remove screws and safety link, screw and safety crank. The safety rod can now be withdrawn, through a hole in the rear of breech piece. Using the fingers, take compression, unhook, and remove mainspring, lift out mainspring lever, and hammer.

Rotate firing pin upwards, remove trigger, withdraw firing pin.

Unscrew screw breech piece, (Mk 1*—1 screw, Mk 1A*—3 Screws) Tapping breech piece lightly with rawhide mallet unscrew from rear barrel (R.H. thread). Mk 1*. Mk 1A* driven straight off to rear.

Place breech piece on wooden block, pistol grip uppermost and with suitable brass punch tap out firing hole bush.

Remove carrier screw, slide off carrier from rear barrel, (care must be taken to ensure that feather is not lost).

Remove junction nut. Remove lever catch, spring and pin.

NOTE:—

In Mk 1A* models it may not be possible to remove carrier and junction nut owing to a sleeve being welded, to the breech end of rear barrel.

ASSEMBLING

Reverse order of stripping.

Ensure that junction nut catch is properly seated.

Do not forget feather for carrier.

Ensure correct seating of firing hole bush, test with firing pin and trigger movement.

TOOLS:— Wrench B.M. No. 359 Mk 1 CM 2529.

ACTION OF MECHANISM

On pulling the trigger the lug forces the mainspring lever to the rear and partly compresses the mainspring. The upper projection is moved clear of the rear end of the slot in the firing pin, while the lower projection engages the hammer catch which forces the hammer to rotate; the lower end, being attached to the mainspring, further compresses it.

The final movement causes the lower projection of the trigger to ride over the hammer catch, thereby releasing the hammer which is rotated forward under the action of the mainspring and striking the firing pin, drives it forward violently on to the cap of the cartridge. On releasing the trigger, the lever is forced forward under action of the mainspring and engaging the lug on the trigger, moves to the normal position. During this movement the upper projection engages the rear of the recess in the firing pin, withdrawing it to the rear and retaining it. The lower projection rides over the hammer catch, and compresses its spring. As soon as the projection is clear, the spring reasserts itself, returning the hammer catch to the normal position.

In addition, on movement of the trigger the safety link with rod which is attached to it, moves upwards and causes the safety crank to revolve about its stud. Thus, if the forward end of the safety rod cannot enter the slot in the junction nut, due to the nut being incorrectly positioned, the trigger cannot be displaced sufficiently to release the hammer catch. Also if the mechanism is in the fired position (i.e. safety rod in — its recess in junction nut), the junction nut cannot be opened. If junction nut is not quite closed, the rod will strike the cam face of slot and close it or hold it in the safe position.

EXAMINATION, TESTS AND ADJUSTMENTS

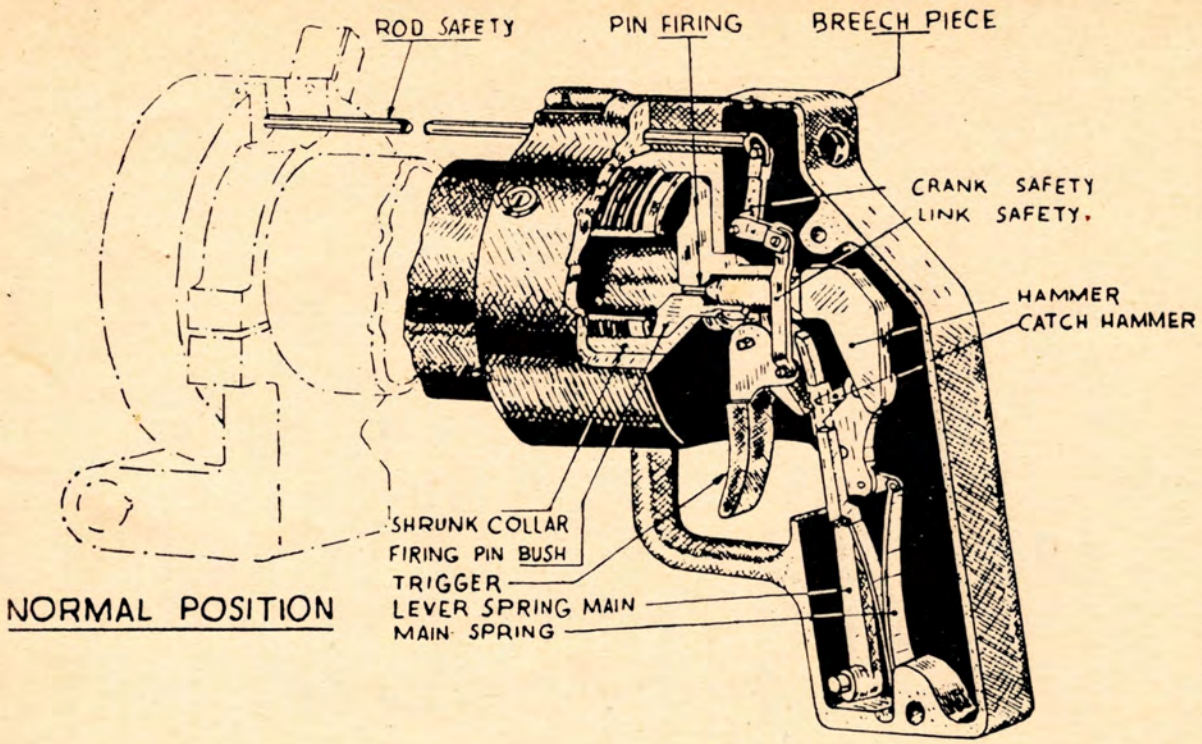
Ensure that the preservative, (Painting browning etc.) is in good condition. Examine for burrs, distortion, flaws, cracks, and general wear.

Test straightness of bore by using:— "Gauges Testing Straightness of Bore 2" Mortar," or if not available, by use of a dummy bomb.

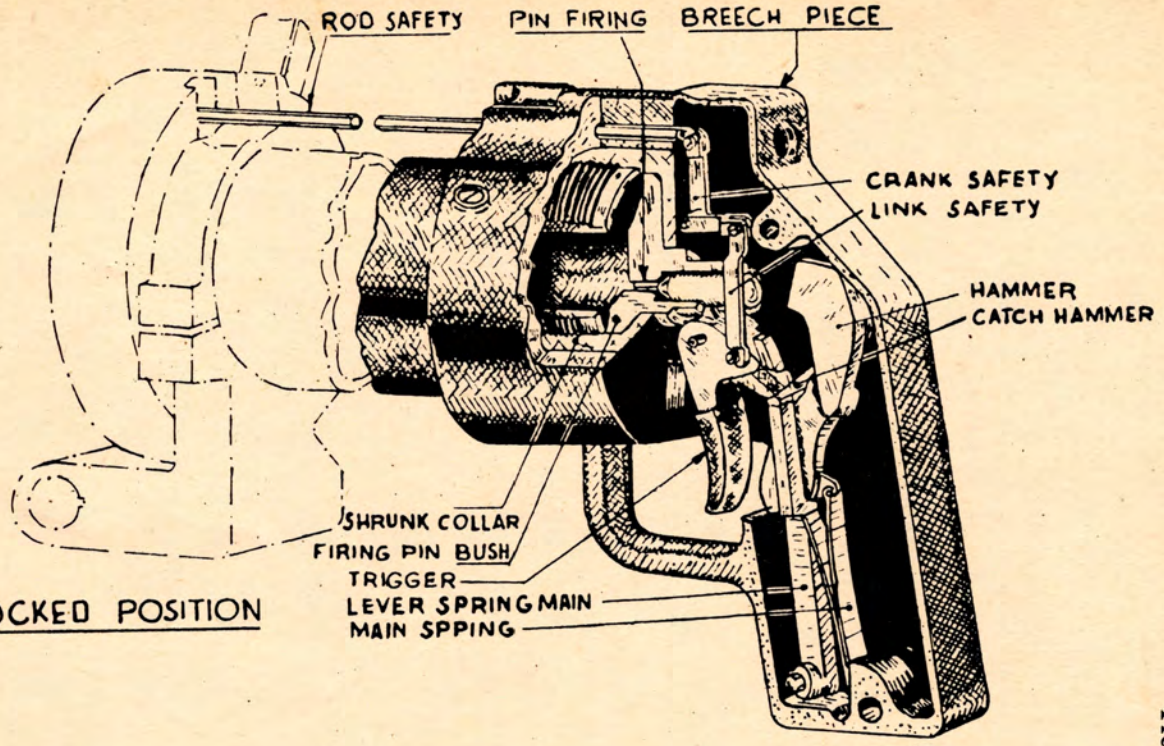
Gauge length of firing pin. .485—.495" Pin. 1.065—1.095" shank. Test Pin firing for freedom and functioning.

Ensure that junction nut closes correctly and that catch engages. Test safety action ensuring that trigger mechanism cannot function until recess in junction nut is opposite safety rod.

Test gas regulator for correct seating, ensure that valve plug rotates freely and is retained in the three positions.



ORDNANCE 2" BOMBTHROWERS Mks I – IA*
TRIGGER AND SAFETY MECHANISM



ORDNANCE 2" BOMBTHROWERS Mks 1-1A*
TRIGGER AND SAFETY MECHANISM

BOMB THROWERS 2" Mk 2

The Mk 2 is a completely different design from the earlier marks, although firing the same type of ammunition and mounted in the same manner.

Range is governed by gas ports in barrel and inner gas regulator sleeve. According to range set gases behind the bomb are allowed to escape through the ports, remaining in outer sleeve sufficiently long enough for bomb to leave barrel.

Unlike the earlier marks the bomb is inserted from the rear. The breech mechanism and firing hole bush are more accessible, thus allowing daily maintenance and the prevention of rust through rain and dust being driven down the barrel from the outside of the A.F.V.

The weapon is 24 inches in length.

The mechanism is percussion.

The barrel is one piece, upon which is welded the mounting bracket with housing for gas regulator retaining plunger. Around the barrel on the rear half is fitted the inner and outer gas regulator sleeves to the rear of which are three breech ring and gas regulator nuts. Screwed on to the rear of the barrel is the breech ring. On the breech ring is the catch locking actuating lever and secured to the bottom is the carrier bracket. On the carrier bracket is the bomb retainer and axis for the carrier. The carrier houses the striker case complete retained by its two pins, the actuating lever with its safety catch, flame guard and frame.

TO LOAD

Grasp actuating lever and turn in an anti-clockwise direction, allow carrier to swing downwards, pivotting on hinge pin. Insert bomb into barrel, bomb retaining catch will prevent bomb from sliding out. Swing up carrier and turn actuating lever in clockwise direction.

TO UNLOAD

Open breech as for loading, move bomb retaining catch to the right and allow bomb to slide out into the hand.

STRIPPING

Ensure the weapon is not loaded. Open breech. Remove keep pin and axis pin of bomb retaining catch, remove catch and spring.

Remove split pin and washer, drive out hinge pin. Unscrew breech ring from barrel (R.H. thread), it may be necessary to use a raw-hide mallet for this.

To Strip Barrel

Remove three breech ring and gas regulator nuts, slide off inner and outer gas regulator sleeves, unscrew inner sleeve from outer sleeve, ensure that grub screw has been removed before attempting to unscrew. Remove gas regulator plunger, spring and screw. The mounting bracket is integral with or welded to the barrel.

To Strip Breech Ring

Remove keep pin, undo nut and pull out actuating lever locking catch. Turn down locking plate, remove bracket fixing screws and bracket.

To Strip Carrier

Remove safety catch actuating lever screw, spring and catch. Turn striker case retaining pins until white painted centre punch marks are adjacent to white line on frame, this turns cut away portion of pins towards the centre allowing striker case to be withdrawn to the front and removed. Undo screw and remove flame guard. Undo actuating lever axis screw and remove lever. Remove striker case retaining pins.

To Strip Striker Case

Unscrew firing pin head securing screw and remove head. Undo firing bush hole securing screw, remove bush, firing pin and mainspring.

ASSEMBLING

Reverse order of stripping..

Points to Note.

When assembling flame guard to carrier ensure that cut away portion is adjacent to bomb retaining catch.

The white centre punch marks on head of striker case retaining pins must be turned away from white line on frame to ensure correct locking of striker case.

Ensure that recess for grub screw is in correct position when assembling inner sleeve to outer sleeve.

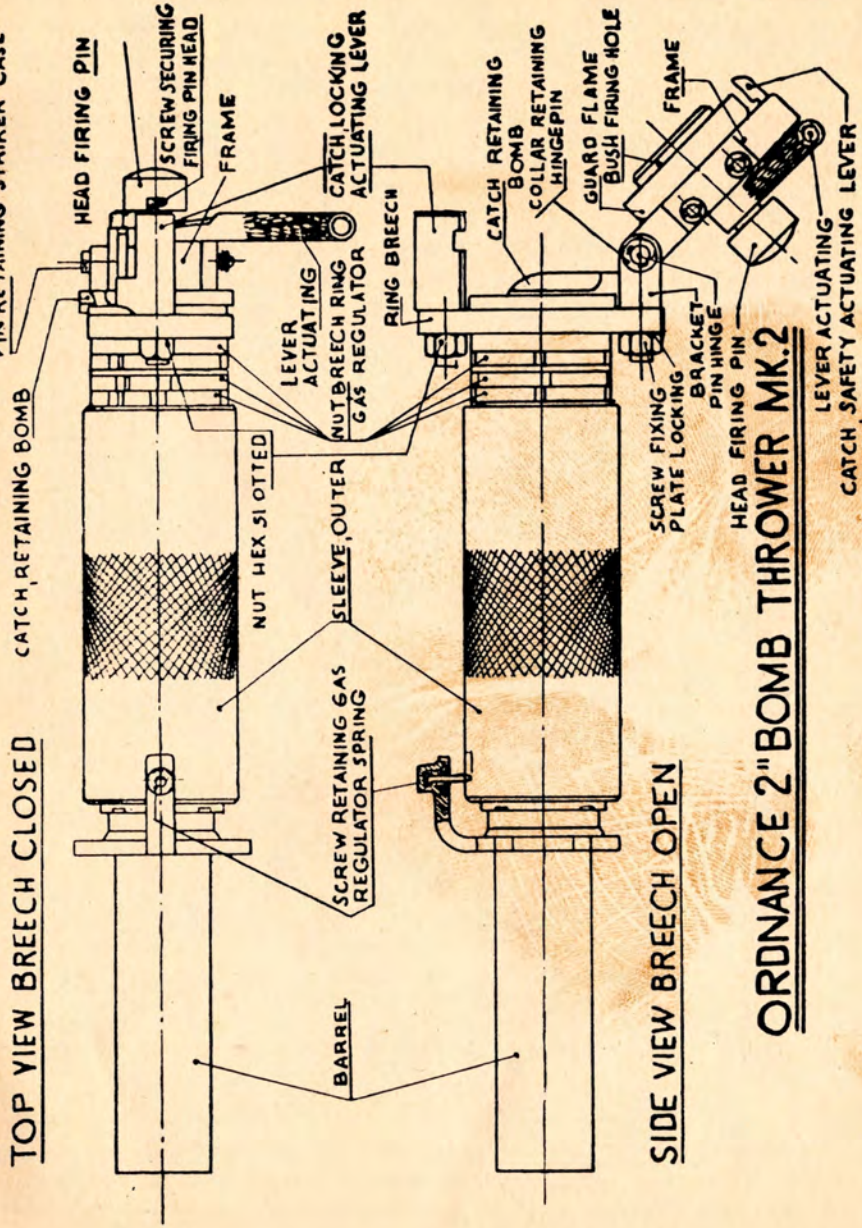
The hinge pin cannot be assembled if the bomb retaining catch has already been assembled to breech ring.

TOOLS: Wrenches breech ring and gas regulator Mk 3. CM 6539.

ACTION OF MECHANISM

Bomb is inserted from rear end and retained by catch.

As the carrier is closed the inclined face of the actuating lever locking catch forces down the front end of the safety catch, pivotting it on its axis


TOP VIEW BREECH CLOSED
SIDE VIEW BREECH OPEN
ORDNANCE 2" BOMB THROWER MK.2
PIN RETAINING STRIKER CASE
CATCH, RETAINING BOMB
HEAD FIRING PIN
SCREW SECURING FIRING PIN HEAD
FRAME
CATCH, LOCKING ACTUATING LEVER
LEVER ACTUATING
NUT BREECH RING GAS REGULATOR
RING BREECH
NUT HEX SLOTTED
SLEEVE, OUTER
SCREW RETAINING GAS REGULATOR SPRING
BARREL
CATCH RETAINING BOMB
COLLAR RETAINING HINGEPIN
GUARD FLAME BUSH FIRING HOLE
FRAME
SCREW FIXING PLATE LOCKING
BRACKET PIN HINGE
HEAD FIRING PIN
LEVER ACTUATING
CATCH, SAFETY ACTUATING LEVER

and raising the rear end clear of slot in actuating lever, allowing lever to be turned in a clockwise direction.

The bomb retaining catch is forced out to the right by the bevel surface of the firing hole bush.

Completing the movement of the actuating lever, the key locks in slot of locking catch. Blow on the firing pin head drives firing pin forward, compressing mainspring and striking cap.

Releasing pressure on firing pin head the mainspring reasserts and brings the firing pin to the rear.

Turning the actuating lever in an anti-clockwise direction unclocks the breech, the key disengaging from slot in locking catch. The weight of the carrier allows it to drop and swivel on the hinge pin. The safety catch returns to its normal position under the influence of its spring, the bomb retaining catch is forced inwards by the action of its spring, holding bomb if not fired, or ready to retain next bomb.

SAFETY

The firing pin head cannot be driven forward until the actuating lever is right home and breech properly closed, otherwise the safety lug on the actuating lever lies in the path of the firing pin head.

EXAMINATION TESTS AND ADJUSTMENTS

Ensure that the preservative (Painting, browning etc.) is in good condition. A number of weapons may be issued bright steel, these must be painted and preserved in accordance with EMER Armt. V. 103, page 1. Examine for burrs, distortion, and general wear.

Test straightness of bore by using "Gauges Testing Straightness of Bore 2 Mortar" or by the use of a dummy bomb. Bore should be slightly oiled. Gauge firing pin protrusion with "Gauge striker protrusion No. 42 Mk 1 (.125" .180") CM 5881. Test for freedom and functioning of spring.

Examine gas regulator sleeves for freedom and ensure all ports are free, and that inner sleeve is correctly positioned on outer sleeve (Grub Screw).

When breech is properly closed see that the safety lug does not foul firing pin head. If actuating lever fails to close adjust in accordance with EMER Armt. V. 107. Mod. Inst. No. 11.

Check position of centre punch marks on head of striker case retaining pins in relation to cut away portion of stem (i.e. Centre punch marks to be in line with and next to line marked on frame, when striker case is being removed or replaced).

BOMB THROWERS 2"

Regulations affecting the above weapon.

List of Changes

B 3209		Mks 1	Intro
5414		Mk 1A	Intro
B 5944	April 42	Mks 1 and 1A	Mod to Screwed eye
6218	June 42	Mks 1 and 1A	Mod to Hinge Pin
7625	April 43	Cartridges 2" Bomb Thrower	
		Mk 2	New pattern
		Mk 1	Nomenclature
7950	July 43	Brushes Cleaning Bore	
8255	Sept 43	Mks 1* and 1A*. Steel jointed for Tanks. Fitting Gas Regulator	Intro
8256	Sept 43	Gas Regulator. Plunger in lieu of 1/4" ball bearing	
8693	Dec 43	Mks 1* and 1A*. Gas regulator with exhaust tube fitted	
9047	March 44	Mk 2 Introduction	
9265	May 44	Mks 1* and 1A*. New pattern clip gas regulator	
C 580	April 45	Mks 1* and 1A*. Mod to gas reg' levers	
1035	July 45	Mk 2 (1) Pins Firing	Future Manufacture
		(2) Bracket Carrier, Cases Striker, Guards Flame, Heads Firing Pin	Future manufacture and Modification
		(3) Rust Proofing	

ACIs

407	1944	Gauges testing straightness of bore

EME Regs

ARMT			
V 103	p 1	Mk 2	Care and preservation
	p 3	Mk 2	Adjustment of actuating lever to ensure correct closing of breech

EME Regs

V 104	p 1	Mk 2	Rust proofing of Equipments

EME Regs

ARMT			
V 107	Mod No. 1	Mk 1 and 1A	Fitting of gas regulator
	Mod No. 2	Mks 1 to 1A*	Mod of B.M. wrench No. 359
	Mod No. 3	Mks 1* and 1A*	Fitting of exhaust tube not essential
	Mod No. 4	Mks 1* and 1A*	Replacement of Jubilee hose clip by steel clip and plate
	Mod No. 5	Mks 1 to 1A*	Mod to screwed eye and carrier frame clearance not essential
	Mod No. 6	Mks 1A and 1A*	Mod to barrel flange on front barrel (Valentine Tanks)
	Mod No. 7	Mks 1 — 1A*	Mod to Hinge pin
	Mod No. 8	Mks 1* and 1A*	Mod to gas reg. lever
	Mod No. 9	Mk 2	Replacement of early type catch locking actuating lever
	Mod No. 10	Mk 2	Mod to striker case and carrier bracket to improve gas seal
	Mod No. 11	Mk 2	Mod of Firing Pin
	Mod No. 12	All Mks	Enlarging of Bolt Holes in Barrel Flange, where necessary

EME Regs

ARMT
V 107 Mod No. 1 } Mks 1 to 1A* } Installation of 2" Bomb throwers in
21 A. G. Mod No. 2 } Sherman 3 and 5.

21 A.G. AND RHINE ARMY TECHNICAL BULLETINS

Para 23 Mod to hinge pins and gas regulator lever.
41 Fitting of catch locking actuating lever (New Pattern).
41 Refitting of screwed eye.
41 Bracket clearance increased.
41 Mod to hinge bracket of fresh barrel.
76 Failure of actuating lever to close.
76 Correct position of centre punch marks on striker case retainer pins.
76, 92. Preservation Condition of new bomb throwers.
91 Mk 2. Sketch and nomenclature.
105 Painting of Mk 2.

BOMB THROWERS 2"

AMMUNITION

Smoke Bomb Mk 1 and 2. Filled with a smoke composition. Bodies painted green with a red band around the head to show they are filled.

The difference between the Mk 1 and 2 is that the Mk 2 has a short delay before the emission of smoke.

Smoke Bomb Mk 3. Filled with a white phosphorous smoke composition and has a delayed action percussion fuse cover with a safety cap, which must be removed before firing.

Denoted by white band around head.

The propellant is either.

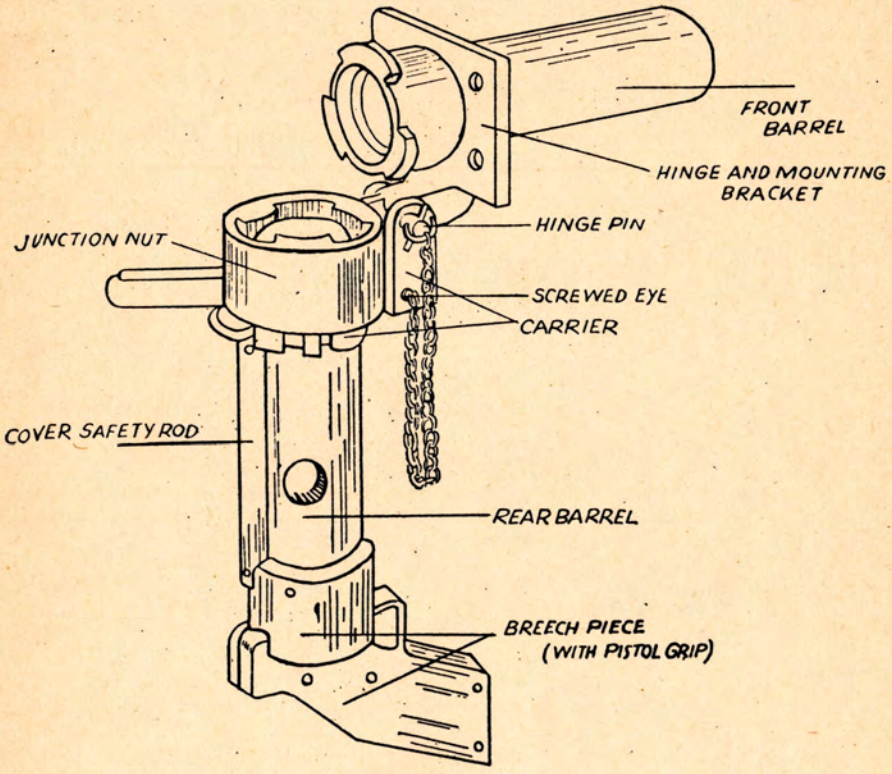
Cartridge 2" Bomb Thrower (18 gr. Ballisite) Mk 1.

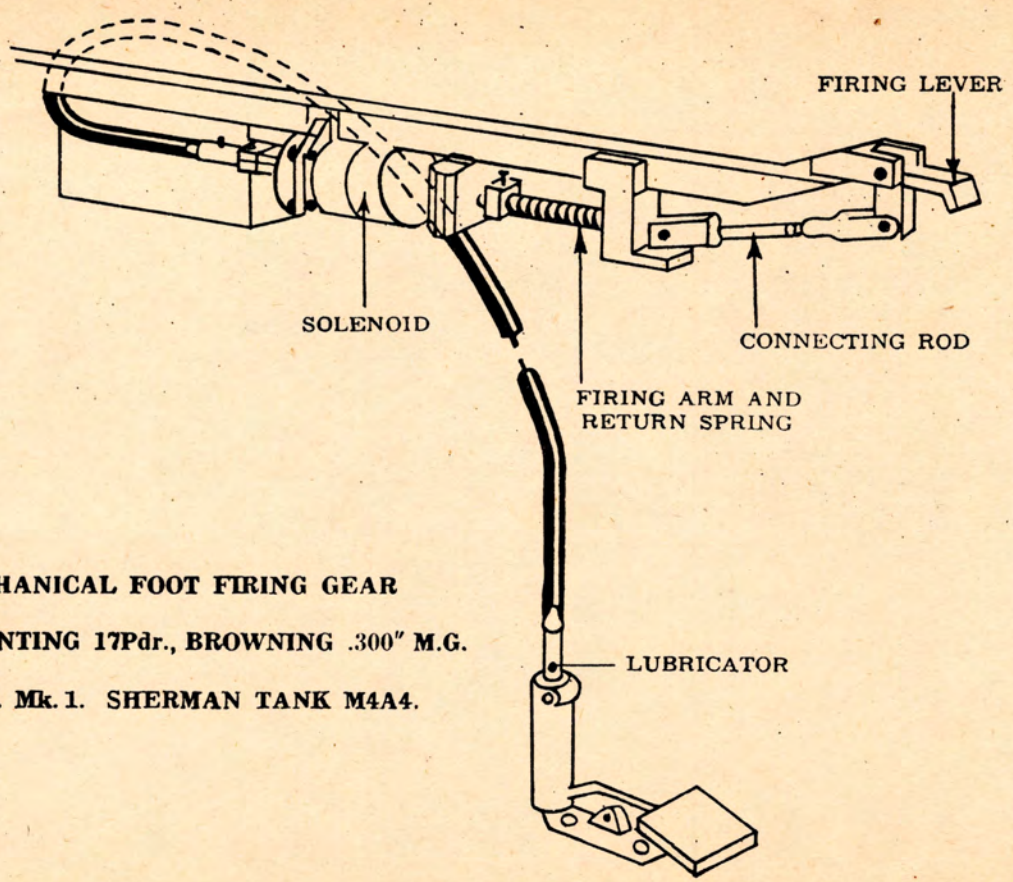
Cartridge 2" Bomb Thrower (42 gr. G. 20) fitting in to tail tubes of smoke bomb.

MISS-FIRES.

Make two attempts to fire, Wait 30 seconds before removing bomb.

BOMB - THROWERS 2IN MARKS I* and I*A

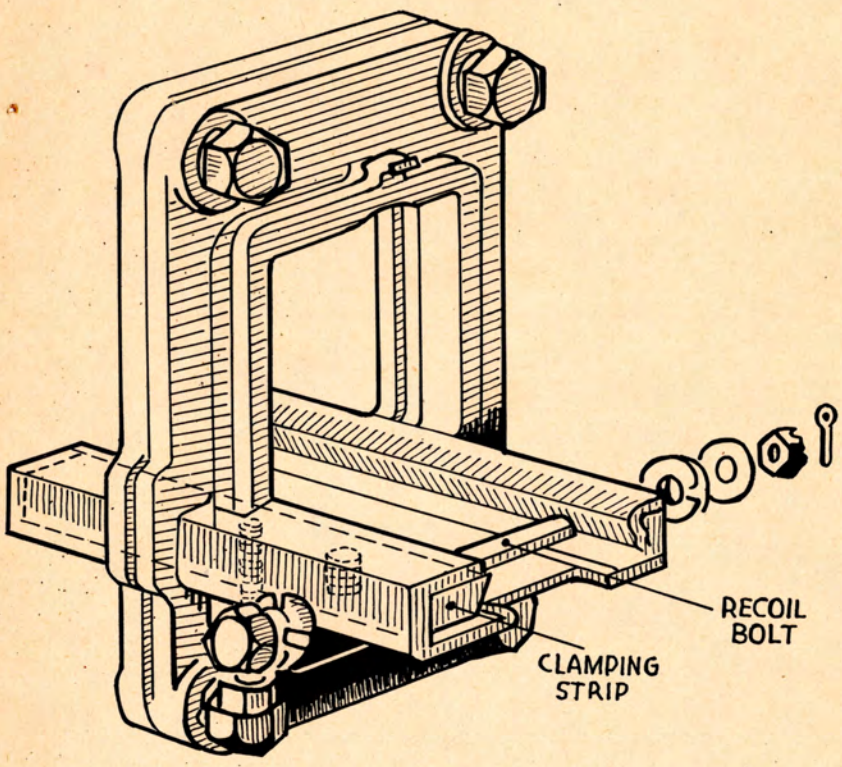




MECHANICAL FOOT FIRING GEAR

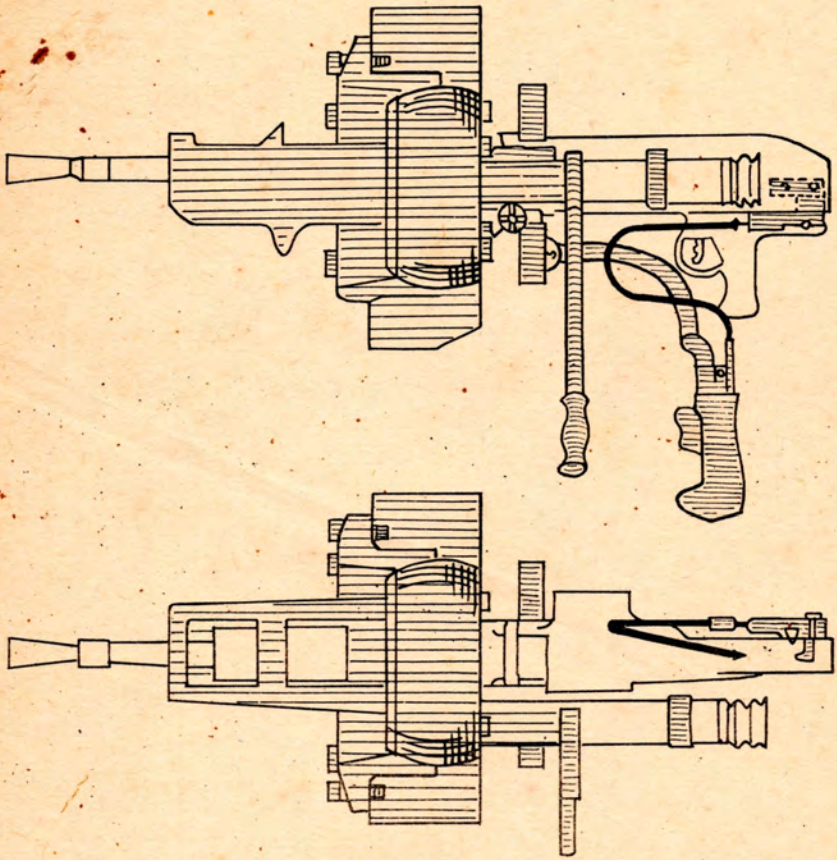
MOUNTING 17Pdr., BROWNING .300" M.G.

No. 2. Mk. 1. SHERMAN TANK M4A4.



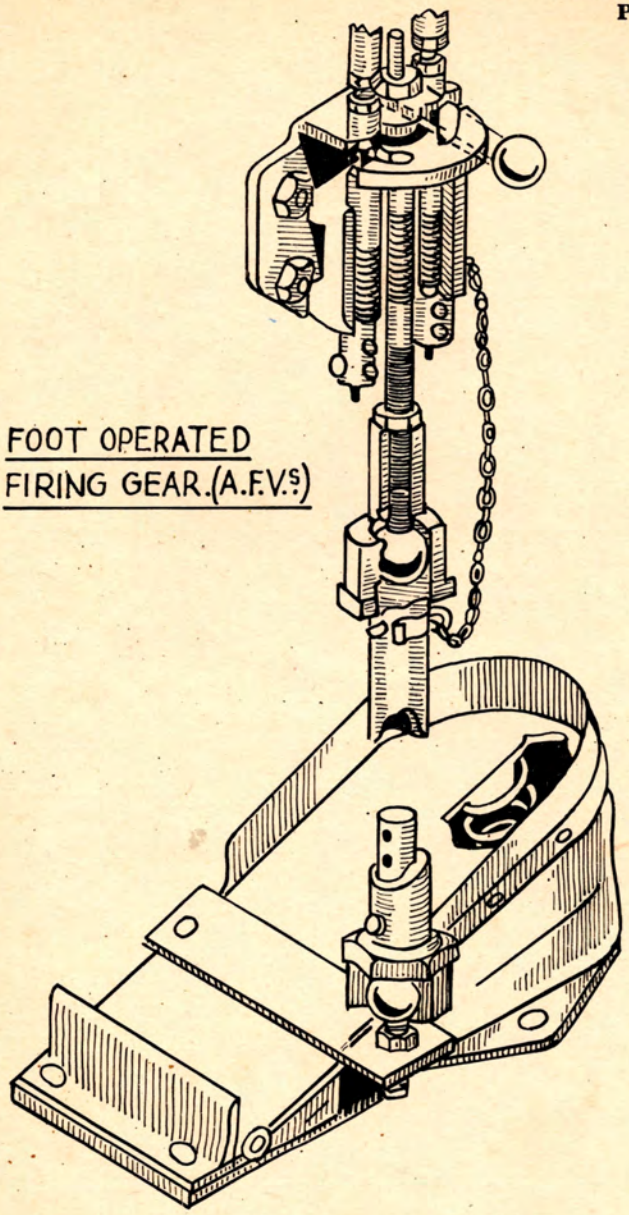
MACHINE GUN CRADLE – CHURCHILL TANK.

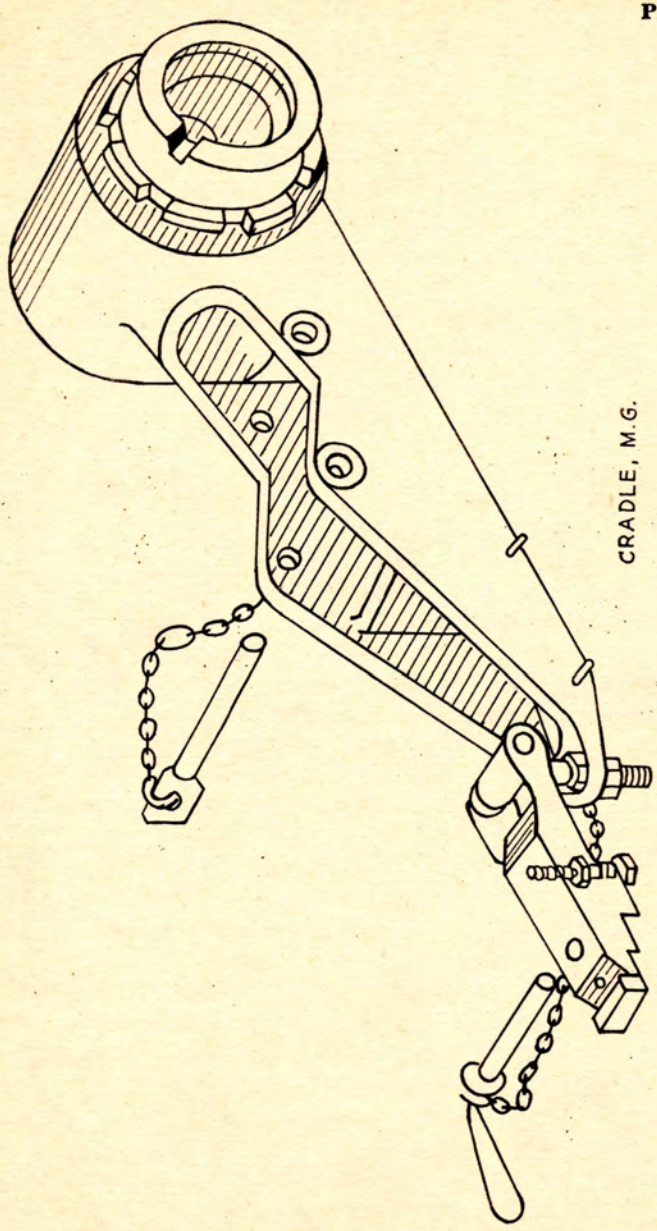
for GUNS M/c BESA 7·92 M.M.



MOUNTING, M.G., Nº23, MK.I. (A.F.V.s).

FOOT OPERATED
FIRING GEAR.(A.F.V.s)





CRADLE, M.G.
BROWNING .300"
(AMERICAN A.F.Vs.)

ARMOURED FIGHTING VEHICLE MOUNTINGS

The term Armoured Fighting Vehicle is applied to all armoured tracked or wheeled vehicles and is abbreviated to "A.F.Vs".

A.F.Vs. fall in to one of two categories — Tanks or Armoured Cars — and the gun mountings are of varying designs to accommodate the main and secondary armament.

These mountings can usually be placed under one of the following headings:—

(a) **Co-axial.** — Houses the main armament and one machine gun (or two M.Gs.). Elevation and depression are obtained with a gear wheel and ratchet usually, while traverse is obtained by rotation of the turret. In these mountings the guns are elevated or depressed around the same axes and the axis of the bores are parallel, though not always on the same plane. The sighting of the guns in a co-axial mounting is usually carried out with a telescope or periscope.

(b) **Ball.** — A mounting which is spherical in shape and set in a similarly shaped socket, thus giving a limited amount of movement in all directions. The mountings carry one machine gun and the movement is usually obtained by means of a grip on the gun.

(c) **Gimbal.** — A mounting which obtains elevation and depression by revolving around two different axes. This type of mounting would have two mantlets one of which would be pivoted inside the other while that one was pivoted to the hull of the vehicle.

(d) **A.A.** — Usually mounted on the exterior of the vehicle, and carrying one or two light, medium or heavy machine guns. These mountings should give all round traverse and approximately 90 degrees of elevation to enable the gunner to engage aircraft.

The main componente of any A.F.V. Mounting are the Cradles, Mantlet, Recoil System, Belt Box Carrier, Telescope Bracket and Brow Pad, the two latter dependant upon the type of sighting used.

The following paragraphs give the main details of design and some particulars of repairs of the more common mountings in British A.F.Vs. During the recent war a considerable number of American A.F.Vs were used by the British Army but it is unlikely that these will be met with now in any large quantity.

Mounting 6 Pdr/.75mm and Besa 7.92 mm M.G.—No. 1. Mk. 2. and No. 2. Mk. 2.

Fitted to:— Churchill Mk. 7.

General description:— The mountings differ in the semi-automatic gear and deflector brackets which in the No. 1. Mk. 2. are individual and similar to the 6 Pdr. mounting in the service, while the No. 2. Mk. 2. has the semi-automatic gear and deflector bracket of strengthened design and fabricated.

An inscription plate attached to the top of the big gun cradle, shows the nomenclature of the mounting. The mark and the serial number etc., should always be quoted when reference is made to the mounting.

The mountings are co-axial, the Ordnance and M.G. forming the vehicle's main armament. Elevation and depression are obtained by an elevating gear and limited by positive stops fitted to the splash guards. The maximum elevation obtainable is 20 degrees and the maximum depression 12½ degrees. Full depression can only be obtained when the gun is broadside on to the vehicle. Traverse is obtained by rotating the turret.

The 6 Pdr., or 75 mm., gun lies on the right of the mounting and the Besa M.G. is on the centre, while to the left is housed the sighting telescope.

The guns are fired from a foot control, a selector gear allowing each gun to fire separately.

The recoil system is the H.P. No. 1. Mk. 1. which is not peculiar to the mounting but is fitted to other mountings carrying 75 mm, 95 mm, or 6 Pdr., guns. It ha a separate identification plate.

Recoil System

The recoil system is depeniant for efficient working on:—

(a) Correct filling of the buffer.

(b) Strength of the run-put springs.

(c) The packing of the glands.

Armourers will normally be concerned only with maintaining the oil level in the buffer, known as "Topping-up". The oil used for this purpose is "Oil, mineral, hydrauliy buffer", generally referred to as "Service buffer oil". To carry out "topping up" proceed as follows:—

(a) Ensure that the gun is in the fully run-out position.

(b) Depress the gun to its limit.

(c) Remove the filler plug.

(d) Pour buffer oil in slowly through the filler plug hole until the buffer is full up.

(e) Replace the filler plug, elevate and depress the gun, thus moving the oil about and bringing any air to the top, finally returning it to the fully depressed position.

(f) Remove the fill a plug and top up further if necessary.

(g) Slacken off the drain plug and writhdraw one full measure of oil, with the measure attached to the loader's guard of the 75 mm or 6 Pdr. gun.

(h) Tighten the drain plug and replace and tighten the filler plug.

The run-out (the return of the gun to its normal position after recoil) is controlled by a "Valve, adjusting, run-out" (V.A.R.O.), and even with a correctly topped-up buffer the run-out may be violent or sluggish if this valve is not correctly adjusted. If the run-out is top violent the valve should be closed until the run-out is satisfactory in vice-versa in the case of a sluggish run-out.

Adjustment of the firing gears

The firing gears of both guns should always be tested before firing.

75 mm Gun

To test. Prove the gun is unloaded. With the striker cooked operate the firing mechanism. Should the striker fail to operate or should it operate as the breech closes, adjustment is necessary. If the firing mechanism fails to operate the striker, it is due to the firing lever in the bracket attached to the S.A. gear bracket not bearing on the firing lever of the gun if it operates the striker as the breech closes it is bearing too neavily.

To adjust. Cock the gun, slacker the lock nut of the cable adjuster and adjust the effective length of the outer cable until the firing levers are just in contact.

The adjustment of the stop screw of the firing lever on the mounting should restrain further movement after the firing mechanism has been operated.

Should the cable not have sufficient movement to operate the firing lever, the turnbuckle on the connecting rod of the pedal control must be adjusted so as to raise the pedal. If too much movement is obtained then the pedal needs lowering. The turnbuckle should normally need adjustment and should not be moved unless necessary. Re-test after any adjustment.

7.92 mm M.G.

The operating arm of the firing gear attachment should just bear against the trigger shaft when the trigger guard body is to the rear. If bearing too heavily the cocking catch may not function or a "run-away" gun might result.

To test. Prove the gun is unloaded and correctly mounted. Cock the gun and operate the firing mechanism. If the gun cannot be cocked or fired, adjustment is necessary.

To adjust. Slacken the lock-nut of the cable adjuster and adjust the effective length of the outer cable until the operating arm is just bearing on the trigger shaft. Tighten the lock-nut securely and re-test.

The Browpad.

The browpad must be adjusted to give the gunner an unrestricted view through the telescope. The arm of the browpad is clamped to allow adjustment of the distance of the eye-piece. The browpad itself can be moved to suit the forehead by slackening the wing nut securing the socket joint.

Besa ammunition feed

The Besa ammunition is fed from the belt box liner through the slot in the 75 mm gun cradle to the Besa gun. The spent cartridges and belt are directed by the deflector to a canvas chute from which they are led into the sheet metal chute and collected in the spent cartridge bin.

Telescope

The telescope is secured by sliding it into the mounting bracket until it comes to, a definite stop and clamping it by tightening the two wing nuts.

To install the Besa M.G.

Slacken the clamping strip retaining bolt with the spanner attached to the mounting and turn the recoil bolt until the flat on its diameter is flush with the face of the cradle. Slide the gun into the cradle and secure it by turning the recoil bolt. Lock the gun in position by tightening down the clamping strip. Keep the spanner in the clip provided when not in use.

To connect the remote control firing gear, lift the plunger and slide the cable attachment into the guide on the right side of the gun. Release the plunger which will locate the attachment and tightening the securing screw.

To remove the gun reverse the procedure.

Mounting 95 mm Howitzer and Besa M.G. No. 2 Mk 1

Fitted to:— Churchill Mk 8.

General description. For most practical purposes this mounting is the same as that dealt with in the previous section. In this mounting however, although the axes of the guns are parallel in the horizontal. They are not in the same plane, the M.G. being at 7 degrees depression when the Howitzer is horizontal. This allows the full elevation of 25 degrees, above the horizontal for the Howitzer with a maximum depression of 3 degrees. The elevation and depression figures for the M.G. are 18 degrees elevation and 10 degrees depression.

Browpad.

This is slightly different in construction from that on the Churchill Mk VII.

The arm can be moved after slackening the nut through which it is inserted. Should the arm not be free when the nut is loose, the bush on which the nut is screwed should be tapped gently back.

Telescope. The allow for the differring plane levels of the two guns the telescope bracket is of slightly different design on the Churchill Mk VIII from the Churchill Mk 7.

The telescope is held in a fabricated sleeve. The sleeve is machined to enable the telescope to be clamped by the wing nut. Secured to the side of the sleeve is the clinometer bracket.

There are two stop screws, knurled to allow finger adjustment, for positioning the telescope according to which gun is in use. Each of these screws can be locked into position by a lock nut. When positioned by the bottom screw the telescope is in alignment by rotating the stop bracket.

Firing Gears. The Churchill Mk 8 is fitted with electrical firing gears and foot firing gear for emergency in the event of a breakdown in the electrical system.

Mounting 77 mm, and Besa 7,92 mm M.G. No. 1 Mk 1

Fitted to:— Comet Mk 1.

General description. This mounting is a co-axial one, both the guns are mounted on a common axis, and the bore axes are parallel with one another.

The maximum elevation obtainable is 20 degrees and the maximum depression 12 degrees.

The main fixing gear is electric but an auxiliary foot-firing gear is also installed.

Recoil system. The maintenance of this is similar to those previously dealt with. There are however two buffer tubes, and "topping-up" therefore must be carried out to both. After filling the buffer, and carrying out elevation and depression, the measure of oil will be withdrawn through the filler hole by means of the syringe provided.

Adjustment of the V.A.R.O. is also the same as for the mounting on the Churchill Mk. 7 & 8.

Adjustment of foot firing gear. This also follows the same sequence as for the firing gear on the Churchill Mk. 7. Adjustment of the effective length of the outer cable in each case until satisfactory firing is obtained is necessary.

Should the cables not have sufficient movement to operate the firing mechanisms of the guns, adjustment of the pedal position can be effected by slackening the locknut and screwing the connecting rod into the ball connection. This adjustment should normally not be needed and should not be done unnecessarily. Re-test both firing after any adjustment.

Sighting Gear. Provision is made for eliminating backlash between the pinion on the range arm spindle and the quadrant, by mounting the spindle in an occentric bush. A serrated locking piece, engaging serrations on the bush secures it against turning.

To adjust:— Slacken the countersunk screw securing the locking piece in the underpart of the sight bracket and withdraw the locking piece. Turn the bush with the "C" spanner provided until any perceptable backlash is eliminated.

Installing the M.G. The cradle mounting for the M.G. is of similar design to that on the Churchill Mk. VII, and the installation and removal of the M.G. is carried out in the same way.

Mounting 2 Pdr., and Besa 7.92 mm M.G. No. 10. Mk. I.

Fitted to:— Armoured Car, Daimler Mk. 1. & 2.

General Description. This is a co-axial mounting, with the 2 Pdr. gun in the centre of the mounting, the Besa M.G. on the right and the telescope on the left. As usual the nomenclature and serial number of the mounting can be found on an inscription plate attached to the top of the gun cradle.

The guns have free elevation, being moved by direct pressure on the shoulder-piece. An elevation lock is provided for securing the mounting when not in use.

The maximum elevation possible on this mounting is 25 degrees while the maximum depression is 15 degrees.

Recoil System. The general particular and maintenance rules for the recoil system of this mounting are similar to those for the mounting in the Churchill tank.

Firing Gear. The firing gear is operated from a pistol grip, there being separate control for each gun. The pistol grip on the left is for the 2 Pdr. gun and that on the right is for the M.G. The adjustment of the gear is carried out in a similar manner to that of the Churchill tanks. In the case of the 2 Pdr., firing gear, should be cable be slack in its seating it should be re-fixed at the

anchorage in the pistol grip, so that the cable cannot slip. Should the pinching bolt the tightened too tightly, the cable is liable to be cut. Re-test after adjustment.

The pistol grips can be rotated to the required position after slackening the clamping bolt securing each grip to the firing gear bracket.

Telescope. The telescope is secured by sliding it in to the carrier and clamping it by tightening the two wing nuts.

Mountings 6 Pdr., and Besa 7.92 mm No. 3.

Fitted to:— Armoured Car A.E.C. Mk. 2.

General description. This is a co-axial mounting with a maximum elevation of 20 degrees and a maximum depression of 10 degrees. There is no elevating gear, the elevation being free and obtained by moving the mounting by means of the shoulder piece. An elevation lock is fitted to hold the gun whilst travelling, or at any other time when free elevation is not required.

The 6 Pdr. gun is on the right of the mounting with the M.G. in the centre and the telescope on the left. The M.G. ammunition box is carried on the right of the mounting and the belt feeds to the M.G. through a slot in the 6 Pdr. cradle between the recuperator springs case and the 6 Pdr.

Recoil System. The recoil system is an H.P. No. 1. Mk. 1 and the same as that on the Mounting 6, Pdr/75 mm and Besa 7.92 mm M.G. No. 1. Mk. 2. (Churchill Mk. 7).

Firing Gear. The guns are each fired by remote control operated pistol grips. Adjustments of these firing gears is similar to those for the firing gears on the Mounting 2 Pdr. and Besa M.G. No. 10. Mk. 1. (Daimler A.G.)

Telescope. This is secured in the seating in similar manner to the Mounting 2 Pdr. and Besa M.G. No. 10. Mk. 1. (Daimler A.G.)

Mountings 6 Pdr./75 mm and Besa M.G. No. 1 Mk. 3.

Fitted to:— Armoured Car, A.E.C. Mk. 3.

General Description. Apart from slight constructional differences this mounting is identical with the Mounting 6 Pdr./75 mm No. 1. Mk. 2 on the Churchill Mk. 7.

The foregoing paragraphs deal entirely with co-axial mountings, which carry, in each case, the main Armament of the A.F.Vs., in question. Despite constructional differences which will obviously be found, these instructions will be a sufficient guide to the maintenance of other co-axial mountings not dealt with here, and should assist armourers to carry out the minor repairs and adjustments for which they are responsible when in First Line Workshops.

In addition to these main Armaments, A.F.Vs., sometimes carry secondary armaments such as one machine gun mounted in the co-drivers compartment. The following paragraphs deal with this type of mounting.

Mounting M.G. No. 23 Mk. 1.

Fitted to:— Churchill Mk. 7 or 8.

General description. This mounting carries one 7.92 mm Besa M.G. and is mounted in a compartment to the left of the driver. It is a spherical mounting and is therefore free to be moved in any direction within its limits by means of a long handle on the left of the mounting. The maximum amount of movement possible in each direction is 15 degrees to left or right, 20 degrees elevation and 15 degrees depression.

Firing gear. The gun is fired from a remote control pistol grip similar to that on the co-axial mounting. Adjustment of this will therefore be similar to those pistol grip firing gears already dealt with.

Sighting. This is done by telescope, and the instrument is mounted and clamped in position, to the left of the gun by two wing nits.

Installing the M.G. The cradle for the M.G. is identical with that found on any Besa M.G. Mounting.

Maintenance. The spherical bearing is lubricated through a nipple screwed into the Inner Face of the housing and connected with the cavity for the spherical bearing.

Mounting M.G. No. 22 Mk. 1.

Fitted to:— Churchill Mk. 7 or 8.

General description. This mounting is an earlier pattern of the one already dealt with and for all purposes concerning the armourer is identical.

Mounting M.G. No. 21 Mk. 1.

Fitted to:— Cromwell Mks. 1, 3, 4, 5, 7 & 8; Centaur Mks. 1, 3 & 4; Comet Mk. 1 and Centurion.

General description. This mounting is also of similar design to No. 1, but there is a slight difference in its movement. Maximum elevation and depression is 20 degrees, left traverse is 20 degrees and right traverse 12 degrees.

Mounting M.G. No. 19 Mk. 1.

Fitted to:— Churchill Mks. 2, 3, 4, 5, & 6.

General description. This is a Gimbal Mounting giving a maximum of 15 degrees traverse in either direction with 15 degrees elevation and 10 degrees depression. It has no remote control firing gear. In other respects it is similar to the No. 23 Mk. 1.

It is sometimes desirable to fit an A.F.V. with an A.A. mounting for use against attacking aircraft. The only mounting which it is necessary to deal with here is the Mounting A.A. Twin P.L.M. (Parish Lulworth Motley) M.G. Mk. 1. Other types of A.A. mounting have been experimented with but have not been retained in use.

The P.L.M. Mounting carries two Guns M/c Vickers .303" G.O. but these can, if so desired, be replaced by one Guns M/c Bren .303".

The guns on this mounting are fired from a handle bar unit on the inside of the vehicle, thus affording maximum protection to the firer. The actual operation of the trigger is by remote control cable.

An all round traverse is possible with an elevation of approximately 90 degrees.

GUNS MACHINE BREN .303 INCH

Introduced L. of C. B2380 April 1939

General Description

MARKS 1 and 2 and 2/1

Weight of gun	Mk 1. 22 lbs 2 oz Mk 2. 23 lbs 3 oz
Weight of barrel	Mk 1* 6 lbs 4½ oz Mk 2* 6 lbs 7½ oz.
Length of gun	45.5".
Length of barrel	25 inches.
Dia of bore	High 0.304" Low 0.301".
Rifling	Concentric 6 grooves. Right hand twist, 1 turn in 10 inches.
Sighting	Blade foresight. Mk 1. Radial type of backsight with aperture sighted from 200 to 2,000 yds. (Drum) Mk 2. Leaf Tangent backsight with aperture sighted from 200 to 1800 yds Sighting radius Mk 1. 31.02" Mk 2. 30.80".
System of feed	Box magazine 30 rds. Drum magazine 100 rds.
System of cooling	Air with quick change barrel (2 barrels per gun).
Operation	Gas and return spring.
Rate of fire	Mk 1. Gun 500 r.p.m. Mk 2. Gun 540 r.p.m. 112 r.p.m. actual.

MARK 3

Weight of gun	19 lbs. 5 ozs.
Weight of barrel	5 lbs 1½ oz.
Length of gun	42.9"
Rate of fire	480 r.p.m.

The Mk. 3 Gun was primarily introduced for tropical theatres of war.

It is a lightened version of the Mk 1. Tangent leaf backsight replaces the radial drum backsight of Mk. 1 Guns. Sight radius 27.31 inches approx.

MAGAZINES

30 rds Box type.

No. 1 Mk. 1.

Mk. 1*

Fitted with auxiliary spring.

Mk. 1**

Fitted with auxiliary spring.
Mk. 1* bottom plate and retainer.

Mk. 2

Fitted with auxiliary spring.
Mk. 2 case and Mk. 2 platform.
(reduced rear lug).

Mk. 2*

Fitted with auxiliary spring.
Mk. 2 case and Mk. 2 platform.
Mk. 1* bottom plate and retainer

Mk. 3

Auxiliary spring integral with case.

All MAGAZINES to be filled with 28 rounds LIMIT.

MAGAZINES

100 rds Mk. 1.

GUN MACHINE BREN

STRIPPING AND ASSEMBLING

I. Precaution

Remove magazine. Cock the gun and ensure that chamber is empty. Press trigger and allow cocking handle to move forward under control.

II. Stripping Main Groups

A. To Remove Barrel Assembly

1. Depress barrel nut catch and rotate barrel nut clockwise as far as it will go.
2. Push barrel forward and out of gun.

B. To Remove Butt Slide Assembly

1. Pull out body locking pin and withdraw butt slide assembly.

C. To Remove Piston and Breech Block Assembly

1. Withdraw piston and breech block assembly to the rear from body.

D. To Remove Bipod Assembly

1. Rotate bipod through 90° clockwise and withdraw from body.

III. A. Stripping Barrel Assembly

1. Remove carrying handle screw and carrying handle.
2. Drive out carrying handle plug pin. When withdrawing punch, hold thumb over plug to prevent it from flying out.
3. Remove plug and spring.
4. Remove sleeve from barrel.
5. Drive out carrying handle plunger pin and remove plunger.
6. Remove carrying handle stem nut, stem and spring.
7. Remove carrying handle catch nut and catch.

*8. Drive out flash eliminator pin and remove flash eliminator assembly.

*9. Remove foresight protector screw and protector.

*10. Drive out foresight blade.

11. Turn gas regulator until retainer is in line with cutaway in gas block and remove.

*12. Drive out gas block pin and remove gas block.

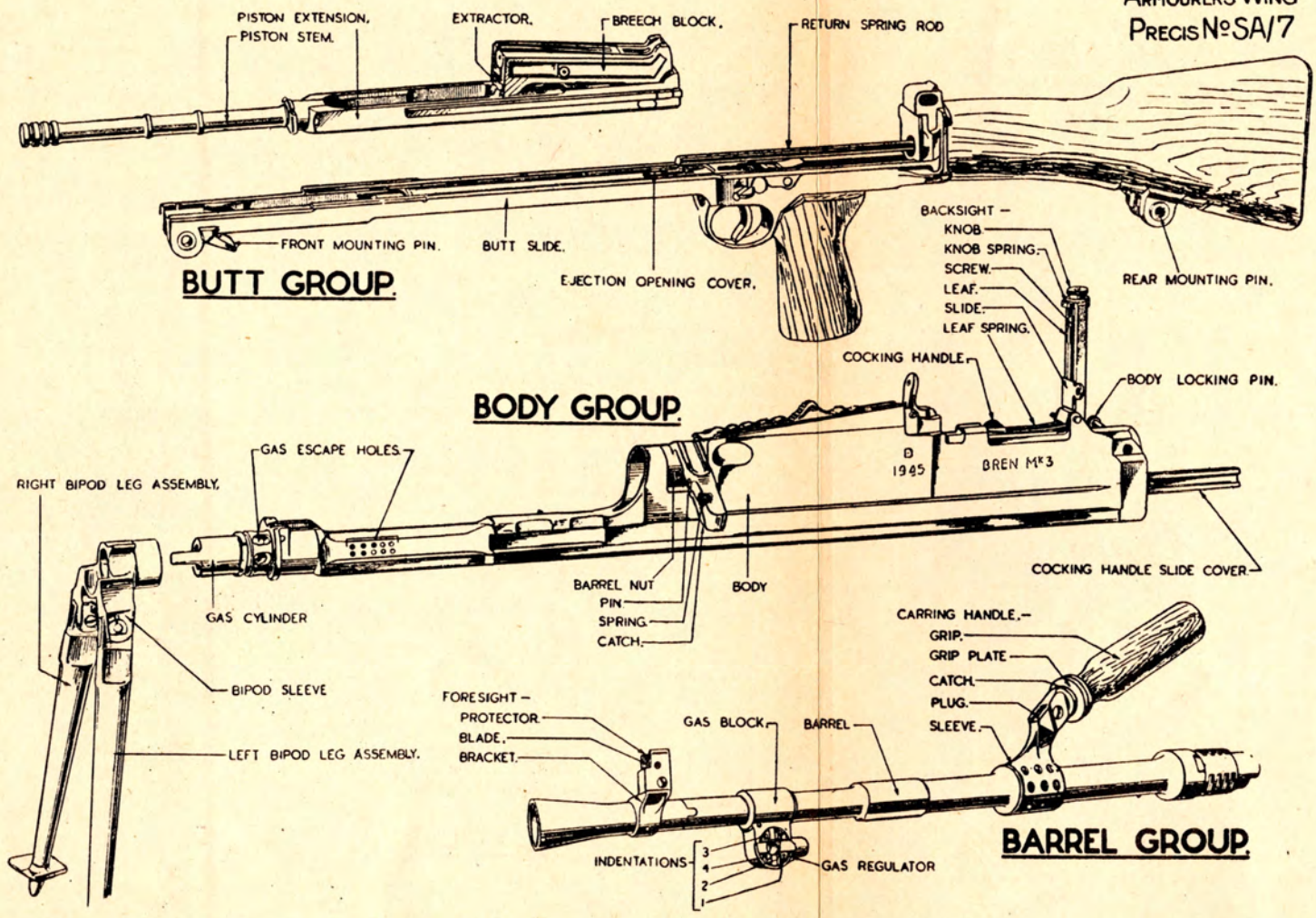
*13. Drive out gas retainer pin and remove retainer.

B. **Stripping Butt Slide Assembly**

1. Unscrew and remove return spring tube nut.
2. Withdraw return springs and rod.
3. Remove inner return spring.
4. Disengage outer return spring from rod.
5. Remove butt from slide.
6. Unscrew and remove the two butt plate screws, butt plate and return spring tube nut spring.
7. Remove cocking handle slide cover.
8. Unscrew and remove butt bracket screws and butt bracket.
9. Remove rear mounting pin plunger, spring and pin.
10. With combination tool unscrew and remove return spring tube.
11. Remove buffer piston spring.
12. Remove buffer piston friction collar.
13. With combination tool unscrew and remove piston buffer nut.
14. Remove piston buffer.
15. Unscrew and remove pistol grip screw and pistol grip.
16. Push out sear pin, press trigger and remove sear.
17. Drive out change lever and remove sear spring, and disengage from sear spring post.
18. Drive out trigger pin.
19. Remove trigger and tripping lever assembly.

* THESE COMPONENTS SHOULD **NOT** BE REMOVED UNLESS DEFECTIVE.

ARMOURERS WING
PRECIS Nº SA/7



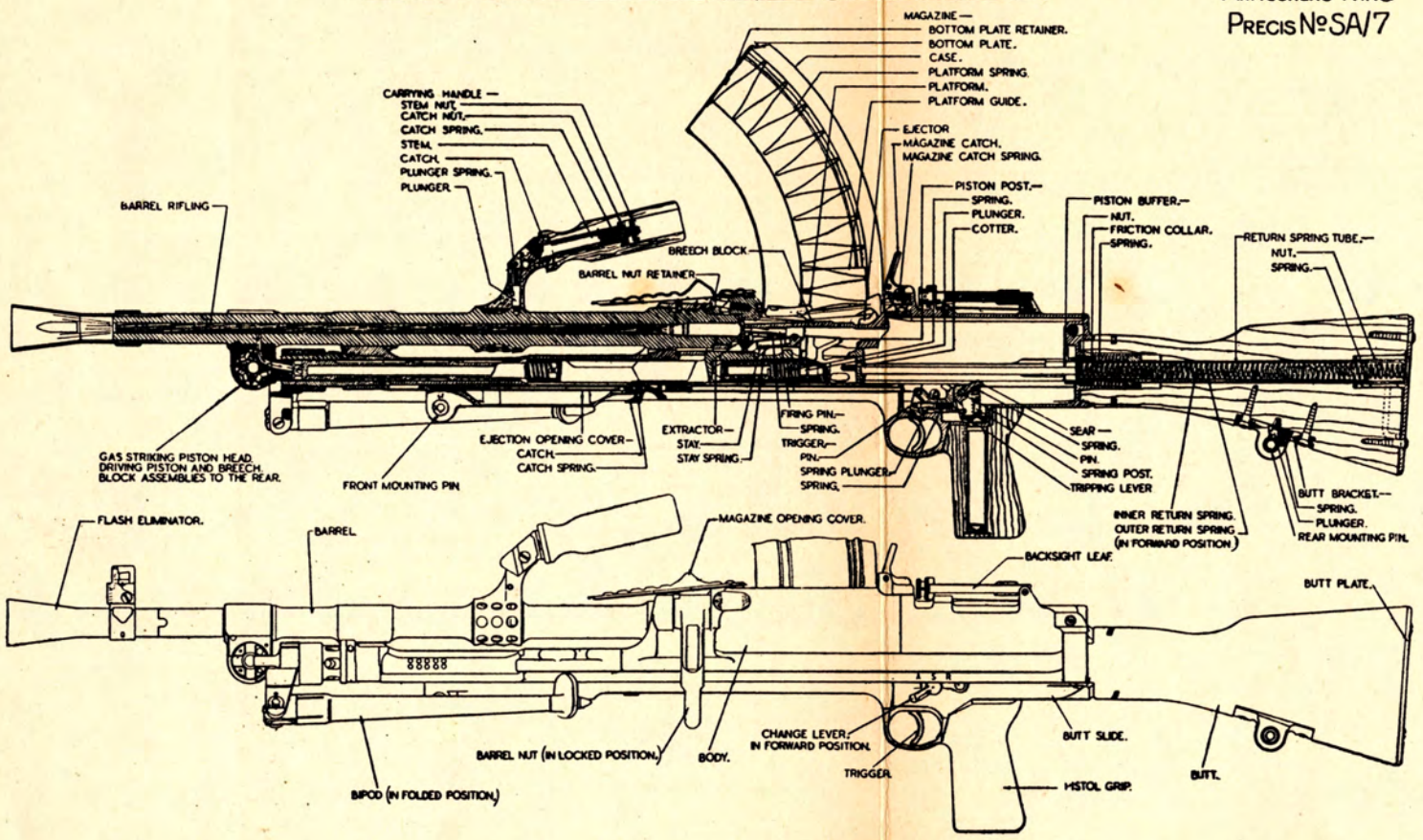
BUTT GROUP.

BODY GROUP.

BARREL GROUP.

GUN, MACHINE, BREN, ·303- INCH, MARK 3.

ARMOURERS WING
PRECIS Nº SA/7



20. Push out pin lever tripping and remove trigger.
21. Drive out trigger spring plunger pin, and remove plunger and spring.
22. Unscrew and remove front mounting pin retaining screw, ball and mounting pin.
23. Slide the ejector cover forward until the catch pin is in line with holes in slide, drive out pin, remove catch and spring, and slide off cover.
24. Drive out change lever detent pin, remove detent and spring.

C. **Stripping Piston and Breech Block Assembly**

1. Disengage breech block from piston.
2. With rear of piston post on hard surface, press down on piston rod, sliding out cotter.
3. With left hand under piston post, tap the top of the piston post lightly with mallet when it will disengage from the slot of the piston extension.
4. Remove plunger and spring.

*5. Drive out piston extension pin, unscrew and remove piston.

6. Push down extractor with thumb and remove extractor stay and spring.
7. With fingers over rear end of breech block push out firing pin retainer as far as it will go, remove firing pin and spring.

*8. File off rivetted end of firing pin retainer and remove.

D. **Stripping Bipod Assembly**

1. Remove split pins.
2. Push out bipod legs hinge pins left and right and remove legs left and right.
3. Remove plunger and springs from sleeve.

E. **Stripping Body Assembly**

1. Press down barrel nut retainer plunger, and lift out barrel nut.

*2. Drive out barrel nut catch pin, and remove catch and spring.

* THESE COMPONENTS SHOULD NOT BE REMOVED UNLESS DEFECTIVE.

3. Drive cocking handle pin upwards, and remove cocking handle, plunger and spring; push slide to the rear and disengage from body.
4. Remove split pin from backsight axis pin, and axis pin; remove backsight leaf assembly, unscrew and remove backsight leaf spring screw and spring.

*5. Drive out backsight screw retaining pin, unscrew and remove backsight screw, remove backsight knob spring. Drive out backsight screw knob pin, and remove knob; disengage backsight slide from leaf.

6. Drive out catch magazine pin until head is clear of body, turn one quarter turn and withdraw; remove retainer and spring; remove magazine catch, spring, and ejector; slide off magazine opening cover to the rear.

*7. Unscrew and remove locking shoulder screw, slide locking shoulder forward and out of body.

8. Push in barrel nut retainer as far as possible, holding it in this position, push out plunger from inside of body; remove retainer and spring.
9. Push in body locking pin, until head is just clear of the body, turn one quarter turn and remove; remove retainer and spring.

IV. Assembling

A. Assembling Body Assembly

1. Insert spring and retainer body locking pin, in such a position that end of retainer will engage with groove of locking pin. Depress retainer and push in body locking pin. Rotate pin until retainer engages with it.
2. Insert barrel nut retainer spring, and retainer with angular faces upwards and to the rear; push in retainer as far as possible and insert plunger from top of body with angular faces to the rear; push home until retainer engages with plunger.
3. Replace locking shoulder and screw and tighten up.
4. Slide on magazine opening cover, and push forward as far as possible. Insert ejector, catch magazine spring, and catch; seating spring behind the front face of the catch, with rear of

* THESE COMPONENTS SHOULD NOT BE REMOVED UNLESS DEFECTIVE.

catch behind lug on ejector. Insert catch magazine retainer and spring into its seating; depress retainer and push in catch magazine pin. Line up holes and push pin in, until head is just clear of the body; turn until retainer engages in groove and push home.

5. Assemble backsight slide to leaf, with aperture to the top and to the left. Replace knob on backsight screw, line up holes and drive in pin. Replace backsight knob spring on backsight screw, with detent to correspond with notches on knob; assemble to leaf, seating knob spring in its recess in top of leaf and screw the screw into slide. Line up hole in leaf with groove in screw and drive in backsight screw retaining pin.
6. Replace backsight leaf spring into its seating and screw home the leaf spring screw. With lower end of backsight leaf, depress rear end of spring, line up axis holes, and insert axis pin from the left; push in axis pin and turn until hole in pin corresponds with hole in right rear on the body. Insert split pin in hole from the front, bending down both ends of pin into groove.
7. Engage cocking slide into slot in body, lug forward. Stand body vertical on its rear end. Insert plunger and spring into cocking handle; and, with plunger on front of lug, press down with cocking handle until holes are in line, insert pin from top and push home.
8. Replace barrel nut catch spring, into its seating in barrel nut, replace barrel nut catch with top of spring in its seating, line up holes and drive in pin, and rivet over.
9. Push magazine opening cover to the rear, depress barrel nut retainer plunger, and replace barrel nut, turning anti-clockwise until retainer engages.

B. **Assembling Bipod Assembly**

1. With locating lug on sleeve to the left, and boss away from you, replace spring and plunger in housing on left hand side. Replace left leg with foot outwards and forwards. Press down on leg, line up holes and insert hinge pin from the inside of sleeve. Push home and turn hinge pin until hole in pin coincides with groove in sleeve. Insert split pin and open ends.
2. Repeat for right leg.

C. **Assembling Piston and Breech Block Assembly**

1. Insert firing pin retainer from the right and rivet over, pull out retainer as far as possible, insert firing pin spring and firing pin with recess in head in line with retainer, depress firing pin and push in retainer.

2. Replace extractor, stay and spring from under side of breech block with long angular face of stay to correspond with rear angular face of extractor, push down on stay until it engages with extractor.

3. Screw piston rod in piston extension, drive in piston extension pin and rivet over.

4. Replace piston spring and plunger in post, seat plunger in its seating in piston extension and with rear end of post on bench give a sharp push forward and downward on piston extension until piston post is correctly seated.

5. With rear of piston post on edge of bench, press down on piston extension. Insert cotter from the left, lug first, and to the rear.

6. Engage T slot on front of block on piston extension with post in recess in block.

D. **Assembling Butt Slide Assembly**

1. Insert change lever detent and spring, press in detent and drive in pin.

2. Slide in ejection opening cover from front of slide, catch seating first, assemble catch spring to catch and catch into cover, seating catch spring on platform in cover. Line up holes in slide, cover and catch, push in pin until clear of slide.

3. Insert front mounting pin from right of slide, with groove corresponding to retaining screw hole, insert ball and screw in retaining screw hole.

4. Replace trigger spring and plunger into tripping lever, depress plunger and drive in pin.

5. Assemble tripping lever to trigger with working surface upwards and to the rear, push in tripping lever pin.

6. Replace trigger and tripping lever into slide, line up holes and insert trigger pin from the left of slide. Move trigger plunger aside with punch and push trigger pin home.

7. Engage forked end of trigger plunger on trigger pin, press tripping lever down and insert change lever from left of slide. Drive in until detent engages.

8. Engage small end of sear spring on post, seat into slide. Press trigger and insert sear, ensuring that sear spring engages in its seating, release trigger when rear end of tripping lever will engage in square aperture in front of sear. Line up holes and push in sear pin from left of slide.

9. Replace pistol grip and screw and tighten up.

10. Replace piston buffer and screw on nut with combination tool, cone to the rear, insert friction collar cone forward. Assemble piston buffer spring, and compressing spring against threaded flange on return spring tube, screw in tube and tighten with combination tool until lines on slide and tube correspond.

11. Insert rear mounting pin in butt bracket with groove corresponding to plunger hole, insert plunger. Replace plunger spring in butt, and bracket to butt, locating plunger on spring. Screw home the two screws.

12. Push in cocking handle slide cover and assemble butt to slide.

13. Replace return spring tube nut spring in its seating in butt with front end of spring outside tube, replace butt plate and screw home the two butt plate screws.

14. Engage small end of outer return spring on return spring rod, insert inner return spring and replace the assembly through return spring tube.

15. Replace return spring tube nut over return spring. Compress springs and screw nut on to tube.

E. Assembling Barrel Assembly

1. Replace gas regulator retainer in gas regulator flat face inwards and drive in pin.

2. Assemble gas block to barrel, line up hole to groove in barrel and drive in pin.

3. Assemble gas regulator to gas block with retainer corresponding to cut away, drive retainer out about 1/8 inch.

4. Replace foresight blade, protector and screw.

5. Drive flash eliminator on to barrel, line up hole through foresight bracket and drive in pin.

6. Insert carrying handle catch in carrying handle and screw on nut, replace carrying handle stem through catch, replace spring and screw on nut.

7. Assemble carrying handle sleeve on barrel with plunger hole corresponding to its groove in barrel; insert plunger and drive in pin, insert spring above plunger, replace plug with angular face corresponding to profile of sleeve, compress until flush and drive in pin.

8. Assemble carrying handle to sleeve, counter-bore hole to the left. Insert screw in counter-bored hole and screw home.

V. Assembling Main Groups

A. Assembling Bipod Assembly

1. With bipod legs to the left assemble to body and rotate anti-clockwise through 90°.

B. Assembling Piston and Breech Block Assembly

1. With breech block forward on piston extension insert piston rod into gas cylinder and push assembly home.

C. Assembling Butt Slide Assembly

1. Engage butt slide in its groove in body and push home, push in body locking pin.

D. Assembling Barrel Assembly

1. Insert rear end of barrel in barrel nut, locating boss on gas block in gas cylinder and extension on body in gas regulator. Push home and rotate barrel nut anti-clockwise until barrel nut catch engages with body.

2. Cock gun, press trigger and set change lever at safe.

GUN MACHINE BREN

DETAILED SEQUENCE OF ACTIONS

NOTE:— Gun is uncocked, breech block is forward, change lever is at safe.

A. TO LOAD THE GUN

1. Push forward magazine opening cover as far as possible.
2. Engage front end of magazine, loaded with a number of rounds, under the front of the magazine opening, push down the rear end of magazine against magazine catch. This rotates the catch magazine compressing the spring, which re-asserts itself and engages the catch over the lug of the magazine.
3. Pull cocking handle to the rear as far as possible; the inside face of the front of the cocking handle slide engages against the lug on the cotter running through the piston extension, withdrawing the piston extension to the rear compressing the return springs. The feed horns on the breech block lifts the column of rounds as they pass under it, the rounds dropping into line with the horns when the breech block is clear. The end of the piston extension, riding against the top face of the lug at the rear of the cover ejection opening catch, depresses it and compresses the spring. The spring re-asserts itself when the slot in the piston extension has passed over the lug to engage it on the forward movement. The slide passes into the clearance in the butt, the bent of the piston post engaging behind the bent of the sear. Push cocking handle with slide forward.

B. FORWARD ACTION

TO FIRE THE GUN AT AUTOMATIC

1. Rotate change lever forward to "A"; this causes the full diameter of the change lever to force the tripping lever downwards on its axis slightly compressing the trigger spring, and bringing the lower bent at the rear of the tripping lever into line with the lower bent of the sear.
2. On pressing the trigger, the trigger rotates on its axis. The top end of the trigger rotating forward and being pinned to the front of the tripping lever, carries the tripping lever forward with it compressing the trigger spring, causing the lower bent of the tripping lever to engage with the lower bent of the sear. The sear rotates on its axis compressing the sear spring and withdraws the main bent of the sear from the bent of the piston post.

3. The return springs re-assert themselves, forcing forward the piston extension carrying with it the breech block, (the rear end of the breech block being held into positive engagement with the angular face at the rear of the piston extension by the top of the block riding along the top of the body). The radiused face of the slot in the piston extension engages against the catch of the cover ejection opening and forces the cover forward. This causes the bevelled face in front of the catch to ride against the front edge of the ejection opening in the butt slide, rotating the catch on its axis, compressing the spring; the spring re-asserting itself as the catch engages with the front of the ejection opening, holding the cover in the forward position.

4. As the block moves forward the horn on the breech block engages against the base of the first round in the magazine and forces it forward.

   NOTE:—Alternative horns of the breech block operate as subsequent rounds are fed from the magazine.

5. The alternate lips of the magazine and the bullet guides in the body, guide the round into the chamber; as the round leaves the lips of the magazine the base of the cartridge is picked up by the chamfered face of the extractor, which forces it further into the chamber. When the round is fully home in the chamber, the breech block continues forward, and the extractor is forced down as the chamfered face rides against the base of the cartridge. The bevelled groove at the rear of the extractor riding against the angular face in front of the extractor stay, (which is in turn supported by the groove in the piston extension) forces the extractor stay to the rear compressing the extractor spring. The extractor spring re-asserting itself forces the extractor into engagement with the rim of the round. The front face of the breech block comes to rest against the shoulders of the body.

6. As soon as the rear end of the breech block rides off the body on to the inclined faces of the locking shoulder, the angular face at the rear of the piston extension commences to lift up the rear of the breech block, and, when the breech block has passed in front of the locking shoulder in the body, the breech block is lifted into engagement with the locking shoulder, locking the breech.

7. The piston extension continues still further forward, the horizontal face on top of the piston extension riding under the bottom of the breech block for a distance of approximately half an inch, this ensures mechanical safety; the piston post striking the firing pin forces the firing pin forward, compressing the firing pin spring and the round fires.

C. BACKWARD ACTION

1. The bullet passes up the barrel, and the recoil thrusting the empty case against the breech block, which being locked to the body forces the body and barrel to the rear along the butt slide. The shoulder at the rear of the body engaging against the buffer piston forces the buffer back, partially compressing the buffer spring. This action buffers the body recoil.

2. The bullet travels along the barrel, part of the following gases escaping down through the gas port in the bottom of the barrel when the bullet has passed it. These gases pass through the gas block and regulator and are forced against the head of the piston.

3. The piston, and piston extension are driven to the rear, compressing the inner and outer return springs.

4. The piston post is carried away from contact with the firing pin; the firing pin spring re-asserting itself withdraws the firing pin.

5. As soon as the horizontal face of the piston extension is clear of the underside of the breech block, the inclined face under the piston post riding against the rear of the slot in the breech block, forces the breech block down out of engagement with the locking shoulder in the body. The vertical face of the piston post takes up against the rear face of the slot in the breech block and carries the breech block back with it. (This action is buffered by the spring piston post which is slightly compressed.)

6. The extractor stay being now at the front end of the groove in piston extension is held into closer engagement with the extractor; the extractor in turn gripping the empty case more tightly levers the case out of the chamber as the breech block is unlocked, and is carried with the breech block as it moves

to the rear until the ejector riding in the groove on top of the breech block strikes the base of the empty case, throwing it downwards through the ejection opening.

7. The piston extension and breech block continue to the rear, until the rear end of the piston extension strikes the piston buffer, this forces the buffer to the rear compressing the buffer spring; the cone on the buffer nut riding against the cone of the friction collar, expands the collar against the sides of the spring housing in the butt slide which assists in arresting the backward movement of the piston extension and breech block. The return springs are now fully compressed. The same cycle takes place while the trigger is compressed until the magazine is empty.

D. WHEN THE TRIGGER HAS BEEN RELEASED

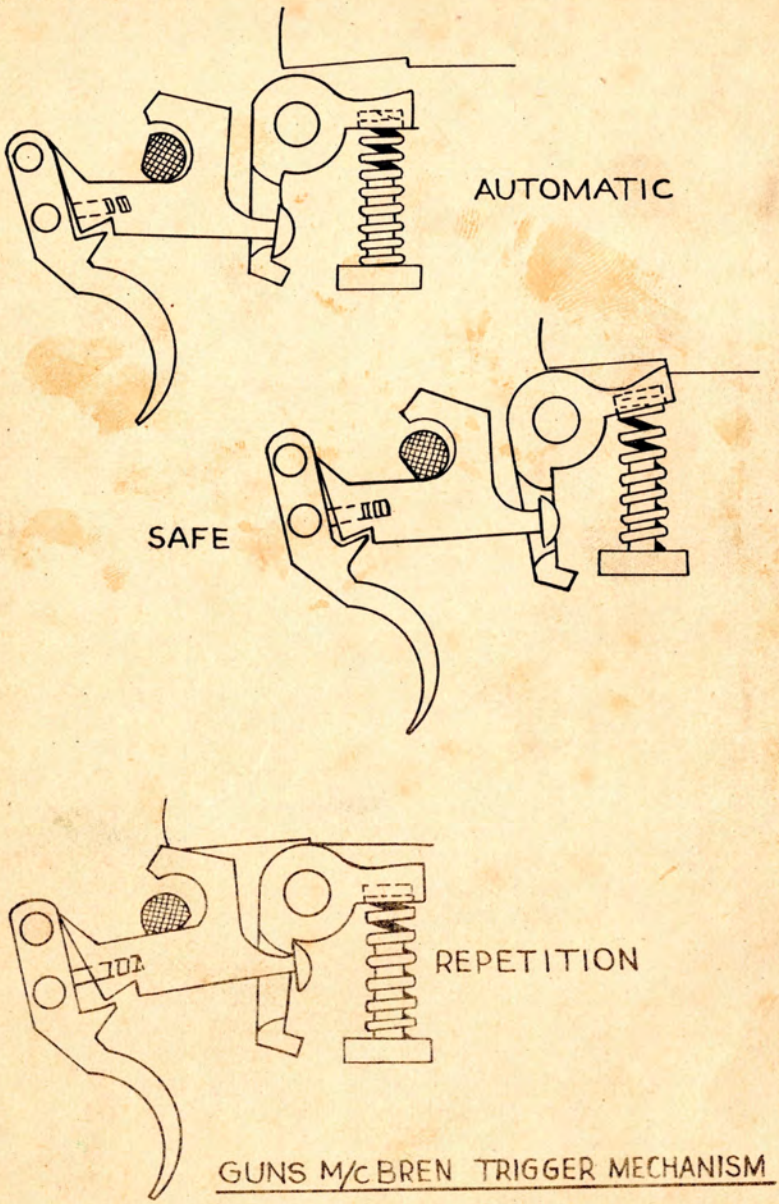
1. On releasing the trigger, the sear spring re-asserts itself rotating the sear upwards, bringing main bent into the path of the bent of the piston post. The lower bent of the sear engages the lower bent of the tripping lever, carries the tripping lever to the rear as the trigger spring re-asserts itself. The trigger being pinned to the tripping lever is rotated on its axis.

2. The piston extension on its backward movement rides over the main bent of the sear, depressing it and compressing the sear spring; as soon as the bent of the piston post has passed the main bent of the sear, the sear spring re-asserting itself forces the sear up and the bent of the piston post engages against it on its forward movement, holding the piston and breech block assemblies to the rear. The sear is restricted in its rotational movement, by contracting he base of the sear spring post.

E. TO FIRE THE GUN AT REPETITION

1. Rotate change lever to "R". This brings the flat on the change lever above the tripping lever, allowing the trigger spring to re-assert itself and force tripping lever upwards; this brings the upper bent of the tripping lever into line with the upper bent of the sear, and the projection on top of the tripping lever into the path of the piston post.

2. On pressing the trigger, the trigger rotates on its axis. The top end of the trigger rotating forward and being pinned to the



GUNS M/c BREN TRIGGER MECHANISM

front of the tripping lever, carries the tripping lever forward with it, compressing the trigger spring, causing the upper bent of the tripping lever to engage with the upper bent of the sear. The sear rotates on its axis compressing the sear spring and withdraws the main bent of the sear from the bent of the piston post.

3. As the piston moves forward, the bent on the piston post rides against the projection on top of the tripping lever, forces it down, compressing the trigger spring and disengaging its upper bent from the upper bent of the sear. The sear spring re-asserts itself and forces up the sear, its upward movement being controlled by the piston extension as it passes over it. When the piston extension is clear of the sear, the sear spring fully re-asserts itself and the sear rises, bringing the maint bent into the path of the bent of the piston post which it engages on its return.

4. As soon as the piston extension has passed clear of the projection on the tripping lever, the trigger spring, re-asserts itself forcing up the tripping lever, until the rear radius of the tripping lever is arrested by the chamfered face in front of the upper bent of the sear.

5. On releasing the trigger, the trigger spring re-asserts itself rotating the trigger and forcing the tripping lever to the rear, the radius at the rear of the tripping lever, rides against the chamfer in front of the upper bent of the sear, and forces the tripping lever down. As soon as the bent of the tripping lever is behind the upper bent of the sear, the tripping lever is forced up under the influence of the trigger spring, the tripping lever continues to the rear into the overcocked position as the trigger spring fully re-asserts itself.

NOTE:—If the change lever is moved from REPETITION to AUTOMATIC whilst pressure is maintained on the trigger the sear will become inoperative—owing to the tripping lever being in the forward position and then depressed to its lowest position by the stem of change lever. The claw or tail lies in front of lower bent of sear. When trigger is released the tripping lever cannot move to the rear to engage sear.

The trigger must be released, change lever put to SAFE, then to AUTOMATIC, before the gun can be fired.

F. **WHEN THE MAGAZINE IS EMPTY** (HOLDING OPEN DEVICE)

1. As the last round is clear of the lips of the magazine, the magazine platform is forced down on to the top of the breech block. When the breech block moves to the rear, the ribs on the top of the breech block lift the magazine platform, as they pass under it.
2. As soon as the breech block has passed clear of the platform, the platform is forced down again, to arrest the breech block on its forward movement, holding the breech block and piston extension block in the overcocked position.

G. **REMOVING EMPTY MAGAZINE**

1. Push catch magazine forward; this disengages the catch magazine from the lug on the magazine, compressing the catch magazine spring.
2. Rotate magazine and lift front end out of engagement with magazine opening.
3. As magazine is disengaged, the horns on the platform magazine are disengaged from the horns of the breech block, which is now allowed to move forward with the piston extension, until the main bent of the sear can engage against the bent of the piston post. Slide back magazine opening cover.
4. Press trigger, allowing breech block and piston assembly to go forward.
5. Rotate change lever to "S". This brings the intermediate flat on the change lever into engagement with the tripping lever, forcing it partially down, and bringing the bents of the tripping lever clear of the upper and lower bent of the sear.
6. Depress catch cover ejection opening, and slide cover to the rear.

MECHANICAL SAFETY

Backward movement

1. 1/4" recoil of the main proportions of the gun on the butt slide.
2. The distance travelled by the piston (approx 1/2") before the action is unlocked.

Forward movement

Distance travelled by piston after locking of the action.

BUFFERING ACTION

1. Buffering of body against buffer piston.
2. Buffering of butt against buffer butt plate (Mk. 1 butts only).
3. Buffering of piston post on breech block during unsealing of the breech.
4. Buffering of piston against buffer piston at end of backward travel.

A SEQUENCE OF INSPECTION

I. **SAFETY PRECAUTION**

1. Remove magazine, cock the gun and ensure that chamber is empty.
2. Allow breech block and piston assembly to go forward under control.
3. Place change lever at "Safe".

II. **VIEW**

A. **EXTERNAL**

1. Check to see that the numbers on both barrels, barrel nut, butt slide (rear end) and body are present and correspond.
2. See that foresight protector screw is present and undamaged. Foresight blade is tight and undamaged. Flash eliminator pin is present and tight.
3. See that gas block pin is present and tight. Gas regulator retainer functions correctly, and retainer pin is present and tight.
4. Ensure that both carrying handles function and take the weight of the gun. Examine for cracks and damage. See that plunger pin is present and tight. Examine sleeve for fit and damage.
5. Test functioning of bipod legs by locking in all positions and ensure that the shoes grip the side of the body when in the closed position. Split pins are present and secure.
6. Check front mounting pin for functioning.
7. Check barrel nut catch for functioning with both barrels and barrel nut retainer for functioning.
8. Examine cover magazine opening for damage and free functioning, and ensure that it locks firmly when open at elevation, and when closed at depression.
9. Examine magazine catch, check for functioning with empty magazine.
10. See the cocking handle functions correctly and locks slide when closed against body.
11. Raise backsight leaf and examine, see that leaf spring functions correctly, leaf spring screw is tight and undamaged, backsight screw functions correctly, and split pin is present and turned over.

12. Examine pistol grip for damage and cracks, and see that screw is tight.
13. Examine butt for damage and cracks, cocking handle slide cover for damage, check rear mounting pin for functioning and see that bracket screws are present and tight, sling loop of butt is undamaged; screws are present and tight.
14. Check with spring balance weight required to move cocking handle, initial movement (8 to 12 lbs), fully cocked (17 lbs, low limit), Mk. 2 springs. Fully cocked (16 lbs), Mk. 1 springs.
15. Check gun for functioning, with change lever in "A", "S" and "R" positions, by moving mechanism backwards and forwards.
16. Functioning test magazine and DUMMY rounds.

B. **INTERNAL**

1. **Remove Barrel Assembly and Examine**
   (a) Chamber and bore; for wear and cleanliness.
   (b) Gas block; ports in block and barrel for fouling.
   (c) Positioning groove on barrel; for burrs or damage.
   (d) Threads; for wear or damage.
   (e) Gas regulator; remove, and examine ports for fouling.
   (f) Gauge .301" must pass through the bore. If gauge .306" passes through the bore, or the Lead Plud enters the breech more than 1¼", the barrel will be shot for accuracy. Barrels which accept the .306" gauge from breech to muzzle will not be used for "Battle Inoculation Firing" or when over head firing is to be carried out. Such barrels will be stamped with a figure "6".
   (g) Minor pitting may be ignored, and slight scratches are permissible provided the .301" gauge runs feely through the bore.
   (h) Apply the chamber mouth gauge No. D. 295A to ensure absence of burrs.
   (i) Barrels having a sharp edge around the mouth of the chamber will be chamfered .015" at an angle of 45 deg.
   (j) Loose barrels will be tightened by fitting an appropriate barrel nut which must not exceed a No. 4. If the combination of a barrel and barrel nut exceeds the fitting of a No. 4. barrel nut, the gun will be sentenced B.L.R.
   (k) Check distance from the cartridge face of the barrel to the breeching up face with a depth micrometer. Barrels in which the distance is below .875" will be sentenced u/s.

2. **Remove Butt Slide Assembly and Examine**

   (a) Cover ejection opening; see that the catch engages positively when the gun is functioning in the vertical position.

   (b) Body ribs; for burrs or damage.

   (c) Front mounting retaining screw; to see if present.

   (d) Trigger mechanism. Strip and examine. Trigger; for damage or wear. Tripping lever bents; for wear. Trigger spring and plunger; for functioning. Change lever working faces; for wear. Sear, main, upper, and lower bent; for wear. Sear spring; for distortion.

   (e) Piston buffer; for functioning. Face; for wear.

3. **Remove Piston and Breech Block Assembly and Examine**

   (a) Piston. Head; for fouling. Piston extension pin; for rivetting. Ribs; for burrs or damage. Breech block engaging ribs; for burrs or damage. Piston post; working faces for wear. Spring piston post; test for functioning. Cotter; cocking lug for wear. Breech block locking ramps; for wear.

   (b) Breech block. Strip and examine. Feed horns; for wear. Guides; for burrs. Face; for damage. Firing pin retaining pin; for rivetting. Locking faces; for wear. Firing pin; point for damage. Assemble firing pin and check protrusion (L .04" H .045"). Extractor and stay; for damage. Spring; for collapse.

   Check the end play of the breech block with feeler gauges placed between the locking face of the breech block and the locking shoulders. The breech block must close over a .002" feeler, and not over a .008" feeler. Test carried out with both barrels assembled and removed.

   (c) Assemble breech block to piston extension. Assemble barrel to body. Insert .064" headspace gauge into chamber. Assemble piston extension and breech block to body and push home. Rear end of the piston extension should pass under the breech block, a distance of approximately ⅜". Insert .074" headspace gauge and repeat. Rear of piston extension should not pass in front of rear of breech block. Remove piston, breech block assembly, and barrel.

   NOTE:—Remove extractor, stay, and spring when testing C.H.S.

(d) Check the end play of the breech block with feeler gauges placed between the locking face of the breech block and the locking shoulders. The breech block must close over a .002" feeler, and not over a .008" feeler. Test carried out with both barrels assemble and removed.

4. **Body Assembly, Examine**

(a) Cylinder; for scores and fouling.

(b) Remove magazine catch. Examine ejector; for wear or damage. Locking shoulder screw; for tightness.

(c) Butt slide and piston extension guides; for burrs.

(d) Slide; for free functioning.

(e) Body locking pin; for functioning.

(f) Remove nut barrel. Threads; for wear or damage.

(g) When the barrel seating is worn or indented there will be a tendency for the cartridge face to be proud of the breech stops. Check by smearing prussian blue on the cartridge face of the barrel and breech block stops. Close the breech and if the marking from the barrel appears at the top of the breech block, test with new barrel and a barrel nut not exceeding a No. 4. If the fault persists the gun will be sentenced B.L.R. On no account will washers .002" or .003" be fitted. (First Echelon only.)

POINTS OF INTEREST

1. Seating for return spring rod in rear of piston extension to the left. Rod housed in left side of butt to even tension on wood due to cut away portion for cocking handle slide.
2. Breaking up of fouling carried out by gun being roated on bipod.
3. Barrel nuts issued in SIX sizes 0 1 2 3 4 5.
4. Locking shoulders issued in ELEVEN sizes NOT to be fitted by forward elements. Nos. 3x, 2x, 1x, 00 0, 1, 2, 3, 4, 5, 6.
5. Barrel changing—not more than 210 rds rapid fire before changing. Should be cooled naturally but if necessary may be plunged into cold water.
6. Drills for gas holes. Gas regulator. 25 29 32 37.
   Nozzle 19. Gas hole in barrel 26.

Stoppages

Likely stoppages to be met with

1. Badly filled magazine.
2. Miss fires.
3. Insufficient gas.
4. Faulty lubrication.

A.C.I. 138/45 dated 7 February, 1945.

BREN LMG— Zeroing.

In the Service the Bren gun will be zeroed as follows:—

1. The gun to be zeroed will be mounted on a Bren tripod.
2. A target, with a white patch in the centre of a clearly defined aiming mark, will be set up.
3. A burst of 10 rds will be fired to warm the gun. These will not be fired on the target.
4. Immediately after the action at 3 above a skilled shooter with the butt in the shoulder and holding and aiming as if firing from the bipod will fire a group of five single shots on the target. He will check the aim after each shot and, if necessary, the gun will be relaid.
5. There are eight sizes of foresight available for the adjustment of vertical errors. They range from .25 inch to .46 inch with a difference of .03 inch between each foresight. Only four sizes, .25 inch, .28 inch, .31 inch, and .34 inch are normally carried by the unit armourer.
6. The difference as shown on the target of one size of foresight to the next is as follows:—

Mk. 1 and 2 guns.		Mk. 3 and 4 guns.	
100 yards	3 1/2 inches.	100 yards	4 1/8 inches.
25 yards	7/8 inch.	25 yards	1 inch.

7. Adjustments, if necessary, will be made on the following basis:--

Actual distance between firer and target.	Sight adjustment.	Correct positioning Mean Point of Impact with reference to aiming mark.	Permissible variation in position of Mean Point of Impact from correct point.
100 yards	200 yards	5 inches directly above.	Not exceeding 2 inches above or below.
25 yards	200 yards	1 inch right and 1½ inches high.	Not exceeding ½ inch above or below.

8. After zeroing in this way, it will be found that the first few rounds from a cold gun will go high. As the barrel warms up, however, the Mean Point of Impact will gradually drop until it remains steady on the point of aim.

9. This ACI cancels all previous instructions on the zeroing of the .303 inch Bren LMG.

Zeroing

The following formula applies to all small arms and MG's. The following will give the difference of the MPI at a given range, caused by one change of blade foresight:—

$$\textbf{Alteration of Blade Foresight} \times \textbf{Range}$$
$$\text{Sighting Radius}$$

e.g. Bren.....

$$\frac{.03" \times 100 \text{ yds.}}{31"}$$

$$\frac{3 \times 100 \times 36}{100 \times 31} = \frac{3 \times 36}{31} = \frac{108}{31} = 3.483"$$

3½" approx.

GUNS, MACHINE BREN .303 INCH

REGULATIONS AFFECTING THE ABOVE WEAPON

LIST OF CHANGES

1939

B 2213 Feb. Covers.
Gun Bren .
Spare Barrel, Gun Bren.
Introduction.

B 2290 Mar. Cases Mounting Tripod Bren.
.303 inch MG.
No's 1, 2, 3 and 4.
Introduction.

B 2380 Apr. Guns Mach. Bren, .303 inch Mk. 1.
(13 main headings, all accessories, follow.)
Rods Cleaning Cylinder Bren, .303 inch MG Mk. 1.
Obsolescent for Bren Guns.
Conversion of Mk. 1 rods to Mk. 1*.
This L of C is the introduction of the gun with its accessories. It also introduces the conversion of Mk. 1 rods to Mk. 1*. A full description of the gun is included.

B 2381 Apr. Buckets Gun Bren.
(7 main headings, all accessories, follow.)
Introduction.

B 2637 Aug. Chests Barrels Bren .303 inch MG Mk. 1.
With fittings for 18 barrels. Introduction.

B 2753 P Sept. Fillers Magazine Bren .303 inch MG. Mk. 2.
1. New Pattern.
Fillers Magazine Bren.
.303 inch MG. Mk. 1.
2. Obsolescent.

B 2768 Sept. Clips Bipod Bren .303 inch MG Mk. 1.
Introduction.

B 2856 Oct. Deflectors Cartridge Case. Bren .303 inch MG Mk. 1.
Bren .303 inch MG Mk. 2.
1. Introduction.
2. Mk. 1 Deflector obsolescent.

B 3042 Dec. Apparatus Weapon Training Spotlight, etc.

1940

B 3202 Feb. Guns Machine Bren .303 inch Mk. 1.
Barrels assembled Mk. 1*.
Regulators gas, Mk. 3.
1. New Patterns.
Guns Machine Bren .303 inch Mk. 1.

Barrels assembled Mk. 1. Regulator Gas Mk. 1.

2. Nomenclature. Obsolescent.

3. Local conversion of Mk. 1 barrel assembled.

B 3285 Mar. Cleaners Gas Regulator Bren .303 inch MG Mk. 2.

Consisting of oval ring with reamers No's 1, 5, 6, 7 and 8.

1. New Pattern.

Cleaners Gas Regulator Bren .303-ins.

M.G. Mk. 1.

Consisting of round ring with reamers No's 1, 2, 3, 4 and 5.

2. Obsolescent. Detail Nomenclature.

B 3286 Mar. Mounting Seat AA .303 inch MG Mk. 1.

1. Introduction.

2. Obsolescent.

Mounting Seat A.A. .303 inch MG Mk. 2.

3. New Pattern.

B 3287 Mar. Mtgs. Tripod Bren .303 inch MG Mk. 1.

1. Fittings of traversing stops (Locally).

2. Local Mod.

B 3448 May Guns Machine Bren .303 inch Mk. 1.

Plungers post piston Mk. 2.

Posts piston Mk. 2.

1. New Patterns.

2. Fitting of Mk. 2 plungers in existing guns.

Guns Machine Bren .303 inch Mk. 1.

Plungers post piston Mk. 1

Posts Piston Mk. 1.

3. Obsolescent. Nomenclature.

Consequent on I., the Mk. 1 becomes obsolescent and the nomenclature is amended to read as shown.

B 3618 July Chests Bren .303 inch MG Mk. 1*.

Modified Ptn. Local Modfn. Chests Bren .303 inch MG Mk. 1.

Obsolescent.

B 3619 July Mtgs. Tripod Bren .303 inch MG.

Mk. 1 Washers, Clip Butt Handle.

1. Introduction.

2. Local fitting.

B 3762 Aug. Sights Fixed Line Bren .303 inch MG Mk. 1.

With Sight, Lensatic, Mk. 1.

Introduction.

B 3871 Sept. Frames Housing Fixed Line Sight, .303 inch Bren MG Mk. 1.
Wood with two securing cords.
1. Introduction.
2. Addition of cords to frames of early issue.

B 3932 Oct. Mags. Bren .303 inch MG Box type; 30 rounds.
No's I. Mk. 1; 1*; 1**; 2; 2*.

B 4053 Nov. Covers Gun Bren.
Modifications.

B 4152 Dec. Apparatus Weapon Training Spotlight Mk. 4.
For Rifles No's 1 and 2, Bren and Lewis.
Boxes Apparatus Weapon Training, Spotlight Mk. 1.
Empty, for one Mk. 3 or Mk. 4 apparatus.

1941

B 4257 Jan. Brushes Rod Cleaning Cylinder Besa 7.92 mm. MG Mk. 1.
1. Introduction.
Rods Cleaning Cylinder Bren, .303 inch MG Mk. 1*.
Also for Besa 7.92 MG (Sec. C2).
2. Extension of use.

B 4515 April Boxes Battalion Spares Bren .303 inch MG Mk. 1.
Wood with spring catch.
Empty.
Filled "A".
For 10 to 24 M.Gs.
Contents as per E.Rs.
Filled "B".
For 25 to 74 M.Gs.
Contents as per E.Rs.
2

B 4876 July Equipments 100 Round Bren Magazine Mk. 1.
Introduction.

B 4877 July Guns Machine Bren .303 inch Mk. 2.
Tools Combination Bren .303 inch MG Mk. 2.
1. New patterns.
Tools Combination Bren .303 inch MG Mk. 1.
2. Use restricted.

B 5006 Aug. Adapters Twin A.A. Bren .303 inch MG Mk. 1.
Washers locking Shaft 3/4 inch.
Introduction.

B 5104 Sept. Guns Machine Bren .303 inch
Bren Mk. 1 Handles butt.
Complete.
Mountings Tripod Bren. .303 inch MG Mk. 1.
Clips butt handle. With distance piece and two screws.
Abolition of.

B 5105 Sept.
Mountings Gate AA Mk. 1.
For Bren, Lewis and Hotchkiss MGs Mountings Motor Coach AA Mk. 1.
For LMGs.
Mountings Picket Post AA Mk. 1.
For Bren, Lewis and Hotchkiss MGs.
1. Introduction.
Holders AA Lewis .303 inch MG Mk. 2.
2. New pattern.

1942

B 5478 Jan.
Brushes Rod Cleaning Cylinder .303 inch MG Mk. 2.
Wire for Bren and Lewis.
Rods Cleaning Cylinder Bren .303 inch MG Mk. 2.
Rods Cleaning Cylinder Lewis .303 inch MG Mk. 2.
Mops Rod Cleaning Cylinder .303 inch MG Mk. 2.
1. New pattern.
Rods Cleaning Cylinder Bren .303 inch MG Mk. 1*.
Rods Cleaning Cylinder Lewis .303 inch MG Mk. 1.
2. Local conversion.
Brushes Rod Cleaning Cylinder Bren .303-inch MG Mk. 1.
Brushes Rod Cleaning Cylinder Lewis .303-inch MG Mk. 1.
Mops Rod Cleaning Cylinder Bren .303-inch MG Mk. 1.
Mops Rod Cleaning Cylinder Lewis .303-inch MG Mk. 1.
Rods Cleaning Cylinder Bren .303 inch MG Mk. 1*.
Rods Cleaning Cylinder Lewis .303 inch MG Mk. 1.
3. Obsolescent.

B 5479 Jan.
Brushes Oil MG Mk. 2.
With plastic stem.
New pattern.

B 5480 Jan.
Holders Filling Bren 100 Round Magazine Mk. 1.
Obsolete.

B 5630 Feb.
Slings Bren Gun.
1. Extended use.
Slings Mortar.
2. Obsolescent.

B 6063 May
Guns Machine Bren .303-inch.
Screws retaining mounting pin Mk. 2.
Balls mounting pin.
For front and rear mounting pins.
1. New patterns.
Screws retaining mounting pins Mk. 1.
2. Obsolescent.
Nomenclature.
Pins Mounting.
For front and rear mounting holes.
3. Local modification.
1. Approved.

B 6311 June
Guns Machine Besa 7.92 mm.
Springs.
Pin firing.
Extension of use.
The use of the above spring has been extended for use on Bren.

B 6376 July — Equipments Mounting Loop-hole MG Mk. 1.
Detail under "Vickers."

B 6531 Aug. — Magazines Bren 100 Round Mk. 1.
1. Modifications.
Magazines Bren 100 Round Mk. 2.
2. New pattern.

B 6530 Aug. — Holdalls Bren .303 inch MG Mk. 1.
Canvas with quick release fasteners; carrying handle and sling.
Introduction.

B 6532 Aug. — Mountings Sidecar Bren .303 inch MG Mk. 1.
Introduction.

B 6713 Sept. — Boxes Magazine Bren .303-inch MG Mk. 1*.
1. New pattern.
Boxes Magazine Bren .303-inch Bren.
.303 inch MG Mk. 1.
2. Local conversion.
3. Obsolescent.

B 6864 Oct. — Guns Machine Bren .303-inch Blades foresight.
.43-inch. Mk. 2.
.46-inch Mk. 2.
Extended heights.

B 6863 Oct. — Brushes Rod Cleaning Cylinder Besa 7.92 mm. MG Mk. 2.
Detail under "Besa".

1943

B 7241 Jan. — Brackets Sight AA Mounting Mk. 1.
Detail under "Vickers".

B 7471 Mar. — Mountings Tripod Bren .303 inch MG Mk. 2.
1. New pattern.
Mountings Tripod Bren .303 inch MG Mk. 1.
2. Obsolescent.
Deletion of AA components.

B 7804	June 43	Blades FS .28 Mk. 2. Obsolescent.
8934	Feb. 44	Equipments Bren 100 rd . Mag. Obsolescent.
9144	Apr. 44	Blade FS .25 Mk. 2. Extended height. „ „ .28 Mk. 2. Re. introduction.
9465	July 44	Springs return Mk. 2. New pattern. „ „ Mk. 1. Obsolescent.
10000	Dec. 44	Boxes mag. Bren Mk. 1. Obsolescent.
C 2	Dec. 44	Stem handle carrying Mk. 3. New pattern. „ „ „ Mk. 1 and 2. Obsolescent.
C 422	Mar. 45	Guns M. Bren Mk. 3 „ „ „ Mk. 4. } New pattern.

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C 739	May 45	Support screwed Bren Mk. 1. Case screwed support Bren Mk. 1. } Introduction.
C 736	May 45	Gun Mk. 1 and 3. Trigger Mk. L. Med. to lug. Gun Mk. 2. Lever tripping Mk. 2. Obsolescent.
C 738	May 45	Magazines Bren No. 1 Mk. 3. New pattern.
C 917	June 45	Mk. 1, 2, 3 and 4. Blades foresight Mk. 3. New pattern. " " Mk. 2. Obsolescent.
C 1025	July 45	Mk. 3. Pin handle cocking Mk. 3. New pattern.
C 1185	Aug. 45	Mk. 2, 3 and 4. Nut tube return spring Mk. 3. Ext. of use. Mk. 2 " " " " Mk. 2. Obsolescent.

EMERs

S.A. and M.G.

553 p. 1. Tightening of loose locking shoulders.
p. 3. Assembly of Mk. 2 return springs.
p. 5. Chamber mouth to be chamferred.
p. 7. Fitting of Mk. 1 trigger.
p. 9. Gauging of barrels.
p. 10. Test for functioning and accuracy.
p. 12. Adjustment of loose flash eliminators.
p. 14. Stripping and Assembling.
p. 25. Interchangeablity of Barrels Mks. 1*, 2 and 4.
p. 27. Repair of loose barrels. Fitting of washers.

E 550 Data Summary.

E 552 General description.

E 554 p. 1. Repair of chipped pistons.
p. 3. Replacement of barrel nut, for tightening barrels.
p. 4. Replacement of locking shoulders, for C.H.S. adjustment.

E 557 Mod In. No. 1 Summary of previous mods.

E 559 Misc. Inst. No. 1 Details of Screw thread system.
Misc. Inst. No. 2 Identification of helical springs.

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21 AG and Rhine Army Technical Bulletins. (Not authority for guidance).

Paras 4, 18	Loose flash eliminators on Mk. 2 barrels.
	Magazine mouths opening cut.
18, 86	Correct MPI when zeroing. Firinglow with .25 inch sight.
18	Chamfer to lips of chamber.
18, 86, 148	Breaking off of right feed projection on breech block.
35	Fitting of Mk. 1 trigger to guns with Mk. 2 tripping levers.
50	Fitting of Mk. 1 bipods to all marks of Bren.
51, 118	Loose gas cylinders on Mk. 2 guns.
102, 148	Chipping of piston ext. at breech block acceptance point.
103, 148	Breaking and shortening of spring post piston.
147	Barrel wear and special safety precautions.
147	Charger loading device.
148	Sleeve handle carrying, breaking of stop.

ACIs

2061	1941	Bipods—painting of
2600		Chest 100 rnd Magazine. Amended Contents List.
601		Magazines 100 rds
1879		Supports adj. (Carrier universal)
2579		Use of Rubber Bars Extended. (See also 1879/41.)
1951		Cover mag opening—repair of
926		Mk. 1. Modifications
927		Mk. 1. Nuts barrel—removal of barrel when cocked.
2491		Mk. 1. Loss of mounting pin
1290		Carrying Handle—retention of. AA position
1120	1942	Holdalls Bren
1350		
1621		Bren and Besa Extractor group "B" and "T"
1000		Butts Mk. 2
244		Strap butt plate—use discontinued
2709		Mk. 1 DP
484		Mks. 1 and 2. Mod. to barrel
536		Painting of in lieu of re-browning
1001		Mags 30 rds. Repair to bottom plate
1053		Faults in feed
1658		Repair of loose barrel
72	1943	Sights fixed line Bren. Withdrawal of
1729		Bipods Mk. 1—fixing lower and upper tubes
377	1944	Slings Bren gun
636		Fillers magazine — Not required
172		Covers gun — AA and Pack saddlery
138	1945	Zeroing
405		Wear of barrels—testing
663		Safety precautions in battle inoculation
332	1946	Tools removing fouling Bren Mk. 1

REME ORGANISATION AFFECTING ARMOURERS

1. GENERAL

The duties of an Armourer consist of the inspection, repair and maintenance of small arms, machine guns and ~~bicycles~~ BAT and their connected equipment.

Also the repair of certain metal accoutrements. Tabulated, these repairs are as follows:—

(a) All weapons of 1" calibre and below (except 1" aiming rifles) together with their mountings, accessories and appurtenances, including those in AFVs.

(b) Bayonets, swords and scabbards.

(c) Mortars, all types.

(d) Such specialist weapons as are distinct from Artillery, e.g. infantry projectors, dischargers, bomb-throwers and rocket launchers.

(e) ~~Bicycles.~~ BAT 120MM. FLAME THROWER PORTABLE.

(f) Helmets and chains.

(g) Metal work of accoutrements, saddlery and appurtenances.

In addition to the above, an armourer will also carry out or assist with, first echelon repairs to ~~6 pdr~~ or similar anti-tank or AFV equipment, held by units to which he is attached. Also the inspection and minor repair of instruments used by an infantry unit. He will also execute any minor repairs or other such work within his capabilities which he may be called upon to perform.

Armourer Warrant Officers will invariably be in control of Base or Command Armourers Shops or performing circuit inspections from Brigade or Divisional HQs.

Assistant Inspectors of Armourers will be responsible for the TECHNICAL Control generally of all Armourers in their command or area, and the supervision of their work. The AIA will also carry out Examinations as laid down in EMERs.

The following EMERs deal with the duties, control of and repairs to be carried out by, REME Armourers.

General C.411, Page 1.
Small Arms A.161, Page 1.

2. ECHELON SYSTEM

Workshop facilities in the field are graded into four groups. Each group is known as an Echelon and the type or standard of repairs carried out in the workshop in each Echelon is referred to by Line. Thus a Regimental or Unit Workshop is a First Echelon Workshop and the standard of repair carried out would be a First Line Repair. It does not *always* follow that the Echelon and Line are the same number. For instance, Third Echelon Workshops are often called upon to carry out Fourth Line Repairs.

The following table shows the types of workshops in the various echelons:—

Echelon System of Repairs

Army Troops	Corps Troops	Infantry Div	Armoured Div	Echelon
Unit	Unit	Unit	Unit	1st
Army Tps W/S	Corps Tps W/S	Inf Bde W/S	Armd Bde W/S	2nd
Based on Inf or Armd Tps W/S depending on location.		Inf Troops W/S	Armd Troops W/S	3rd
ABW Base Armament and General Command Wksp at Home				4th

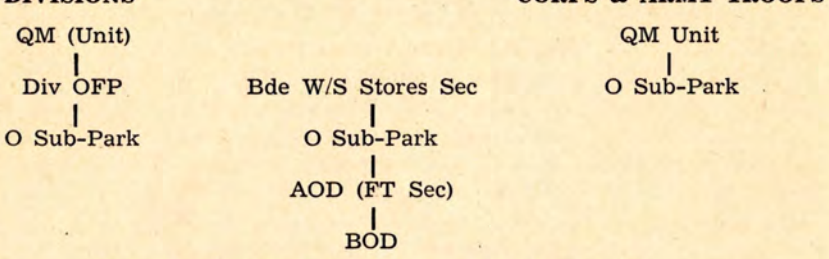
Gen Tps W/S (2nd Line) for GHQ and L of C Troops.

If, on a general turnover to peace conditions, the intermediate Workshops and Echelons disappeared, the general procedure detailed in this chapter would not be greatly affected.

Further details and the authority for the Echelon System of repairs will be found in EMERs General B.035, pages 1-2.

The drawing of stores is also carried out on the Echelon System. Though it is not customarily the job of an Armourer to demand stores from RAOC, the following table will show the various RAOC establishments concerned, in case he should be called upon to do so.

Demanding of Stores



General Troops and L of C supplied by AOD

3. **PROCEDURE**

To ensure consistency of action by REME Workshops and Personal, a standardised procedure is laid down involving the use of various Army forms and books.

Armourers may find modifications in this system, to suit the local conditions, but in general the procedure will be as laid down by War Office.

In the following paragraphs, where the BAOR system differs from the War Office system, that of the BAOR is used.

Armourers should, at all times, keep themselves acquainted with current publications so as to be always aware of changes in procedure. It is impossible in this chapter to deal with every detail of procedure and only by making himself acquainted with the various publications affecting his work can an Armourer carry out his work in the proper manner. The following text books and periodical publications should contain the answers to any question affecting Armourers, and details of procedure:—

Instructions for Armourers, 1931.

Equipment Regulations Part I, 1942.

RAOS Part I.

Small Arms Training, Vol. 1.

Vocabulary of Army Ordnance Stores.

Periodical Publications of:—

EMERs (including 21 Army Group local EMERs).
ACIs.
Lists of Changes.
Rhine Army Technical Bulletin.

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As most phases of procedure entail the employment of various Army forms and books, the following paragraphs show those most commonly used together with a brief description of their uses:—

AB 281 — **Artificers' Daily Work Book**

Should be maintained by all Unit Armourers and contain a record of all work carried out and component parts used. This will be examined regularly by the visiting AIA.

AB 282 — **Ledgers**

This ledger is usually maintained by the Regimental Quartermaster, but it is from the AB 281 that the weekly usage of components is taken.

AF G 1048 — **Quarterly Inspection Report**

This form is completed by the Unit Armourer after each routine inspection. Prepared in duplicate, one copy being forwarded to OC Company or Squadron, while the other is retained by the Armourer. In the event of the Annual Inspection or the Inspection of Mob Store arms, one copy should also go to CO.

AF G 919 — **Monthly Return of Lists of Changes**

All modifications authorised by Lists of Changes will be reported on monthly, regarding completion or otherwise. Where it has been impossible to complete Lists of Changes, reasons should be given. Submitted to the CO of the Unit.

AF G 3660 — **Defect Report**

In the event of any peculiar or recurring defect, it should be reported to the AIA or Senior REME Officer of the formation on AF G 3660. Prepare in duplicate, keeping one copy. Enter as much detail as possible.

AB 108 — **Temporary Receipt**

To be used in all cases where a permanent receipt on a voucher cannot be given.

AF G 1090 — **Certificate of Inspection of Mobilisation Equipment**

In peacetime, where Unit Mob Stores are maintained, this form, which is hung on the wall of the store, should be signed by the Armourer each time he concludes an inspection.

AF G 1045 — **Workshop Indent**

When a unit requires work to be carried out in a REME Workshop it will submit on AF G 1045. The BAOR routine in this case, lays down that the unit will submit one copy only. When work is sent for, unit will take it to Workshops, who will prepare an AB 108 in triplicate, giving one signed copy to unit as a receipt, one copy is sent to Progress with AF G 1045 and the other copy remains with Workshops R and I. The system at present in use in UK, is that a further three copies of AF G 1045 are taken with job. These are treated in the same way as ABs 108 in the BAOR system.

AF G 1043 — **Condemnation Certificate**

When an equipment, sent to Workshops for repair, is beyond the facilities of the Workshops, an AF G 1043 will be prepared. One copy of this will be sent to the unit, which notifies them of condemnation, and also acts as authority for their demand for replacement. A copy is sent to COO to support eventual backloading of stores from Workshops and the third copy is retained.

AF G 1033 — **Issue and Receipt Voucher**

This form is always used when issuing stores. On receipt of stores a copy is retained by consignee as a Receipt Voucher to support an entry in his Ledger. Another copy is signed and returned to consignor as Receipt of Stores. The consignor, who prepared the original also retains a copy, but it is the receipted copy returned from the consignee which is his authority to amend the Ledger.
In the event of a unit receiving a Condemnation Certificate (AF G 1043) they will voucher the condemned stores to the Workshops concerned on AF G 1033.

AF G 1045A — **Workshop Extract** (See AF W 5200 — Route label)

When the main bay handling a job in REME Workshops, requires services to be carried out by blacksmiths, welders or other ancilliaries, an AF G 1045A will accompany the job. This form should be prepared in duplicate, one copy for retention and one for the ancilliary shop carrying out the work.

AF G 1028 — **Packing Note**

Stores not being vouchered, or where the voucher does not accompany stores, should be accompanied by a packing note. This should be prepared in duplicate and signed by a packer and a witness. Duplicate copy of AF G 1028 can act as a temporary receipt.

AF G 1018 — **Sealing Label**

Used for sealing the exterior of cases, etc., for transport.

AF G 985 — **Discrepancy Report**

Any discrepancy between stores received and the quantities quoted on the voucher should immediately be reported to the issuing store on AF G 985. Prepared in quadruplicate; send three copies to sender of stores.

AF G 982E — **Indent for Ordnance Stores**

The complete demand totals five forms. Form No. 5 is retained and remainder forwarded to issuing store. When stores are dispatched to unit they will be accompanied by Forms No. 3 and 4. No. 4 becomes the Unit's receipt voucher, with which they support their ledger entry while Form No. 3 is signed as a receipt for stores and returned to issuing store.

AF G 890 — **Expense Indent and Voucher**

This form is usually prepared and submitted by Workshop Progress Office, but, depending upon local rulings, the Armourers' Shop may have to submit on its own behalf. It is a demand on Workshops Expense Store and is prepared in quadruplicate. Three copies are passed to Expense Store. Expense Store retain original; pass duplicate duly amended, to Progress Office and obtain temporary receipt for stores on triplicate copy.

AF G 838 — **Charge for Loss or Damage**

In the event of a charge being preferred against an individual for loss or damage REME Workshops will assess the amount of damage, etc., and notify unit on AF G 838.

AF W 5200 — **Route label**
AF W 5200-1 — **Route label (Urgent)**

} Submitted with job to ancilliary W/shop.

AF G 1084 — **Workshop Repair Card**

This card, containing all necessary detail, is passed by Progress to Workshop or Bay when job is received in shops. The shop or bay foreman will enter thereon all appropriate data relating to the job, material used, date commenced, etc. On completion of job, this card, suitably endorsed, will be sent to PFW.

AF G 807-1 — **Workshop Time Card**

This card is compiled by the Shop or Bay Foreman and submitted to Progress each day. It will contain a complete record of all accountable time of personnel in Shop or Bay.

AF G 867-1 — **Certificate of Examination**

AF G 867-2 — **Calling-in Notice**

Normally prepared by Progress, and sent to unit as notification that Workshop is ready to accept work designated on AF G 1045.

AF G 867-3 — **Notification to Collect**

Progress will prepare in duplicate, passing duplicate to R and I and send original to unit. This notifies unit that work is completed and ready for collection.

AF C 351 — **AIA Examination Report**

This form is used by AIsA, to report result of annual examinations. It will be submitted in triplicate to the DDME or other senior REME Officer.

AF P 1922 — **Local Purchase Order**

Used when spare parts have to be purchased locally or when work is required to be carried out by a local contractor.

AF G 860 — **Civilian Contractor Tender**

When stores or work are required from local sources a tender is usually asked for from civilian contractors before AF P 1922 is submitted.

AF G 875a — **Report on Examination of OML**

Submitted to CREME/ADME in triplicate, who will forward 2 copies to Central Inspectorate.

C.I. will then confirm or re-sentence equipment, sending duplicate copy back to CREME/ADME, for information of unit.

AB F 202 — **Machine Gun Barrel Test Diagram**

A form on which will be shown the diagram of shots obtained when a test is carried out as laid down in SAT Vol I, Pamphlet 1.

4. STRUCTURE OF EMERs

EMER General A003, Page 1, Para 1, states:—

> Electrical and Mechanical Engineering Regulations (EMERs) will, as issued, govern the activities of the Corps of Royal Electrical and Mechanical Engineers and all work directed by the Director of Mechanical Engineering at the War Office. They will as soon as possible supercede all existing regulations.

Therefore, although at the moment, it is necessary to be aware of and in touch with ACIs, Lists of Changes and other regulations affecting Armourer's work; the structure of EMERs and how to read them must be fully understood.

The whole of EMERs is divided into parts, each part dealing with a definite subject, e.g. GENERAL, or a definite type of equipment, e.g. SMALL ARMS and MACHINE GUNS. When referring to an EMER the Part will always be stated first.

Next, each part is sub-divided into sections, each section being given a letter. In Small Arms and Machine Guns each different equipment has a separate section, e.g. Rifles of all types are Section C, thus an EMER dealing with rifles will begin—EMER Small Arms and Machine Guns, C.

Next, each section will be composed of several different instructions, each given a number. It is the last digit of this number which is important as it signifies the type of modification or regulation. The following list illustrates this:—

Figures ending in 0 deal with Data Summaries
" " " 1 " " Operators Instructions
" " " 2 " " General Description
" " " 3 " " First Echelon Work
" " " 4 " " Second to Fourth Echelon Work
" " " 5 " " Parts Lists
" " " 6 " " Echelon Repair Schedules
" " " 7 " " Modification Instructions
" " " 8 " " (Spare)
" " " 9 " " Miscellaneous Instructions

Each block of numbers will have its pages numbered in rotation and in referring to an instruction, its page numbers should be quoted (except where number ends with 7). Thus EMER Small Arms and Machine Guns, C503, p3, will deal with a regulation on Rifles concerning first echelon work. Where the number ends in 7, the regulation will deal with a definite modification each of which is given a Modification Instruction number. A reference to one of these then, may read, EMER Small Arms and Machine Guns, C507, Mod Inst No. 2.

When an EMER is amended, a completely new regulation is published and designated Issue 2 or Issue 3, etc. This should also be stated when referring to an EMER.

21 Army Group or Rhine Army Local EMERs will also be met with. The structure and method of reading these is similar to that for War Office EME Regulations.

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METHOD OF DEALING WITH WEAPONS SENTENCED "B.L.R." "N.F.W."

All Weapons sentenced "B.L.R." "N.F.W." and forwarded to Workshops will be accompanied by a Certificate signed by the Commanding Officer that action has been taken in accordance with the instructions contained in K.R.'s 1940, Paras 764-770.*

* These paras refer to the Procedure etc. of Courts of Inquiry.

CERTIFICATE

This is to certify that K.R.'s 1940 Paras 764-770 have been complied with in respect of:—

A.F. G.1045 for repair attached.

Station .....

Date .....

Lieut.-Colonel,
Commanding 6 Bn. Royal Scots Fusiliers.

V.A.O.S. SECTIONS

ARMAMENT AND SMALL ARMS

SMALL ARMS

B. 1. Small Arms and their components:— (including)
Pistols Revolver
Pistols Signal
Projector, Infantry, Anti-tank
Projectors Grenade No. 5 Rifle
Rifles

B. 2. Small Arms Accessories, Tools and Packages.

B. 3. Carbines and Pistols, Automatic, with Components.

C. 1. Machine Guns, Mountings, and appurtenances for ground service use:— (including)
Equipment Bren
Gun, Machine Bren
Gun, Machine Browning
Gun, Machine Vickers
Gun, Machine Hispano
Gun, Machine Oerlikon
Gun, Machine Polsten
Mountings, Tripod Vickers
Mountings, Universal
Mountings, 20-mm. H.B.
Mountings, Tripod Bren

C. 2. Machine Guns and their appurtenances for use in Armoured Fighting Vehicles:— (including)
Dischargers Smoke Generators
Guns, Machine, Besa 7.92 mm

C. 3. Bicycles

Armament

M. 1. Miscellaneous Weapons:— (including)
Bomb-Thrower 2-in.
Flame-thrower, wheeled
Mortar Spigot 29-mm
Ordnance ML 2-in. Mortar
Ordnance ML 3-in. Mortar
Ordnance SB 3-in. Gun

Armament (contd.)

Ordnance SB 4.2-in. Mortar
Projector 2½ in.
Projector, Chemical

M. 4. Gauges etc. for Mortars.

N. 3. Artillery Equipments:— (including)
Ordnance QF 6-Pr. 7-cwt
Ordnance QF 2-Pr.

L.V. 4 T.G. Ordnance, Mountings and Appurtenances.

M.G. MG, Mountings and their appurtenances for use in mechanical vehicles.

Instruments

V. 5. Fire Control Instruments and Associated Stores for Field Artillery:— (including)
Clinometer Field
„ Sight
„ Mortar
Periscope No. 14. A.
Rangefinders No. 2 and No. 12, Mk. 7
Sights Dial No. 7 (all Mks obsolescent)
„ „ No. 9
Telescope, Scout Regt.
„ Sighting No. 22D or 22C
„ Sighting No. 32
„ Sighting No. 41 and No. 51.

General

F. Tools and Workshop Equipment
G. 1. Ironmongery
G. 2. Metals
H. 1. Oil, Paint and Chemicals
H. 2. Cordage and Textile Materials
H. 4. Packages (including cases, Wood, packing etc.)
7. Signal Stores
Z. 2. Batteries, etc.

Ammunition

Q. 1. SA and MG Ammunition (Ball)
Q. 2. SA and MG Ammunition (Blank)

INSTRUCTIONS FOR DEALING WITH, AND REPORTING ON, ACCIDENTS WITH AMMUNITION AND EXPLOSIVNS.

ACTION BY OC UNIT

1. **All accidents, except those occurring in Bomb Disposal units**

The OC Unit will take action as detailed below, in the event of any accident occurring within his unit, or in the event of any accident being brought to his notice as a matter of general service or public interest.

He will enquire into the circumstances attending the accident with a view of ascertaining whether or not it has been due to faulty or defective ammunition or weapons: in cases of doubt he should refer by telephone to the RAOC or REME technical personnel at local or Command HQ.

He will then report the incident by telegram, including a statement as to whether or not the ammunition is presumed to be at fault, to:—

(a) GOC of the Command, and

(b) DDOS at Command HQ, or
DDOS Corps, in the case of Field Force Units.

2. **Preliminary Investigation**

On receipt of a telegram from an OC Unit, reporting an accident under para 1, concerning which **the ammunition is presumed to be at fault,** the DDOS will:—

(a) Cause an immediate investigation to be made by an ICO, who will submit a detailed report on the defect as soon as possible to the CILSA (Chief Inspector of Land Service Ammunition RAOC) through the DDOS.

(b) Direct the OC Unit to complete the requisite number of copies of the appropriate form. The IOO will assist in this task if requested to do so by the CO Unit.

If, as the result of his investigations, the IOC forms the opinion that, contrary to the statement of the OC Unit, the ammunition has not been at fault, he will record his opinion, giving reasons, in his report to the CILSA.

On receipt of a telegram from an OC Unit, reporting an accident concerning which **the weapon is presumed to be at fault, or has been damaged,** the DDOS will inform the DDMN who will arrange for a special examination of the weapon concerned to be carried out by an EME or an AIA and direct the EME or AIA to attend the subsequent Court of Enquiry. A copy of the EME or AIA's report should be forwarded to the DDOS for onward transmission to the CILSA.

If, as the result of the examination carried out by the EME or AIA the weapon is, contrary to the statement of the OC Unit, considered not at fault, the DDME may advise the DDOS to adopt the procedure in relation to the Court of Enquiry as given in the paragraphs under Section 4, Courts of Enquiry.

3. Reports by Command HQ

When a report of a major accident is received by the DDOS he will in addition to following the procedure, outlined below, telephone available details to the DDOS (Amn) (War Office) and CILSA, Bramley, as quickly as possible.

All accidents except those occurring in a Bomb Disposal Unit will be reported by the DDOS by telegram, to the appropriate authorities listed in the following paragraphs, except that DG of A and DCIA/A (Director General of Artillery and Deputy Chief Inspector of Armaments, Ammunition) will not be informed of accidents concerning which it has been established that neither the ammunition nor the weapon is at fault. The telegram will be despatched as early as possible, preferably on the same day as the telegram is received from the OC Unit, or, when an IOO has been detailed to carry out a preliminary investigation, immediately on receipt of the IOO's report.

Authorities to whom telegraphic reports of accidents are to be sent, in accordance with the foregoing paragraph are:—

(a) DDOS (Amn), The War Office.

(b) CILSA c/o RAOC, Bramley, Near Basingstoke, Hants.

(c) DME, The War Office (when weapons are involved).

(d) DG of A Ministry of Supply.

(e) DCIA/A Woolwich Arsenal (telegraphic address, AMMCIA WOL LONDON).

The telegram referred to in the two previous paragraphs will give the following information:—

(a) Name of Unit, date of accident, and a brief description of the accident.

(b) Nature of the equipment and/or ammunition.

(c) Date and place of the Court of Enquiry.

(d) Advice whether or not an IOO has been detailed to attend the Court of Enquiry.

(e) Advice whether or not higher technical representation than is available in Command, is necessary as the Court of Enquiry.

NOTE:— The CILSA will be responsible for notifying this information to the appropriate General Staff Directorates of the War Office.

4. Courts of Enquiry

The responsibility for convening Courts of Enquiry to investigate the circumstances in which accidents have occurred with ammunition or explosives will rest with:—

(a) The Commandant or COO in the case of War Office installations.

(b) The Commandant in the case of practice camps.

(c) The Brigade Commander in the case of any unit within a brigade.

(d) The District Commander in respect of any unit within a District.

(e) The OC Unit in all other cases.

When the DDOS is satisfied that neither the ammunition nor the weapon involved in an accident are at fault, he may authorise the Brigade Commander, or the District Commander, in the case of a unit within a brigade or district, to order the unit to convene its own Court of Enquiry.

When it has been established that neither the ammunition nor the weapon involved in an accident are at fault, the responsible officer indicated in para 1 may arrange the date of assembly of the Court of Enquiry without consulting the DDOS, but must first immediately inform him of the date decided.

The constitution of the Court will normally be of officers selected from units other than the one involved in the accident. Should this not be possible, not more than one officer from the unit involved may sit as a member of the Court and this officer will not act as president.

When it has been established, however, that neither the ammunition nor the weapon is at fault, the provisions of the above paragraph may be waived and the Court constituted in the normal manner.

This Précis is an extract from Regulations for Army Ordnance Services, Part 7, Pamphlet No. 5, dated 8 Nov 46 as amended by Amendment No. 1, dated 1 Apr 47.

GUNS MACHINE CAL. .30 BROWNING M1919 A4 (FIXED & FLEX) and M1919 A5

1. General Information

Weight of Gun	31 lbs A4.Flex & A5. 30 lbs A4Fixed.
Weight of Barrel	7 lbs 6 ozs.
Overall length	41 ins. A4.Flex & A5. 38 ins. A4Fixed.
Calibre	.30 ins. 4 grooves. Right hand. 1 turn in 10".
Rate of fire	400 to 550 rounds per minute.
Muzzle velocity	2700 ft. per sec.

The Browning M/c Gun Cal .30 M1919A4 and 1919A5 is a recoil operated, gas assisted, belt fed gun. A woven fabric belt of 50, 100, or 150 rounds is normally used but a metallic link, disintegrating belt is also supplied. The cooling is by air assisted by a perforated barrel jacket and the gun is capable of firing 60 rds. per minute for 30 mins. before becoming too hot.

Flexible guns are fitted with pistol grips. The M1919A5 model is a fixed gun and is fitted with a retracting slide for the cocking handle. This gun was designed for use in A.F.Vs having very restricted space.

The terms fixed and flexible refer to guns which are designed for use in, or on mountings of that nature.

2. Feeding

This gun can be fed only from the left.

3. Loading

(a) Ensure that the Rod Spring Driving is released from the Bolt and is positioned against the Back Plate.

(b) With the Cover closed, insert the first round in the feed opening until the cartridge is engaged by the Pawl Check Feed. (N.B.) if using metallic links, insert the double loop and the first round into the feed opening.

(c) With the Cocking Handle pull the Breech Block to the rear as far as possible, then allow it to go right forward under control. This positions the first round against the Cartridge Stops.

(d) Repeat paragraph (c). This action withdraws the first round from the belt, loads it into the chamber and positions the second round against the Cartridge Stops. The gun is now ready to fire.

4. Unloading

(a) Lift the Cover remove the belt, withdraw Breech Block. Ascertain that no rounds are present in the Feedway, "T" slot or chamber.

(b) Release Breech Block and lower Cover.

(c) Press Trigger to relieve tension on Firing Pin Spring.

5. Ammunition

The types of ammunition used in these guns can be identified by markings on the tips of the bullets as follows:—

A.P.	Black tip.
Tracer.	Red tip.
Ball.	Green tip.

STRIPPING

1. Precaution

(a) Pull back Cover Latch, raise Cover.

(b) Remove Belt (if in gun).

(c) Pull back Breech Block.

(d) Inspect gun to see that there is no ammunition in it.

2. Main Assemblies

(i) **Back Plate**

(a) Pull Latch to rear and raise Cover.

(b) Pull back Cocking Handle and hold in rearmost position.

(c) Push in Driving Spring Rod as far as it will go and turn clockwise, until screwdriver slot in rod is vertical. This retains the rod and compressed Driving Spring in Breech Block.

(d) With Extractor held downward, push Cocking Handle forward until rear end of rod is clear of Backplate.

(e) Push Latch forward and lift out Backplate.

(ii) **Breech Block**

(a) Pull Cocking Handle right back and remove it by pulling out to the right.

(b) Slide Breech Block to the rear and so out of the casing.

NOTE:— Do not disturb the Driving Spring Rod as this may cause serious injury if allowed to fly out under the influence of the compressed Driving Spring.

(iii) **Lock Frame, Barrel Extension and Barrel**

(a) Press in head of Trigger Pin through hole in right side of Body. This pin is sprung and therefore acts as a retaining plunger for the Lock Frame.

(b) Pull Lock Frame, Barrel Extension and Barrel to the rear and out of the Casing, by means of the finger grip of the Trigger.

(c) To separate Lock Frame from Barrel Extension and Barrel, grasp Barrel with left hand and Lock Frame with right and push forward the tips of the accelerators with the thumb.

(iv) **Latch**

(a) The Latch will pull straight off the rear of the gun, with slight resistance only from the Latch Spring.

(v) **Cover**

(a) Removes plit pin from Bolt Axis Cover.

(b) Remove nut from Bolt.

(c) Remove Bolt Axis Cover, Spring Plate Stop Cover, and Fixed and Movable Plates Stop Cover.

(d) Lift out Cover.

3. Stripping Main Assemblies

(i) **Black Plate Assembly**

(a) Unscrew Screws Adjusting Buffer from Buffer Tube and remove Plunger Adjusting Screw and Spring.

(b) Invert Buffer Tube and shake out Buffer Discs and Plate Buffer.

NOTE:— In some patterns of Fixed Back Plate the Buffer Tube is almost vertical. In this type the Buffer Plate is in two sections.

(ii) **Breech Block Assembly**

(a) Remove Extractor Assembly by turning upright and removing to the left. To strip this assembly drive out first the Ejector Pin and then the Plunger Extractor Cam Pin. The same Spring operates these two components and can now be removed.

(b) With Breech Block firmly grasped in right hand press down on Driving Spring Rod, on table or piece of hard wood, until Driving Spring Rod is slightly depressed. Turn Breech Block a quarter turn to the left until lugs on Driving Spring Rod leave their recesses in the Breech Block. Slowly release pressure on the Breech Block allowing it to rise under pressure from the spring. When sufficient of the rod protrudes grasp rod and spring with left hand. Raise both hands together keeping rod and spring compressed in block. Now separate rod and spring from Breech Block with a quick jerk, thus ensuring that spring is not allowed to buckle.

(c) Turn the top of Cocking Lever to the rear and push out Cocking Lever Pin to the left.

(d) Lift out Cocking Lever.

(e) Release Firing Pin by pushing down on Sear. Hold Breech Block in left hand, front end towards the body, top side up. Place finger under Sear. Push the Sear Spring down and to the right so that it engages in the slot in the Breech Block. This releases the Sear which will now drop out to the underside of the Breech Block.

(f) Turn Sear Spring back into its former position. With a punch applied in the hole on the underside of the Breech Block push out Sear Spring Pin.

(g) Place the palm of the right hand over the rear of the Breech Block and allow Firing Pin to drop out.

(h) The Firing Pin Spring should not normally be removed, but should this become necessary, drive out pin and allow spring to come out taking care that it does spring out too sharply.

(iii) **Lock Frame Assembly**

(a) Grasp head of Trigger Pin with pliers and lift out to the right. Remove Trigger. Do not remove Trigger Pin Spring unless to replace.

(b) Push out Accelerator Pin and remove Accelerator.

(c) Stand Lock Frame on table, depressors upwards. Press down on Barrel Plunger and release plunger guide pin from slot in Lock Frame. Allow Plunger and Spring to rise slowly, and remove.

(iv) **Barrel Extension Assembly**

(a) Pull out Barrel Locking Spring to the front.

(b) Unscrew Barrel.

(c) Push out Pin Locking Piece and remove Locking Piece.

(v) **Cover Assembly**

(a) Remove Screw from top of Belt Feed Lever Pivet Pin and take out Pivot Pin.

(b) Remove Belt Feed Lever from Feed Slide and allow slide to slip out from its grooves in the Cover.

(c) To strip Feed Slide, push out Pin Axis Feed Pawl keeping thumb over pawl. Remove Feed Pawl and Spring Feed Pawl.

(d) Insert screwdriver between Cover Extractor Spring and slot in Cover Extractor Cam and maintaining control over spring, lever out of engagement with cam and remove spring from Cover.

(vi) **Casing and Barrel Jacket Assembly**

(a) Remove Pawl Check Feed by holding down Pawl and withdrawing the split pin to the rear. Remove Pawl and Spring.

(b) Remove Cam Locking Screw from bottom of Casing and remove Cam Locking Piece.

(c) With special tool remove Front Barrel Bearing. (N.B.) On earlier types of guns the Barrel Bearing and Bearing Plug were two components. In this case unscrew Plug first, remove Locking Ring and with the same tool unscrew Barrel Bearing.

(d) The Barrel Jacket is sweated to the Casing Trunnion Block and should only be removed in case of replacement.

Remove set screw and unsweat and screw off the Barrel Jacket. Mark a line on Trunnion Block to indicate position of hole, which is located .25" measured from the rear bearing surface of the casing.

Screw on new Casing making sure that end is bearing squarely all round Trunnion Block and mark off position of set screw hole.

Remove Casing and drill the hole for set screw. Then sweatsolder rear end threads and assemble to the Casing.

Replace set screw and centre punch it into position.

(vii) **Backsight Assembly**

(a) This applies to A4 guns only. A5 guns are not fitted with sights.

(b) Remove the Backsight Windage Milled Head Pin.

(c) Slide off Milled Head complete with Spring and Plunger.

(d) Unscrew the Windage Screw from Leaf. Lift out Leaf complete.

(e) Slide out Base Spring to the rear.

(f) Strip the Sight Assembly as follows:—

Drive out Pin Retainer Elevating Screw.

Puch up on Elevating Screw until Slide is at the top of the Leaf, then unscrew elevating screw complete with Knob and Pin. Take care not to lose the Plunger Click Rear Sight and Spring from underneath knob of Elevating Screw.

Remove Slide by pushing through Leaf.

(viii) **Foresight Assembly**

(a) To remove complete sight, unscrew larger of the two screws on Sight Bracket and pull off sight to front.

(b) Remove Locking Screw.

(c) Undo Screw Clamping Blade about 4 turns and slide out Blade.

(d) Remove Screw Retaining Foresight which is at the bottom of the sight bracket.

(e) Remove Spring Plunger Retaining Foresight Screw and Plunger.

(f) Undo Screw Post Foresight and remove Post.

ASSEMBLING

1. **Assembling main assemblies**

(i) **Foresight Assembly**

(a) Hold Foresight Bracket upright. Place Post Foresight in slot and insert Post Foresight Screw ensuring that counterbore in Clamping Screw hole is to the front.

(b) Insert Plunger, rounded nose up into hole at bottom and follow up with Spring.

(c) Replace Retaining Screw and tighten up.

(d) Replace Blade Foresight and tighten up Clamping Screw.

(e) Replace Foresight on Gun and insert Screw. Locate position with Locking Screw and tighten up.

(ii) **Backsight Assembly**

(a) Replace Slide in Leaf, threaded hole to the right and Battlesight on top.

(b) Replace Spring and Plunger Click, Rear Sight.

(c) Insert Elevating Screw into top of Leaf. Screw down into Slide and push down to locate in small hole in the bottom of Leaf.

(d) Replace Pin, Retaining Backsight Elevating Screw.

(e) Slide the Backsight Leaf Spring into Backsight Bed.

(f) Replace Leaf in Backsight Bed graduations toward the rear of the gun, and insert Windage Screw from left and screw home.

(g) Replace Milled Head with plunger and spring, and secure with pin.

NOTE:— Sights should not normally be removed unless for replacement of parts.

(iii) **Casing and Barrel Jacket Assembly**

(a) Replace Front Barrel Bearing and Locking Band.

(b) With sloping surface to rear replace Locking Piece inside Casing. Insert Screw, tighten up and secure Screw with centre punch.

(c) Place Spring Pawl Check Feed in its recess in left of feedway, and replace Pawl Check Feed. Hold down on Pawl and insert split pin.

(iv) **Cover Assembly**

(a) Place forked end of Cover Extractor Spring under stud on cover. Press down on the other end of the spring and engage projection under notch in Cover Extractor Cam.

(b) Reassemble Feed Slide and insert slide in Cover taking care that the Pawl Feed is pointing to the right as Cover goes on the gun.

(c) Place front end of Feed Lever in slot in Cover so that it engages with Feed Slide and hole in Feed Lever is in line with hole in cover.

(d) Replace Feed Lever Pivot and secure with Securing Screw.

(v) **Barrel Extension Assembly**

(a) Place Locking Piece in its slot, taking care that the double bevelled edge is upwards and to the front. Insert Locking Piece Pin and ensure that both ends of pin are flush with the sides of the Barrel Extension.

(b) Insert Barrel and screw in until face of breech is just flush with inside face of Barrel Extension.

(c) Insert Barrel Locking Spring in its seating in left side of Barrel Extension with the hook inwards, and press home.

(d) Place unassembled Breech Block in slots in Barrel Extension press forward and raise Locking Piece into locked position. Screw Barrel in until tight on Breech Block. Unscrew Barrel two notches or two clicks and see if Locking Piece is free. This is a provisional Cartridge Head Space Adjustment.

(vi) **Lock Frame Assembly**

(a) Reassemble Barrel Plunger and Spring to Lock Frame in reverse order as for stripping ensuring that the smaller end of spring is under head of Barrel Plunger.

(b) Hold Lock Frame with Accelerator Pin holes at the bottom and insert Accelerator with claws forward and rounded portion down. Insert Accelerator Pin ensuring that ends of pin are flush with sides of Lock Frame.

(c) Insert Trigger upwards between the Separator and Spacer placing the centre on its square seating. Replace Trigger Pin from right ensuring that Trigger Pin Spring is in its recess.

(vii) **Breech Block Assembly**

(a) Place Firing Pin in Breech Block striker portion downwards and do the front. If Firing Pin Spring has been removed, replace in reverse order, before assembling Firing Pin to Breech Block.

(b) Tilt Breech Block forward until Striker protrudes though front face and assemble Sear Spring and Pin. When Sear Spring Pin is right home press down on end of Sear Spring and engage it in slot in Breech Block.

(c) Insert Sear from bottom of Breech Block notched projection to the front. Holding the Sear well up release Sear Spring from the recess in Breech Block so that it engages with the Sear.

(d) Replace Cocking Lever ensuring that the rounded portion on the lower end is to the rear so that it will properly engage with the recess in the Firing Pin. Insert Cocking Lever Pin from the right of the Breech Block. Push tail of Cocking Lever forward until Firing Pin cocks on the Sear.

(e) Hold Driving Spring Rod with Spring assembled on bench with left hand so that the loose portion of the spring is upwards. It is best to have the bottum of the left hand as near to the top of the rod as possible thus supporting some of the loose spring.

Take Breech Block in right hand and place the driving spring hole over the loose end of the spring. Press down with BOTH hands until Driving Spring Rod is inside Breech Block ensuring that spring does not buckle.

Release left hand and continue downward pressure until lugs on rod enter slot in Breech Block. Now turn Breech Block a quarter turn clockwise so that lugs lock in block. Raise Breech Block slowly to see if rod is properly engaged. Screwdriver slot in rod should be vertical.

(f) If Extractor Assembly has been stripped reassemble in reverse order. Place Extractor Assembly into Breech Block with arm vertical; when pivot is right home turn Extractor assembly down.

(viii) **Plate Back Assembly**

(a) Insert Plate Buffer into rear of Buffer Tube small end to the front and push right forward.

(b) Replace Buffer Discs ensuring that there are 22 in all for normal sized Buffer Tubes. In some fixed Back Plates the Buffer Tube is shortened and only 8 discs will be found.

(c) Screw in Adjusting Screw with Plunger and Spring assembled, until tight, then unscrew until plunger is heard to engage with one of the recesses on the Adjusting Screw.

2. **Replacing assemblies in gun**

(i) **Lock Frame, Barrel Extension and Barrel**

(a) Assemble Lock Frame to Barrel Extension by inserting the Locking Piece Depressors into the side grooves in the Barrel Extension and at the same time turning the accelerator upward to engage around the "T" head of the Barrel Extension Shank. Push the Lock Frame sharply home on the Barrel Extension and push down tips of the Accelerator so that the Lock Frame and Barrel Extension are locked together and the Barrel Plunger Spring is compressed.

(b) Slide the complete assembly into the casing pressing in on the Trigger Pin, until head of pin is inside casing and engages with the hole in the right wall.

(ii) **Cover Catch**

(a) Push Cover Latch on to Casing in the reverse direction from stripping. With fingers press upwards on Cover Latch Spring so as to ensure that spring does not try and engage UNDER top plate of casing.

(iii) **Breech Block**

(a) Press Cocking Lever forward and insert Breech Block into casing, pushing down on rear end so as to prevent Ejector from releasing Accelerator.

(b) Insert Cocking Handle into Breech Block through right side of casing and push forward about 1", being sure that the collar on the handle is INSIDE the right wall of casing.

(iv) **Plate Back**

(a) Press forward on Cover Latch and slide Plate Back into grooves in casing.

(b) Release Cover Latch.

NOTE:—The gun is now fully assembled, but the Driving Spring is still locked in Breech Block and the Breech Block is not fully forward.

To release Driving Spring, pull Cocking Handle back until the Driving Spring Rod protrudes through Plate Back. With a screwdriver turn rod a quarter anti-clockwise until rod is released from Breech Block, and allow Breech Block to go fully forward.

Press the Trigger.

ACTION OF MECHANISM

NOTE:—The gun is loaded and cocked. One round is in the chamber, the breech is locked, the belt is in position and the claw on the extractor arm is ready to withdraw the next round from the belt.

1. **Backward action**

(a) On lifting the trigger, it rotates on the trigger pin, and the cams at the front end of the trigger being already engaged in the slot in the sear forces down the sear, disengaging the bent of the sear from the bent of the firing pin, compressing the sear spring. The firing pin spring which is under compression, now asserts itself forcing forward the firing pin against the cap of the cartridge, and the round fires.

(b) The bullet leaves the barrel and the recoil thrusting the cartridge case against the breech block drives back the breech block which being locked to the barrel extension, also takes with it the barrel extension and barrel (assisted by the gas striking the barrel plug and rebounding onto

the muzzle of the barrel). The barrel, the barrel extension, and the breech block are driven to the rear a distance of approximately 5/8ths inches when the barrel and barrel extension are stopped by the front face of the lock frame, this component being supported by the backplate.

(c) During the first 5/16ths inches of this movement, the following actions take place:—

(i) As the breech block commences to move back, the sear (under the influence of the compressed sear spring) rides up the inclined faces of the cams on the trigger forcing the platform of the sear bent against the bent of the firing pin.

(ii) The cocking lever, riding against the rear face of the top plate bracket, is rotated forward, the lower end of the cocking lever being engaged in the slot of the firing pin, thus commencing to withdraw the firing pin (which now rides along the platform of the sear bent) compressing the firing pin spring.

(iii) The locking piece pin, riding against the inclined faces of the depressors on the lock frame is forced downwards as soon as the locking piece is clear of the cam locking face, so forcing it down the ramp of the cam, out of engagement with the breech block. This action represents the mechanical safety.

(d) The stud barrel plunger, on the shank of the barrel extension being engaged in the groove in the head of the plunger barrel forces back the plunger barrel compressing the spring plunger barrel.

(e) During this movement the two horns of the accelerator (which are engaged under the shank of the barrel extension) riding up the rear face of the barrel extension, are thrust upwards and backwards, and being forced against the rear step of the breech block, throw it further to the rear. The plunger barrel assembly being held in the compressed position by the lugs on the horns of the accelerator which are now locked against the shoulders of the barrel extension shank.

(f) As the breech block moves further to the rear the cocking lever completes its full rotation and the firing pin spring is fully compressed. As soon as the bent of the firing pin is past the bent of the sear, the sear spring fully reasserts itself forcing up the rear to enable the bent of the sear to engage into the bent of the firing pin on the forward movement, the cocking lever holding the firing pin in the over cocked position.

(g) The breech block travels still farther to the rear completing the compression of the driving spring until arrested by the buffer in the backplate. (The breech block striking the buffer plate which in turn compresses the fibre discs, or spring).

(h) In addition to the actions already described the following movements take place during the backward movement of the breech block:—

(i) The empty case being engaged in the extractor lips of the "T" slot in the front of the breech-block face is withdrawn from the chamber.

(ii) The claw of the extractor arm being forced down by the spring cover extractor, engages in the rim of the first round in the belt, and withdraws round from belt. The plunger extractor cam rides over the extractor cam, along the ledge between the extractor cam and the extractor feed cam, and onto the lower step of the extractor feed cam, riding along the step until the ramp o nthe extractor feed cam depresses the plunger, compressing the plunger extractor cam spring. The extractor arm is now forced down by the cam cover extractor, and when the plunger extractor cam is clear of the extractor feed cam, the plunger extractor cam spring, reasserts itself forcing the plunger outwards behind the inclined edge at the rear of the extractor feed cam.

(iii) The stud on the feed lever riding in the diagonal groove in the top of the breech block moves from left to right, rotating the feed lever on its axis, and since the front end of the feed lever is engaged in the feed slide, the feed slide must move from right to left. The feed pawl riding over the second round is lifted compressing the feed pawl spring, the spring reasserting itself forces down the feed pawl, to enable it to come into engagement behind the round.

2. Forward action

(a) The driving spring reasserts itself and forces the breech forward, after approximately 3¼ inches of travel the rear step of the breech block engages the tip of the horns of the accelerator forcing the accelerator forward, thus unlocking the lugs on the horns of the accelerator from the shoulders of the barrel extension shank.

(b) The spring barrel plunger now reasserts itself forcing forward the plunger barrel (which is engaged with the barrel extension), thus forcing forward the barrel extension and barrel, this operation receiving extra assistance from the accelerator as it sweeps down the face of the barrel extension.

(c) The breech block moves forward in the barrel extension until the round is fully in the chamber, the slot in the underside being now above the locking piece. At this point the locking piece rides up the ramp of the locking piece cam to engage in the slot in the breech block.

(d) At the same time the top end of the cocking lever rides up the forward face of the top plate bracket rotating the cocking lever, thus withdrawing the lower end of the cocking lever clear of the rear face of the slot in the firing pin. The bent of the firing pin moving forward and engaging against the bent of the sear.

The barrel extension and breech block are now locked and move forward together.

(e) In addition to the actions already described the following movements take place during the forward movement of the breech block:—

(i) The plunger extractor cam on the extractor arm is guided down the inclined edge at the rear of the extractor feed cam, thus forcing the round down the extractor "T" slot until it is in line with the chamber, the ejector on the extractor arm at the same time ejecting the empty case off the bottom of the breech block face and out of the gun. The breech block continues to move forward the extractor arm riding along the top of the barrel extension, until the plunger extractor cam riding up the extractor cam on the left side plate lifts the extractor arm forcing the ejector to leave the round (which by this time is well in the chamber), the ejector moving to the right as it does so compressing the ejector spring, which reasserts itself when the ejector is clear of the round. As the extractor arm rises it compresses the cover extractor spring. The plunger extractor cam passes over the top of the extractor cam, and the extractor arm moving forward riding over the rim of the newly positioned round is forced down onto it by the cover extractor spring.

The ejector is deflected to the right around the cartridge which has been positioned against the cartridge stops in the feedway by:—

(ii) The stud on the feed lever, riding in the diagonal groove on the top of the breech block, moves from right to left, rotating the feed lever on its axis, and since the other end of the feed lever is engaged in the feed slide, the feed slide must move across from left to right. The feed pawl being already engaged behind the next cartridge, pulls the belt across with it positioning the round against the cartridge stops. The second round as it rides over the pawl check feed forces the pawl down compressing its spring, the spring reasserting itself and forcing up the pawl so that it will engage behind the round, once it is past, and so prevent the belt from slipping back.

(iii) The actions detailed in the preceeding sub-paras show the complete action of feed as distinct from the firing action of the gun.

(f) The breech block and barrel extension move forward together until the sear (which is in engagement with the trigger) rides down the inclined faces of the cams on the trigger, compressing the sear spring and disengaging the bent of the sear from the bent of the firing pin. The firing pin spring forces the firing pin forward to fire the round and the same cycle continues every time a round is fired until the trigger is released or the belt is empty.

3. **When the trigger has been released**

Pressure being taken off the trigger enables the trigger to float on its axis and become in-operative.

4. **Failure to extract a round from belt**

Should the round positioned against the cartridge stops fail to be extracted from the belt, the arm on the feed pawl, as the slide moves across, rides on top of the positioned round, holding up the feed pawl and compressing the feed pawl spring. This stops the pawl from engaging behind the second round and so prevents a jam in the feedway on the forward movement of the breech block.

5. **Mechanical Safety (Additional)**

Should wear take place on the sear bent or on the bent of the firing pin, they will not engage during cocking action and the compressed firing pin spring will tend to carry the firing pin forward sharply and fire the round. This is prevented by the cocking lever which can only rotate with the movement of the breech block and therefore controls the forward movement of the firing pin.

TESTS, ADJUSTMENTS AND GAUGING

1. **Barrels:—**

Gauging:—With bore gauge test barrel from breech. If reading is .310" or more barrel is unserviceable. If bore gauge is not available visual and accuracy tests should be used and British gauges can be used to determine the amount of wear.

To determine whether chamber is over lenngth use 1.950" Headspace gauge. Insert gauge in chamber and note amount of protrusion. This should be .125" (1/8th inch). If it protrudes

LESS than .121" the barrel is unserviceable. The measurement is taken from the lips of the barrel to the face of the headspace gauge.

Visual:— Apart from normal visual examination of the bore, special attention should be paid to the notches at the breech end. Worn notches will allow barrel to turn and affect headspace adjustment.

2. **Headspace:—**

Remove barrel plunger and spring from lock frame. Lock driving spring into breech block. With headspace gauges test headspace. The following results should occur:—

With minimum or 1.940 gauge.	Action should close easily.
With middle or 1.946 gauge.	Action should close against. slight resistance.
With maximum or 1.950 gauge.	Action should not close.

If headspace gauges are not available adjust as follows:—

Open the cover. Pull recoiling portions to the rear and allow them to fly forward. Observe whether barrel extension and barrel have gone fully forward, by noting whether front end of barrel extension is against trunnion block. If this is so apply gradual pressure to cocking handle to see if breech block moves on barrel extension, if it does not then the headspace is correct.

If play exists then headspace is excessive. If barrel and barrel extension are not fully forward then headspace is insufficient.

In each case adjust by screwing up or unscrewing barrel in barrel extension one notch at a time, re-testing after each notch. To do this pull breech block to the rear exposing notches and insert punch or nose of dummy round in notch.

3. **Timing:—**

This test ensures that the action does not fire prematurely.

Pull back on cocking handle until gun cocks. Let forward slowly inserting .120" Timing gauge between front of barrel extension and trunnion block. When gauge is held in position, pull trigger. Gun should not fire.

If gun fires examine trigger which will probably be found to be set down at front end. Straighten it if necessary. This may be found to be insufficient adjustment in which case the nose of the trigger may be set upwards JUST SUFFICIENT TO PREVENT GUN FIRING.

Timing test is also carried out to ensure that gun DOES fire as action closes. This test is carried out as for previous timing test except that gauge used is .1232" thickness and with this held in position by barrel extension and trunnion block gun SHOULD fire. If gun does not fire set nose of trigger downwards until adjustment is effected.

Before carrying out the above tests the following points should be assured:—

(i) If trigger recess in backplate is cut to the old dimension of .29" above bottom plate, increase it to .35".

(ii) If lock frame spacer is 5/16ths diameter, it should have a trigger clearance recess on the underside. This clearance is in the form of a flat .05" deep, extending 7/32nds either side of centre of spacer.

4. **Position of feed slide:—**

With the gun closed and the recoiling portions forward exert pressure on left end of feed slide. Feed slide should protrude about 1/32nd to the right of the cover to ensure correct positioning of rounds in the feedway.

5. **Front barrel bearing plugs:—**

If the front barrel bearing plug is a separate component, it should be marked 0.718" DIA., on its front face. This means that the bullet exit hole is .718" in diameter.

If plugs with other markings (or no markings) are found the hole should be measured and if in excess of .718" diameter will be modified by fitting a mild steel insert with an inside measurement of .718". For full details of this modification refer to EMER (SA&MG) E.467 Mod. Inst. No. 1.

The history leading up to this change of barrel bearing plugs is briefly as follows:—

The original driving springs of .041" or .045" wire were found to have insufficient strength to lift the recoiling portions when the gun was being fired at high angles of elevation. A stronger driving spring was therefore introduced to overcome this. With the increased resistance from the driving spring however it was discovered that gas assistance was then insufficient to overcome it and so increased gas pressure was obtained by decreasing the bullet exit hole and thus trapping more gas.

For guns being used in the A.A. role therefore the stronger or .047" driving spring should be used. A gun fitted with a strong driving spring will always, in view of the above, have a .718" plug fitted with it.

6. **Springs Driving:—**

These should be of .045" or .047" diameter wire. Springs of .041" diameter may be met with. These should be replaced.

7. **Condemnation lengths for springs:—**

Minimum lengths:—

Spring Pin Firing	4 1/4"
Spring Driving .045" or .047"	16"
Spring Punger Barrel	3.75"

8. **Protrusion of plate buffer through backplate:—**

To ensure that sufficient buffering movement is possible on the plate buffer, the plate should protrude through the backplate 1/8th" inches.

9. **Firing Pin Protrusion:—** .060"—.068".

10. **Firing Pin Hole:**— With gauge No. A77203 check size of firing pin hole in breech block. The gauge is .081" in diameter and should be rejected.

11. **Cover Latch:—** A gap should exist between the back end of the Cover Latch engaging surface and the rear face of the Cover Plate. This gap should not be less than .003 (EMER. E464. d/30 July 1945).

12. **Pull-Off.** This should be between 9 and 12 lbs.

ARMOURERS' WING
Précis No. SA/13

Gun M/c. .30" Cal. Browning M1919A4 & M1919A5

Stoppages, Causes and Remedies

Position of cocking handle	*Stoppage*	*Possible Cause*	*Remedy*
Fully Forward	Failure to fire	Faulty round or missfire	Re-cock and carry on.
		Excessive friction	
		Weak driving spring.	Change defective components.
		Weak firing pin spring.	
		Faulty timing.	Check and Adjust.
Fully Forward	Failure to feed	Empty pocket in belt.	Pull belt to right, re-cock and carry on.
		Weak charge.	
		Weak or broken:—	
		Spring pawl feed	Exchange or repair faulty parts.
		„ „ check	
		„ cover extractor cam	
		Worn extractor	
		Broken feed lever	
		Hard extraction	Examine chamber.
In Semi-Recoil position	Obstruction in chamber.	Seperated case in chamber.	Clear empty or separated case.
	Failure to extract round from chamber.	Weak or broken barrel locking spring.	Check headspace.
		Hard extraction, extractor rips rim of cartridge and new round feeds against empty case.	Examine chamber, change barrel if necessary.

Gun M/c. .30" Calibre Browning M1919A4 & M1919A5

Regulations referring to the above

EMERs

EMER	SA & MG	E.463.	page 1.	Testing and adjusting.
			page 3.	Maintenance of extractor.
			page 4.	Fitting of correct type barrel bearings and driving springs.

ARMOURERS' WING
Précis No. SA/13

Gun M/c. .30" Calibre Browning M1919A4 & M1919A5
Regulations referring to the above

EMER	SA & MG	E.464.	page 1.	Fitting of cover and cover latch.

Gun M/c. .30" Calibre Browning M1919A4 & M1919A5

Regulations referring to the above

EMER SA & MG. E.467. Mod. Inst.
No. 1. Conversion of plugs front barrel bearing "M.1. & M.2." to "718"

ACIs

ACI.	1253.	1944.	Front barrel bearing plugs and springs driving.

21 A.G. and RHINE ARMY TECH. BULLETINS

(Not an authority. For guidance only)

AFV. Para. 4. Damage to rounds in belt. Removal of first six rounds.

SA & MG. Paras. 16 & 72. Correct components for M1919A4 and A5 guns.
„ 16 & 116. Fracture of cam exposure.
„ 72, 115, & 143. Excessive wear of barrel. Fracturing of locking piece cam.
„ 142. Further instructions to para 16 & 72.

GUN MACHINE CAL. .50 BROWNING M.2

(HEAVY BARREL)

1. General Information

Weight of gun	84 lbs.
Weight of barrel assembly	27—28 lbs.
Overall length of gun	5 ft. 5 ins.
Number of grooves in barrel	8 (right hand turn)
Rate of fire	400—500 rds. per min.

The Browning machine gun .50 Calibre M.2 Heavy Barrel, is a recoil operated, belt fed gun. The metallic link, disintegrating belt is used for all firing of the gun. Owing to the heavy barrel, and to prevent sluggish recoil, the oil is removed from the oil buffer assembly. It also has a Bolt Latch Mechanism to enable single shots to be fired.

2. Cooling

There is no cooling system for the gun, the barrel being quickly and easily changed when hot.

3. Feeding

(i) The gun may be fed either from the right or the left hand side. To change the feed from right to left hand side, the Rear Cartridge Stop, Right Hand Assembly must be removed. Change the Front Cartridge Stop from the right to the left hand bracket; and the Belt Holding Pawl and Spring from the left to the right hand bracket. Assemble the Link Stripper and the Rear Cartridge Stop (as provided) to the left hand bracket.

(ii) Remove Plunger and Spring Feed Lever and insert them in lower hole in Feed Lever.

(iii) Disengage the Belt Feed Pawl Arm from Belt Feed Pawl and reposition in the opposite side of the Pawl. Turn Spring Belt Feed Pawl round repositioning it in the elongated recess; insert the slide assembled into the cover with the Pawl to the right and replace Feed lever.

(iv) Remove Extractor Arm and change Switch Bolt from left to right.

4. Loading

(i) Lock down Release Bolt Latch.

(ii) (a) When feeding from left hand side:—
With Cover closed, insert the DOUBLE LOOP of the link and the first round into the feed opening until the cartridge is engaged by the Belt Holding Pawl.

(b) When feeding from the right hand side:—
With Cover closed, insert the SINGLE LOOP of the link and the first round into the feed opening until the cartridge is engaged by the Belt Holding Pawl.

(ii) Pull the Retracting Slide down and to the rear as far as possible, then allow the Retracting Slide to go forward under control. This positions the first round against the cartridge stops.

(iv) Repeat paragraph iii. This action withdraws the first round from the belt, loads it into chamber and positions the second round against the cartridge stops. The gun is now ready to fire.

5. Unloading

Lift the Cover and remove the belt. Retract the Bolt and examine to ascertain that no rounds are present in the feedway, "T"slot or Chamber. Release Bolt and lower the Cover,

Press the Tigger to relieve tension on the Firing Pin Spring.

STRIPPING

1. Precaution

(a) Raise Cover.

(b) Remove belt, if in gun.

(c) Ensure that there is no cartridge in feed way, "T"slot or chamber.

(d) If gun is equipped with Bolt Latch, press the Bolt Latch Release.

2. Removing main assemblies

(a) **Barrel assembly:—**

Unscrew barrel from barrel extension and remove.

(b) **Plate-back, Spade grip assembly:—**

(i) Release the back plate lock by pulling outwards.

(ii) Pull up on the back plate latch, while still keeping pressure on the lock.

(iii) Slide back plate up and out of gun.

(c) **Bolt assembly:—**

(i) Pull the driving spring assembly about $^{3}/_{8}$th inch to the left, which removes it from the positioning hole in the right side plate. The force of the driving spring will tend to move it to the rear and the spring and rod can now be removed from the gun.

(ii) Pull retracting slide grip down and to the rear until it is opposite the cut away in cocking slot. Push retracting slide forward about one inch and remove bolt stud to the right and cocking handle to the left.

(iii) Withdraw bolt assembly from the casing.

(d) **Oil Buffer and Barrel Extension assembly:—**

(i) Insert a drift in the countersunk hole near the rear of the right side plate, and depress the oil buffer spring lock. At the same time grip the projecting end of oil buffer and pull barrel extension and oil buffer assembly from gun.

(ii) Separate oil buffer assembly from barrel extension assembly by pushing forward on the tips of the accelerator.

(e) **Cover assembly:—**

(i) Close the cover and remove split cotter pin.

(ii) Push out the cover pin.

(iii) Unlatch the cover and rotate upward and forward to remove it from the trunnion block.

3. **Stripping main assemblies**

(a) **Barrel assembly:—**

(i) Drive out pin, carrier barrel, bolt head and remove bolt head.

(ii) Drive out pin retaining, barrel carrier bolt.

(iii) Rotate bolt barrel carrer half a turn, so that the lug on the bolt is turned away from the barrel. Slide out bolt and springs.

(iv) Disengage the wire handles from the barrel and unscrew them from the sleeve, barrel carrier, handle assembly.

(v) Slide off sleeve, barrel carrier assembly.

(b) **Plate-back, spade grip, assembly:—**

(i) Turn sleeve, buffer tube, until spring, buffer tube is immediately under release bolt latch, and withdraw.

(ii) Remove back-plate adjusting screw, taking care not to lose adjusting screw plunger and spring as they are released.

(iii) Remove buffer discs and buffer plate.

(iv) Drive out trigger pin with punch. (This pin also acts as axis for bolt latch release).

(v) Ease out trigger spring and bolt latch release, spring.

(vi) Lift out trigger and bolt latch release.

(vii) Remove cotter from back-plate lock (Split pin first).

(viii) Lift off back-plate lock and spring.

(ix) Drive out back-plate latch pin.

(x) Remove back-plate latch with spring.

(c) **Latch Lock**

(i) Press in sides of spring and remove from lock.

(d) **Rod driving spring assembly**

(i) With a piece of rag to protect the hand pull down on driving springs until they are compressed sufficiently to free the collar. Drive out the pin which is tapered and release springs gradually.

(e) **Bolt assembly**

(i) Rotate extractor upward and pull out to the left.

(ii) Lift out bolt switch, and bolt switch stud.

(iii) With cocking lever to rear, depress the sear and release the firing pin.

(iv) Remove cocking lever pin and cocking lever.

(v) Lever the sear stop from out of engagement with the slot in bolt Push up sear stop pin and remove sear stop.

(vi) Press down on sear and remove sear slide to left.

(vii) Remove sear and sear spring.

(viii) Tilt bolt until firing pin assembly will drop out.

(ix) Remove firing pin from firing pin extension.

(f) **Extractor assembly**

(i) Remove pin ejector.

(ii) Lift out ejector and ejector spring.

(g) **Firing pin extension assembly**

(i) With extension held in vice drive out firing pin, spring stop pin and remove spring. NOTE:—Observe caution—very strong spring.

(h) **Oil buffer assembly**

(i) Remove oil buffer tube from oil buffer body by pushing on end of piston rod.

(ii) Lift rear end of lock oil buffer tube, until detent is clear of body, then slide it off.

(iii) Remove accelerator pin and accelerator.

(iv) Spring locking oil buffer body should not be removed unless defective.

(j) **Oil buffer tube assembly**

(i) Take weight of spring until collar is free of piston head. Turn collar of piston through 90 degrees allowing collar and spring to lift over piston head. Spring oil buffer is very strong and therefore great care should be exercised when removing it.

(k) **Barrel extension assembly**

(i) Lift out spring locking barrel to the front.

(ii) Push out breech lock pin and remove breech lock.

(l) **Cover assembly**

(i) Remove split pin from belt feed lever pivot.

(ii) Bring stud of belt feed lever half way across cover and lift out belt feed lever, taking care not to lose plunger and spring.

(iii) Remove belt feed slide assembly.

(iv) Lift tongue of cover latch spring out of the grove in cover and pull spring forward and out. The spring will have to be moved slightly to one side to avoid feed slide lever pivot.

(v) Controlling it with thumb of left hand, lever cover extractor spring out of engagement with the notch in cover extractor cam. Lift out spring.

(vi) Remove split pin from cover latch shaft. Remove shaft by turning to locked position and drawing out.

(vii) Remove cover latch.

(m) **Belt feed slide assembly**

(i) Knock out belt feed pawl pin.

(ii) Remove belt feed pawl, feed pawl spring and feed pawl arm.

(n) **Retracting slide assembly**

(i) Remove the retracting slide lever assembly from the bracket by taking out the split pin and removing nut and washer.

(ii) Remove the retracting slide lever spring.

(iii) Remove split pins and unscrew nuts from retracting slide bracket bolts. Bolts will then push through into casing.

(iv) Remove locking wires if fitted, and unscrew the three retracting slide bracket screws.

(v) Pull retracting slide bracket away from gun.

(vi) Lift out retracting slide from bracket.

(vii) Drive out pin retracting slide plunger and remove plunger and spring.

(o) **Bolt latch assembly**

(i) Remove trigger bar pin and trigger bar. A keeper spring on the head of the pin will force it out of its seating when the pin is turned sufficiently to release the key. The pin will be found on the left of the casing.

(ii) Unscrew nut bolt latch stop screw as far as possible.

(iii) Screw in screw stop bolt latch.

(iv) Remove split pin from nut bolt latch rod.
CAUTION:—Before removing nut rod bolt latch, note that this nut is holding a very strong spring under tension.

(v) Stand casing vertically upright on its rear end as low as possible. Unscrew nut rod bolt latch, until bolt latch is clear of the top plate bracket. NOTE:—The spring and plunger bolt latch will be heard forcing down the latch when clear.

(vi) Insert 4" × 2" wooden block against knuckle of latch assembly and with the casing still in the upright position, maintaining downward pressure on the casing, unscrew and remove nut rod bolt latch. On removing wooden block bolt latch assembly will fall clear.

(vii) Remove spring bolt latch, spring and plunger bolt latch, push out pin bolt latch and unscrew nut and screw stop bolt latch.

(p) **Casing and barrel support assembly**

(i) Pull back trunnion lock which is situated under the casing and unscrew support barrel.

(ii) Unscrew and remove screw lock breech bearing.

(iii) Unscrew bearing breech.

(iv) Push out pins front sight cover and remove cover and blade front sight.

(v) Unscrew the four screws base rear sight and remove rear sight assembly.

(vi) Remove the belt holding pawl pin by drawing out with a pair of pliers, keeping thumb on pawl and spring.

(vii) Remove pawl and spring.

(viii) Remove the remaining belt holding pawl pin, from the other side of the casing and lift out the rear cartridge stop assembly, or in the case of a right hand feed, the rear link stripper. Remove the front cartridge stop.

(ix) Remove the two pins from the trunnion block cover by driving out with a small punch, and remove cover.

(x) Turn upside down and remove the cotter pin securing the breech lock cam nut. Support the cam with two fingers and unscrew nut. Remove the breech lock cam and screw.

(xi) Turn gun right side up and remove the cotter pin and nut from the switch plate on he left hand side of casing.

(xii) Remove switch plate assembly and spring.

(q) **Rear sight assembly**

(i) Drive out pin rear sight windage knob and remove knob.

(ii) Remove spring and plunger rear sight windage click.

(iii) Remove screw rear sight windage, and take off leaf rear sight assembly.

(iv) Remove screw rear sight cover plate and plate *rear sight cover.*

(v) Remove stop rear sight leaf.

(vi) Remove the two screws rear sight windage scale, and rear sight windage scale.

(vii) Disengage and remove spring rear sight base, removing screw from underneath.

(viii) Unscrew screw clamp telescope sight assembly.

(ix) Prise out clamp telescope sight and remove springs.

(r) **Leaf rear sight assembly**

(i) Drive out pin rear sight elevating screw retainer.

(ii) Unscrew and remove screw rear sight elevating and knob. Drive out pin and remove knob.

(iii) With slide at the bottom of the scale, insert drift through small hole on left hand side of leaf and push out the nut rear sight leaf.

(iv) Bring slide to top of sale and remove.

(v) The click rear sight elevating knob is not removed unless defective.

(s) **Screw clamp telescopic sight assembly**

(i) Drive out pin retaining telescopic sight clamp screw.

(ii) Remove handle and spring.

ASSEMBLING

Assembling main assemblies

(a) **Screw clamp telescopic sight**

(i) Replace spring and handle; with handle against the head of screw.

(ii) Replace pin retaining telescopic sight clamp screw.

(b) **Leaf rear sight**

(i) Insert slide at top of scale, with knurled face to graduated side, and bring slide to bottom of scale.

(ii) Replace nut rear sight leaf through slot at bottom of scale, thread outwards and countersunk hole in nut to conform to countersunk hole in slide.

(iii) Replace knob and pin rear sight elevating screw, inserting screw into leaf. Compress screw and click until groove is in line with hole in leaf and insert pin rear sight elevating screw retainer.

(c) **Rear sight assembly**

(i) Replace springs into clamp telescope sight and assemble clamp into base with groove on underside.

(ii) Replace screw clamp telescopic sight assembly.

(iii) Insert one of the screws rear sight base into centre hole in base, then insert spring rear sight base.

(iv) Replace scale and screws rear sight windage.

(v) Insert stop rear sight leaf in hole in left hand side, replacing plate rear sight cover and screw.

(vi) Replace leaf rear sight assembly graduated side on top, compressing leaf onto spring rear sight base, insert screw rear sight windage.

(vii) Replace spring and plunger rear sight windage click into knob rear sight. Replace knob on screw rear sight windage and replace pin.

(d) **Casing and barrel support assembly**

(i) Replace rear sight assembly, registering dowels into top plate.

(ii) Lift leaf rear sight and screw up, screw rear sight base, through hole in spring. Now replace and screw up the three remaining screws.

(iii) Replace cover and blade front sight (highest point to the rear). Align holes and replace pins.

(iv) Screw in bearing breech aligning holes and replace screw lock breech bearing.

(v) Replace the trunnion block shim with hole in line with trunnion lock and screw on barrel support.

(vi) The switch is installed by first inserting the bent end of the hairpin spring into the small hole in the switch recess. Slip the back end of the switch back into the recess, holding the switch firmly against the side plate and making sure that the lug on the back of the switch rides on top of the spring. Push the threated protusion through the hole in the side plate and secure it with nut and cotter pin. Try the switch to see that it pivots and snaps back into position.

(vii) Assemble breech lock cam bolt to the breech lock cam, and replace the breech lock cam, bevelled surface up and to the rear. Place the lower projection on the cam through the hole in the bottom plate. Screw the castleated nut on the bolt, with the notches up and draw tight. Back it off, only as much as necessary to insert cotter pin. When so assembled the breech lock cam should "float" slightly. Measured at the base of the "U" shaped opening at the front of the cam, the clearance between the cam and the bottom plate should be between .001" and .008".

(viii) Replace the rear cartridge stop assembly into rear end of feed block, and front cartridge stop, into the front end of feed block, and secure with one of the belt holding pawl pins.

(ix) Replace the belt holding pawl spring in hole in feed block, locate the free end of the spring in the hole in the belt holding pawl and press the pawl down with the thumb. Insert the belt holding pawl pin.

(e) **Bolt latch**

(i) Replace nut and screw stop bolt latch into bolt latch, screwing up as far as it will go.

(ii) Assemble latch bolt and rod together with pin.

(iii) Replace spring bolt latch on rod and insert rod into bracket allowing latch to hang down.

(iv) Now insert 4" × 2" wooden block against knuckle of bolt latch assembly and stand casing upright on the block.

(v) Press downwards on casing (if the rod is properly aligned so that the key on the rod enters the slot in the bracket bolt latch) the threaded end will protude through the front end of the bracket.

(vi) Screw on the nut bolt latch rod about two turns.

(vii) Insert plunger and spring into bolt latch, and raise the latch until it clears the extension of the top plate bracket.

(viii) Hold latch in this position, tighten up nut bolt latch rod until split pin can be inserted.

(ix) Unscrew stop bolt latch as far as it will go then screw in one quarter turn. Now tighten up nut against latch.

(x) Assemble trigger bar and pin.

(f) **Retracting slide bracket assembly**

(i) Reassemble the plunger and spring into the retracting slide bracket. Press down spring and replace pin.

(ii) Place the slide assembly into bracket with plunger engaging in notch in the slide.

(iii) Place the bracket in position on the side of the casing, and insert the three screws—the long one to the front.

(iv) Insert rear bracket bolt, chamfer to rear, and front bracket bolt, chamfer to front. Replace nut and split pin.

(v) Insert tang of retracting slide lever spring into small hole in retracting slide lever, push lever on to stud. At the same time position the hooked end of the spring over the retracting lever stop. Replace washer, nut and split pin.

(g) **Cover**

(i) Replace the cover latch between the pin bosses in the cover with the keyway towards the top of the cover and with the projecting wing of the latch against the underside of the cover.

(ii) Insert the cover latch shaft assembly. The shaft lever must be on the opposite side of the gun to the retracting slide, key to the top of the shaft. Before pushing the shaft right home slip on the washer and replace cotter pin from the inside of the cover. Bend the end of the cotter pin round the shaft to avoid fouling casing when cover is closed on the gun.

(iii) Replace extractor cover spring by hooking the slotted end under the extractor cover spring stud, with the curved end away from the cover. Hold the spring firmly against the stud, press the curved end down until it rests on the cover and slide the projection of the spring into the recess of the cover extractor cam.

(iv) Place the cover latch spring inside the cover with the bent end against the cover and the enlarged hole over the latch spring stud. Depress the spring and, at the same time, slide the spring towards the latch. Make sure that the latch end of the spring rides over the projecting wing on the cover latch by levering with the rim of the cartridge. Bent end of spring should snap into groove.

(v) Assemble the belt feed slide by placing the belt feed pawl arm on the belt feed pawl so that when it is assembled in the gun the arm will be towards the rear when the cover is closed.

(vi) The Pawl and pawl arm properly assembled, are place in the belt feed slide with the spring held by the spring stud and the recess in the pawl. The spring is depressed to align the holes and the pin inserted.

(vii) The belt feed slide is assembled to the cover with the pawl end of the slide towards the side from which the gun is fed.

(viii) Insert the belt feed lever plunger and spring in the hole in the belt feed lever, towards the latch end for the left hand feed or in the hole towards the hinge for a right hand feed. Alighn the notch in the belt feed slide with the slot in the cover. Place the belt feed lever, with the boss up, over the pivot stud, and after depressing the lever plunger and spring, push the lever right down on the stud to that the toe of the lever can work to and fro in the cover. Replace the cotter pin.

(ix) Place cover in closed position on casing, depressing cover detent and spring and insert cover pin. Replace cotter pin and splay ends with screwdriver.

(h) **Barrel extension**

(i) Insert barrel extension shank in barrel extension with the projection at the rear end of the shank downwards. Drive home with a copper drift until the groove in the shank is in line with the pin hole. Insert pin and ensure that the ends of the pin are flush with the sides of the barrel extension.

(ii) Place the breech lock, with the double bevelled face to the top and towards the front, in the barrel extension and insert pin take care that the ends of pin are flush with the side of the barrel extension.

(iii) Replace the locking spring in its seat with the protrusion or nib inside.

(iv) Screw barrel into barrel extension as far as possible. (See note on stripping barrel extension).

(j) **Oil buffer tube assembly**

(i) Place spring buffer over piston buffer with collar attached. Compress spring and collar until lugs on piston head pass through slot on collar.

(ii) Turn collar through 90 degrees and release.

(k) **Oil buffer body assemby**

(i) Insert accelerator with claws forward and curving upwards. Insert pin accelerator.

(ii) Place oil buffer body on bench upside down. Place oil buffer tube lock in slot so that it bows outwards. Press down so that ears on lock engage in circular recess on body. With right hand, slide lock towards accelerator lifting end so that lug clears oil buffer body and engages in its hole.

(iii) Raise end of buffer tube lock and insert oil buffer tube into body. Release lock so that lug engages serrations on oil buffer tube.

(l) **Extension firing pin**

(i) Place the extension in a vice with the pin stop firing pin spring hole vertical.

(ii) Replace firing pin spring.

(iii) Compress the spring and insert pin, end of pin to be flush with extension.

(iv) Replace firing pin.

(m) **Extractor assembly**

(i) Place the extractor on the bench with axis pin to rear and pointing to the left.

(ii) Insert the ejector spring, tang up and to the rear.

(iii) Push the small end of the ejector pin into the extractor from the right hand side, as far as the spring.

(iv) Take the ejector in left hand, bevelled surface away and claw to left and push down into slot in extractor compressing the extractor spring.

(v) Push the pin home and rivet end.

(n) **Bolt**

(i) Insert firing pin and firing pin extension into bolt, with bent on the firing pin extension downwards.

(ii) Replace the sear spring in blind hole at rear of bolt.

(iii) Insert the sear and locate the lower end over the sear spring.

(iv) Depress the sear and insert the sear slide from the left.

(v) Insert the sear stop and engage rear end in groove.

(vi) Replace the cocking lever, making sure that the rounded nose at the lower end of the lever is to the rear.

(vii) Replace the cocking lever pin from the left hand side. The upper end of the cocking lever should be to the rear of the bolt before inserting pin, as this aligns cocking lever for the return of the pin.

(viii) Cock by pressing forward on the cocking lever. Turn cocking lever to the rear and press on the sear with a cartridge to release firing pin, to test correctness of assembly. Re-cock the assembly.

(ix) Replace switch plate stud with switch plate. Make sure that the switch plate is in the correct position with regard to the feed of the gun.

(x) Replace the extractor, by inserting the axis pin into the large hole in the left of the bolt, extractor pointing up. Turn the extractor downwards toward the front to engage collar on the extractor under the collar cut in bolt.

(o) **Driving spring**

(i) Place driving spring rod upright in vice gripping it by the flat portion of the head.

(ii) Place the inner and outer springs on rod and compress them by gripping in the hand and pulling them down until end of rod protrudes above the end of the springs.

(iii) Get an assistant to replace the collar and insert the stop pin. Take care to insert the stop pin so that head of pin goes into the counterbored side of the rod.

(p) **Backplate assembly**

(i) Replace spring in backplate latch. Re-assemble latch and push in pin.

(ii) Replace spring in backplate lock. Re-assemble lock and push in cotter.

(iii) Place trigger and bolt latch release together and place in slot. Place spring into position between trigger and backplate recess, press up and push in pin till it holds trigger. Next insert spring between bolt latch release and backplate recess, press up and push pin axis right home.

(iv) Insert buffer plate and fibre discs.

(v) Place spring and plunger into hole in backplate adjusting screw and screw into buffer body until right home.

(vi) Replace sleeve buffer tube.

(q) **Carrier barrel assembly**

(i) Slide sleeve barrel carrier assembly onto barrel with the bushing to the front.

(ii) Screw wire handles, into sleeve barrel carrier handle assembly, and engage handle on barrel.

(iii) Insert spring and bolt barrel carrier into sleeve from the rear with the lug of the bolt turned away from the barrel.

(iv) Turn lug of the bolt to engage in locking notch in barrel and replace pin retaining carrier bolt.

(v) Replace bolt head and pin.

Replacing assemblies in gun

(a) **Barrel extension and oil buffer assembly**

(i) Assemble the oil buffer assembly to the barrel extension by holding barrel extension in the left hand and oil buffer assembly in the right hand. Support accelerator with forefinger of right hand. Enter the breech lock depressors in the guide ways of the barrel extension. Make sure that piston rod and barrel extension shank engage each other and push oil buffer body forward as far as it will go, so that parts are locked together.

(ii) Next insert barrel extension into rear of casing and push forward until complete assembly is locked in position by oil buffer lock spring.

(b) **Bolt and driving spring assemblies**

(i) Push cocking lever forward and insert bolt into casing, taking care that front end of bolt does not trip accelerator forward.

(ii) Push bolt forward until hole is in line with enlarged hole in side plate.

(iii) Insert cocking handle and cocking handle stud. Push bolt home.

(iv) Insert driving spring rod assembly and compress until stud engages in hole in right of casing.

(c) **Backplate assembly**

(i) Replace backplate and press trigger.

(d) **Barrel**

(i) Screw barrel home and adjust for headspace (see Tests and adjustments).

ACTION OF MECHANISM

(a) **Firing**

When the trigger is pressed, it raises the back end of the trigger bar. The trigger bar pivots on the trigger bar pin, causing the front end to press down on the top of the sear. The sear is forced down until the notch in the sear is disengaged from the shoulder of the firing pin extension. The firing pin and firing pin extension are driven forward by the firing pin spring to fire the cartridge.

(b) **Recoiling**

The complete cycle of the recoiling portions of the gun, which takes place as each cartridge is fired, consists of the recoil stroke when certain parts of the gun move rearward, and the counter-recoil stroke when these same parts move forward. At the instant of firing, the barrel, the barrel extension, the bolt, known as the recoiling portions, are in the forward position in the gun. At this same time, the bolt is held securely against the base of the cartridge by the breech lock, which extends up from the barrel extension into a notch in the underside of the bolt

After the cartridge explodes, and as the bullet travels out of the barrel, the force of recoil drives the recoiling portions rearwards. During the first three-quarter inch of travel, the breech lock is pushed back off the breech lock cam stop. This permits the breech lock to be forced down out of the notch in the bolt by the breech lock depressors engaging the breech lock pin, and by the bolts action on the double bevelled forward face of the breech lock. This unlocks the bolt and represents the mechanical safety.

As the recoiling portions move toward the rear, the barrel extension rolls the accelerator rearwards. The tip of the accelerator strikes the lower projection on the bolt and hastens or accelerates the bolt to the rear. The barrel and barrel extension have a total rearward travel of 1$^{1}/_{8}$th inches, at which time they are completely stopped by the oil buffer body assembly.

During this recoil of 1$^{1}/_{8}$th inches, the oil buffer spring is compressed in the oil buffer body by the barrel extension shank. The spring is locked in the compressed position by the claws of the accelerator, which are moved against the shoulders of the barrel extension. The bolt travels rearward for a total of 7$^{1}/_{8}$th inches. During travel, the driving spring assembly is compressed. The rearward stroke of the bolt is finally stopped as the bolt strikes the buffer plate. Thus part of the recoil energy of the bolt is stored in the driving spring assembly, and the remainder is absorbed by the buffer discs in the backplate.

(c) **Counter-recoiling**

After completing the recoil stroke, the bolt is forced forward by the energy stored in the driving spring, and the compressed buffer discs. When the bolt has moved forward about 5 inches the tip of the accelerator is struck by a projection on the bottom of the bolt. This rolls the accelerator forward.

As the accelerator rolls forward, the accelerator claws are moved from the shoulders of the barrel extension shank. This releases the oil buffer springs. The accelerator rolling forward and the energy in the spring force the barrel extension and barrel forward.

As the barrel extension moves forward, the breech lock engages the breech lock cam and moves upwards. The bolt, which has been continuing its forward motion since striking the accelerator, has at this instant reached a position where the notch on the underside is directly above the breech lock, thus permitting the breech lock to engage the bolt. The bolt is therefore locked to the barrel extension and barrel just before the recoiling portions reach the firing position.

(d) **Cocking**

The act of cocking the gun is begun as the bolt starts to recoil immediately after firing. As the bolt moves rearwards the tip of the cocking lever, which is in the "V" slot in the top plate bracket, is forced forward. The cocking lever is pivotted so that the lower end forces the firing pin extension rearward. The firing pin spring is thus compressed against the sear stop pin. The firing pin extension moves rearward until the shoulder at its back hooks over the notch at the bottom of the sear under pressure of the sear spring.

During the forward motion of the bolt, the tip of the cocking lever enters the "V" slot in the top plate bracket. This action swings the bottom of the cocking lever out of the path of the firing pin extension, thus permitting the firing pin to snap forward when released by sear. When the recoiling portions are approximately one-sixteenth inch from the forward position the gun is ready to fire. If the trigger is not depressed at this instant the recoiling portions assume their final forward position and the gun ceases to fire. The gun is again ready to fire.

(e) **Automatic firing**

For automatic firing, the trigger is pressed and held down. The sear is depressed as its tip is carried against the cam surface of the trigger bar by the forward movement of the bolt near the end of the counter-recoil stroke. The notch in the bottom of the sear releases the firing pin extension and the firing pin, thus automatically firing the next cartridge at the completion of the forward stroke. The gun fires automatically as long as the trigger is held down and until the ammunition is exhausted.

(f) **Feeding**

The belt feed mechanism is actuated by the bolt. When the bolt is in the forward position the belt feed slide is within the confines of the

gun. A lug on the rear of the bolt feed lever is engaged in the diagonal cam groove in the top of the bolt.

As the bolt moves rearward during the recoil the belt feed lever is pivotted. The forward end of the belt feed lever moves the belt feed slide out of the side of the gun and over the ammunition belt. Feed from either side is possible with all Cal. .50" M2 guns.

The ammunition belt is pulled into the gun by the belt feed pawl which is attached to the belt feed slide. When the bolt is forward, the belt feed pawl has positioned a cartridge directly above the chamber. The belt holding pawl is in a raised position to prevent the ammunition belt from falling out of the gun.

As the bolt recoils, the belt feed slide is moved out over the belt, and the belt feed pawl pivots so as to ride over the link holding the next cartridge in the belt.

At the end of the recoil stroke, the travel of the belt feed slide is sufficient to permit the belt feeding pawl to snap down behind the link holding the next cartridge in order to pull the belt into the gun.

As the bolt moves forward on the counter-recoil stroke, the belt is pulled into the gun by the belt feed pawl. The belt holding pawl is forced downwards as the belt is pulled over it. When the forward stroke is completed the belt holding pawl snaps up behind the next cartridge.

(g) **Extracting and ejecting**

As recoil starts a cartridge is drawn from the ammunition belt by the extractor. The empty case is withdrawn from the chamber by the "T" slot in the front face of the bolt.

The empty case having expanded through the force of the explosion fits the chamber very snugly and the possibility exists of tearing the case if the withdrawal is too rapid. To prevent this and to ensure slow initial withdrawal, the top front edge of the breech lock and the front side of the notch in bolt are bevelled. Thus, as the breech lock is unlocked, the bolt moves away from the barrel and barrel extension in a gradual manner.

As the bolt moves to the rear, the cover extractor cam forces the extractor down, causing the cartridge to enter the "T" slot in the bolt.

As the extractor is forced down, a lug on the side of the extractor rides against the top of the switch, causing the switch to pivot downward at the rear. Near the end of the rearward movement of the bolt, the lug on the extractor over-rides the end of the switch, and the switch snaps to its normal position.

On the counter-recoil stroke, the extractor is forced down still further by the extractor lug-riding under the switch. The ejector expels the empty case. The extractor stop pin in the bolt limits the downward travel of the extractor so that the cartridge assisted by the ejector, enters the chamber. When the cartridge is nearly chambered, the extractor rides up the extractor cam, compresses the cover extractor spring and snaps into the groove in the next cartridge.

(h) **Single-shot**

Under some conditions it is desirable to operate the gun as a single shot, semi-automatic weapon. To meet this condition, the gun is equipped with a bolt latch.

The bolt latch is attached to the bolt latch bracket, which is rivetted to the underside of the top plate and the right hand side plate. The latch engages a should on the top of the bolt when the bolt is in its rearward position. A bolt latch release which controls the bolt latch is provided.

As the bolt moves to the rear it is engaged by the bolt latch and held there. When the bolt latch release is pressed down, the latch assembly is raised to allow the bolt to be driven forward to the forward position. The gun may then be fired by pressing the trigger. If both the bolt latch release and the trigger are held down, the gun will function as an automatic weapon. The bolt latch release may be locked in the depressed position by means of a lock secured to the back plate group.

For single shot firing alternate pressure on the trigger and latch bolt will be necessary.

(j) **Mechanical Safety (Additional)**

In the event of wear taking place on the notch at the base of the sear, or on the shoulder on the rear of the firing pin extension, contact may not take place during cocking.

The compressed firing pin spring would then tend to take the firing pin forward sharply as soon as recoil was completed thus firing the charge prematurely. This is prevented by the cocking lever which can only rotate with the movement of the bolt and therefore controls the forward movement of the firing pin.

(k) **Failure to extract round from belt**

Should the round positioned against the cartridge stops fail to be extracted from the belt on recoil, the arm on the feed pawl, as the slide moves across, rides on top of the positioned round, holding up the feed pawl and compressing the feed pawl spring. This stops the pawl from engaging behind the second round and so prevents a jam in the feed way on the counter-recoil movement.

TESTS, ADJUSTMENTS AND GAUGING

(a) **Head-space**

The head-space is gauged with the aid of a "Gauge head-space and Timing, Cal. .50—A196228." See that the barrel is screwed in just enough to buttress onto the barrel extension. To ensure that it is not screwed in too far, pull recoiling portions back about one inch and allow to fly forward. They should close without further pressure.

Next fully cock the gun and allow the recoiling portions to go forward. This ensures that the pin firing is withdrawn.

Raise the cover and with the aid of the extractor retract the bolt slightly (not more than one sixteenth inch) so as to put the forward face of the breech lock and the bolt into close contact as when firing.

Then insert the gauge (head-space end) in "T" slot between the face of the bolt and the rear end of the barrel. If there is insufficient head-space it will not be possible to insert the gauge. If this is the case unscrew the barrel one notch at a time until gauge will just enter.

If the head-space gauge is not available an adjustment can be made by screwing the barrel in until it just touches the bolt and then unscrewing one notch.

(b) **Timing**

This test is to ensure that the gun does not fire before the breech is sealed. Using head-space gauge as for test in previous para, proceed as follows:—

Adjust head-space and leave gun cocked.

Retract the bolt slowly, about one quarter inch, and insert the .116 end of the gauge, between the front of the barrel extension and trunnion block, with the curved edge of the blade over barrel notches. Allow action to close slowly on gauge.

Press the trigger and the gun should not fire.

If the gun fires, remove the trigger bar and compare it with a new one or any number of other bars. Place rear ends together and try and find a trigger bar on which the front end is higher than the one removed. Test the gun again with the fresh trigger bar.

Now remove the gauge and put in its place a .020" feeler. In this instance the gun SHOULD fire when the trigger is pressed.

If the gun does not fire with .020" feeler, change trigger bar as above, except that the fresh bar should be one the front end of which is LOWER than the one removed.

(c) **Back-plate buffer**

To ensure maximum buffer movement, the back-plate buffer should protrude through the back-plate $^{3}/_{16}$ths inch. If protrusion is insufficient check number of buffer discs. There should be 23. If the number is correct the discs will require renewing.

(d) **Firing pin protrusion**

There is no gauging limit for this, but it should be not less than one sixteenth inch.

(e) **Firing pin hole**

The "Gauge firing pin hole, Cal. .50—A77200" is a "No-go" gauge and should not enter the firing pin hole in the bolt. If it does enter, the bolt is unserviceable. The size of the hole should not exceed .084".

(f) **Barrel support overturning**

Steel shims are used to ensure that the barrel support is correctly positioned and if it is ever necessary to remove the barrel support, it will invariable be necessary also to use a thicker shim when replacing it. These shims are issued in sets of twelve, numbered accordingly. The difference between each shim is .0025".

(g) **Barrel**

Normal visual inspections of barrels is all that will be possible on most occasions. Inspect for wear, pitting, bends, bulges or cuts in the normal way.

If a "Gauge breech bore, C20623" is available use it as follows:—

Seat the sleeve in the chamber of the barrel. Then slide in the plug until tapered end is arrested in the bullet lead. Note the reading on the plug. If the red line on the plug comes into line with, or below the outside edge of sleeve the barrel should be changed.

There is no gauge for measuring the calibre.

(h) **Length of oil buffer assembly**

The overall length of this assembly should be between 6.525" and 6.553". In order to detect a short oil buffer assembly and at the same time to determine the lenght of the oil buffer spring proceed as follows:—

Remove driving spring assembly, and elevate the gun to 90 deg. noticing if there is a gap between barrel extension and trunnion block. If there is a space remove oil buffer tube and adjust length with piston rod. If length is correct but space still shows replace oil buffer spring.

(j) **Minimum length of springs**

If the free length of any of the following springs falls below the measurements given, it should be exchanged.

Springs driving inner	21 ins.
Springs driving outer	21 ins.
Spring pin firing (.059' wire)	3 1/8 ins.
Spring oil buffer	5 3/4 ins.

(k) **Driving spring rod hole**

The mouth of the driving spring hole in the bolt should be chamfered to an angle of 60 deg. to prevent the fouling and buckling of the spring.

(l) **Bolt handle and bolt stud**

The ends of these two components which enter the bolt, should not exceed .585" in length. The ends of entry should also be chamfered to an angle of 45 deg.

(m) **Belt feed lever slot**

Interference sometimes exists between the forward end of the belt feed lever and the sides of the slot in the cover through which it operates. The dimension of this slot should be 1.802". If slots are found narrower than this they should be opened out with a file. More metal (2 to 1 proportion) being removed from the LEFT end of the slot.

STOPPAGES AND REMEDIES

Normal stoppages on the .50" Browning gun are similar to those of the .30" gun and can be remedied in the same manner. As there is incorporated in the mechanism of the .50" gun however an additional assembly for effecting repetition fire, the following must be considered in addition.

(a) If when set for automatic fire the gun continues to fire only single shots, note the position of the retracting slide handle. If it is in the fully forward or partly recoiled position continue as for .30" gun.

If fully recoiled it shows that the bolt is engaged behind the bolt latch. This could be caused by any of the following:—

(i) Broken spring clip on sleeve buffer tube allowing release bolt latch to rise.

(ii) Broken nib on front of release bolt catch thereby failing to keep the bolt latch raised.

(iii) Broken bolt latch at the point where the bolt latch engages bolt.

(b) If the gun when set for single shots, continues to fire automatic the back plate assembly should be removed and the bolt latch assembly inspected for wear or breaks on bearing shoulder and to ensure that it is not jamming in the raised position. If the bolt latch is free and undamaged remove and examine the bolt for wear or breaks on the shoulder which engages the bolt latch.

ARMOURERS' WING
Précis No. SA/14

GUN M/C CAL. .50 BROWNING M.2. (HEAVY BARREL)
(Regulations affecting the above equipment)

E.M.E.Rs.

S.A. & M.G.	F.103	page 1	Removal of unserviceable rear sight assembly.
		page 3	Tests and adjustments.
		page 7	Adjustment of new type retracting slide brackets.
		page 9	Description and assembly of newly designed parts.
		page 15	Clearance between bolt and receiver side plates.

E.M.E.Rs.

S.A. & M.G.	F.107	Mod. Inst.	No. 1	Summary of previous instructions.
			No. 2	Removal of sight bracket horns. (Cancelled by Issue 2).

F. 109. Misc. Inst. No. 1. Summary of W.O.T.Is.

21 AG AND RHINE ARMY TECH BULLETINS

A.F.V.	para 5	Shortening of screw retracting slide, rear.
S.A. & M.G.	para 101	Inspection and gauging of barrels.
	para 117	Adjustment of retracting slide bracket for assembly to Moutings M.G. (A.A. .50") 80030 and D59530, on Sherman tanks.
	para 145	.50" guns on Chaffees to be replaced by .30"

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