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WCLP BRADLEY



Small Arms Training
Volume I, Pamphlet No. 27
Pr., 7-cwt. Anti-Tank Gun
1924

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1924

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SMALL ARMS TRAINING, VOLUME I, PAMPHLET No. 27

6-pr., 7-cwt. ANTI-TANK GUN

SECTION 1.—GENERAL

1. Publications dealing with the weapon.

- (a) "The Handbook for the Ordnance, Q.F. 6-pr. 7-cwt., 1942," which gives further technical details.
- (b) Additional details regarding mechanism, stripping and maintenance are to be found in "Maintenance for the Ordnance, Q.F. 6-pr. 7-cwt., 1943."
- (c) "Artillery Training, Vol. 1—Tactical Handling. Pamphlet No. 9—Anti-tank Tactics, 1943."
- (d) "Anti-tank Gunnery," M.T.P. No. 59, 1943.

2. **Designation.**—The equipments in current use are known as ORDNANCE, Q.F. 6-pr. 7-cwt., Mk. II and IV on CARRIAGE, 6-pr., Mk. I to III.

The calibre of the gun is 2.244 in.

3. Characteristics.

- (a) *General.*—The 6-pr. is of the Q.F., breech loading type. The Mk. II gun has a muzzle velocity of approximately 2675 f.p.s. and the Mk. IV of approximately 2800 f.p.s.
- (b) *Accuracy.*—The 6-pr. fires a solid shot at a high muzzle velocity. This gives the shot a flat trajectory and a short time of flight. The shot is filled with a tracer composition to assist the fire controller in observing the fire.
The 90 per cent. zone of dispersion at 800 yds. is 4 ft. high and 3 ft. wide. The gun is, therefore, accurate. Targets are not engaged at ranges exceeding 800 yds. unless the gun is itself being attacked.
- (c) *Mobility.*—Drag ropes and bars are provided to facilitate the manhandling of the gun over rough ground. The gun is heavy and, therefore, experience and practice are necessary before a detachment can manhandle efficiently. The gun rides well behind any vehicle provided with a towing hook and has a tilting angle of 40 degrees.
- (d) *Penetration.*—The 6-pr. has very effective penetration at ranges up to 800 yds.

- (e) *Flexibility*.—The gun has a free traverse of 90 degrees, which is shoulder controlled by the layer. The vertical movement of the gun is 20 degrees (15 degrees elevation and 5 degrees depression), mechanically controlled.

A semi-automatic gear ejects the empty case, leaving the breech open to receive the next round.

Fire orders are short and fire control in general is simple.

Although emphasis must be laid on accuracy and securing hits on the target, rather than on a high rate of fire, it is possible to fire accurately at a rate of about 12 rounds per minute.

Targets can be engaged rapidly within the 90 degrees traverse of the gun, and targets outside the traverse can be engaged quickly by a well-trained detachment.

(f) *Limitations*.

- (i) Very careful siting is necessary to conceal the *pronounced flash* from the muzzle. (See Sec. 13, Lesson 31).
- (ii) The *considerable blast* makes observation from the gun difficult. The fire controller must, therefore, control the fire from a position on the upwind flank. (See Sec. 4.)
- (iii) The shock of discharge causes the equipment to *bounce*, particularly before the spades have settled in. Any tendency to "gun-shyness" as a result of this can be overcome by careful instruction and experience.
- (iv) The difficulties of manhandling the equipment, due to its *weight* of 22½-cwt., can largely be overcome by careful training and practice.
- (v) Side shields are provided with the equipment for protection against blast and splinters. In view, however, of the *vulnerability* of the equipment and the detachment, and the pronounced flash from the muzzle, great care must be taken in the siting and concealment of the gun.

4. Tactical employment of the infantry anti-tank gun.—

The principal role of the infantry anti-tank gun is to protect the infantry battalion by killing those tanks which attack it. The tactical handling of the anti-tank platoon must, therefore, depend on the role of the battalion. The principal tasks of the infantry anti-tank platoon may be enumerated as follows:—

- (a) *The advance*.—The task of the anti-tank platoon during any battalion move is to protect the column throughout its whole length, sharing the task with any artillery anti-tank guns that may have been allotted to the battalion.

The platoon guns will either be distributed throughout the column by sections, so that any part of the column which is attacked will have some anti-tank defence, or be concentrated together so that stronger resistance to enemy tanks can be given from one particular area.

In the particular role of convoying unarmoured troops, anti-tank guns may break the standard rule and fire at ranges exceeding 800 yds., their task being to keep the enemy tanks away from the column and not necessarily to kill them.

The attack.—The role of the anti-tank guns in the attack is to provide continuous defence to the attacking troops whilst they are moving forward and to form a "secure base" on any ground won, by the rapid establishment of a co-ordinated anti-tank defence on the objective.

Whenever the ground is suitable for tank action, the attacking troops are liable to counter-attack by enemy tanks, particularly when they themselves are not supported by tanks. The task of the anti-tank platoon and of any artillery anti-tank guns that may be in support is to protect the infantry against such counter-attacks.

This main role may be sub-divided into the following tasks :—

- (i) *Protection of the concentration area*, or area in which the battalion debusses or harbours before continuing its advance to contact. The co-ordinated layout must be the best that the platoon commander can achieve in the time available.
- (ii) *The approach to contact march.*—The protection of the marching troops during the advance to contact is best achieved by allotting one section to the leading company and two to move with the main body. The sections with the main body may either move at the head of the column (probably near the battalion "O" Group) under control of the platoon commander, so that they may be quickly deployed to engage enemy tanks as they appear ; or picquet the route by bounds, each section in turn taking up positions along the axis of advance, to cover likely tank runs on either or both flanks. Marching troops should be allowed to pass them before they in turn pull out of position and move on to the next bound.

If during the advance to contact the battalion is embussed, sections will be distributed throughout the column, probably one being allotted to the leading company.

(iii) *Assembly areas.*—If at any time during an approach march the battalion is deployed, sections should be allotted to companies to provide anti-tank protection and the guns linked in with any artillery anti-tank guns that may be in support. Similar all round protection must be given to any assembly area that may be occupied before an attack, the infantry anti-tank guns being deployed to assist in such protection as far as time permits. The assembly area must always provide the battalion with a "secure base", the anti-tank defence of which is normally allotted to the artillery anti-tank guns, which remain in position at the assembly area until the objective is captured.

(iv) *The assault.*—If the attacking troops are to be protected against counter-attack at their most vulnerable moment, anti-tank guns must be moved on to the objective and into positions from which they can fire as soon as possible after the infantry have arrived there. Guns may have to be man-handled on to the objective and infantry may have to be allotted to assist.

The battalion commander must make quite clear in his orders with which assaulting companies the anti-tank sections are to move and will detail in general their consolidation tasks. Guns will move with "A 1 echelons"* of the companies to which they are allotted. On these occasions sections of the anti-tank platoon should be placed under command of company commanders for the purposes of immediate consolidation only. The object is to ensure that sections are deployed immediately to cover the main direction of tank threat from ground which the infantry is in fact holding on the objective. Unless there is good reason to the contrary, they will be sited to conform to the fire plan which has been detailed in the orders for the attack. Section commanders normally report to the commanders of the companies to which they have been allotted at the forming-up place. They will be accompanied by a guide and should move close to the company commander during the assault so as to be able to make an early reconnaissance of the area allotted to them.

* NOTE: A 1 echelon is the company fighting transport.

The battalion commander should also indicate the area from which he wants any artillery anti-tank guns that may be under his command to operate, together with the tasks which he wants them to carry out. Artillery anti-tank guns under command should be regarded as a reserve of guns which can give depth and solidity to the anti-tank layout. The plans of the platoon commander and any artillery commander must be carefully detailed and discussed in advance.

Sections should move under command of the "A 1 echelon" of the company to which they have been allotted. The commander of "A 1 echelon" should not necessarily wait for the success signal before moving his group forward. On occasions "A 1 echelon" may arrive almost at the same time as the company commander and the assaulting troops. There will be times when all "A 1 echelon" transport will be under battalion control, particularly at night.

- (v) *Consolidation*.—Sections will be deployed by the detachment commander immediately on arrival on the objective, to cover the main direction of tank threat. The company commander allots gun areas and tasks to the section commander, as decided by the ground on the objective, the sudden appearance of enemy armour, and the final platoon posts. Unless there is good reason to the contrary, these orders must conform with those originally given by the battalion commander.

The section commander will move guns from their immediate positions to these reconnoitred positions as quickly as possible.

It is very important that this immediate consolidation layout is co-ordinated by the platoon commander as soon as possible and linked in with the artillery anti-tank guns.

- (c) **The defence**.—The role of the infantry anti-tank guns in the defence is to kill tanks that attempt to enter the battalion locality, by killing them on the tank runs for which they are sited. This killing will be done primarily between the perimeter of the battalion locality and a distance outside it of up to 800 yds. Depth, however, is essential to anti-tank guns in the defence and must be built up by a co-ordinated layout of the infantry and artillery anti-tank guns inside the battalion locality.

Depth in the main is achieved by the co-ordination of all anti-tank weapons in the brigade locality.

It is essential that the platoon commander and the commander of any supporting artillery anti-tank guns should be present at the battalion commander's orders. The plans of both the platoon commander and any such artillery anti-tank gun commander must be co-ordinated, and sections allotted tasks and sited in company areas that enable the majority of the tank runs into the battalion locality to be covered. Gun positions will be selected from which the initial tasks can be carried out. Subsequently, further tasks may be allotted and second positions selected and prepared, to which guns may have to move to meet a threatened attack. The general principles of siting anti-tank guns are given in section 13, lesson 31.

(d) **Withdrawal.**—In the withdrawal the main role of the infantry anti-tank guns is the defence of the battalion in successive rearguard positions. The battalion anti-tank layout must be co-ordinated by the platoon commander and linked in with any artillery anti-tank guns which may be in support.

For purposes of withdrawal sections will operate under command of companies in whose areas they are sited and will withdraw with them. Close co-operation is necessary between rifle company commanders and anti-tank section and detachment commanders, who must know the general plan for the withdrawal, including timings and routes. Company commanders will be responsible for giving the final order to withdraw to detachment commanders under their command.

The defence of the next position must be organized before any rearguard position is vacated, and a reconnaissance party must be sent back early for this purpose.

SECTION 2.—GENERAL DESCRIPTION

Instructor's Notes

Stores.—Equipment complete, diagrams.

The detail contained in this section is too great for a squad to remember in one lesson. The section should, therefore, be divided into convenient stages. It is suggested that one lesson should contain the basic structure, a second the superstructure and the piece, and a third the recoil and recuperating system.

It should be remembered that at this stage only a general description of the equipment is required. The detailed description of each part should be left until the lessons on stripping and mechanism.

1. General.—The gun is known as the Ordnance, Q.F. 6-pr. 7-cwt., Marks II and IV on Carriage, 6-pr., Marks I to III.

The carriage is of the split-trail type. The trail legs can be opened to an angle of 90 degrees for firing, permitting a traverse of 90 degrees. The carriage allows 15 degrees elevation and 5 degrees depression.

The Mark II carriage differs from the Mark I in that it has a No. 2 trail, a different type of saddle supporting bracket, and a No. 232 special axletree. The Mark III carriage is converted from the Mark I for transport by air.

The description of the equipment is divided into the following main parts :—

- (a) the basic structure,
- (b) the superstructure,
- (c) the recoil and recuperating system,
- (d) the piece,
- (e) the breech mechanism.

2. The basic structure consists of the following parts :—

- (a) the trail legs, ✓
- (b) the pivot or hinge brackets,
- (c) the saddle supporting bracket, ✓
- (d) the pivot socket, ✓
- (e) the axletree, ✓
- (f) the stub-axle brackets,
- (g) the wheels and braking gear,
- (h) the lower shield,
- (i) the side shield,
- (j) the trail castor. ✓

(a) *The trail legs* are connected at the front by a pivot socket and can be locked at the rear by a locking bracket.

The right leg consists of two channel plates welded together and strengthened by brackets, gussets, facing and stiffening plates. Near the centre it is angled and the angling strengthened by two stiffening plates.

A trail leg locking bracket is bolted to the rear end and a hole provided in the bracket to house the pintle of the trail eye bracket

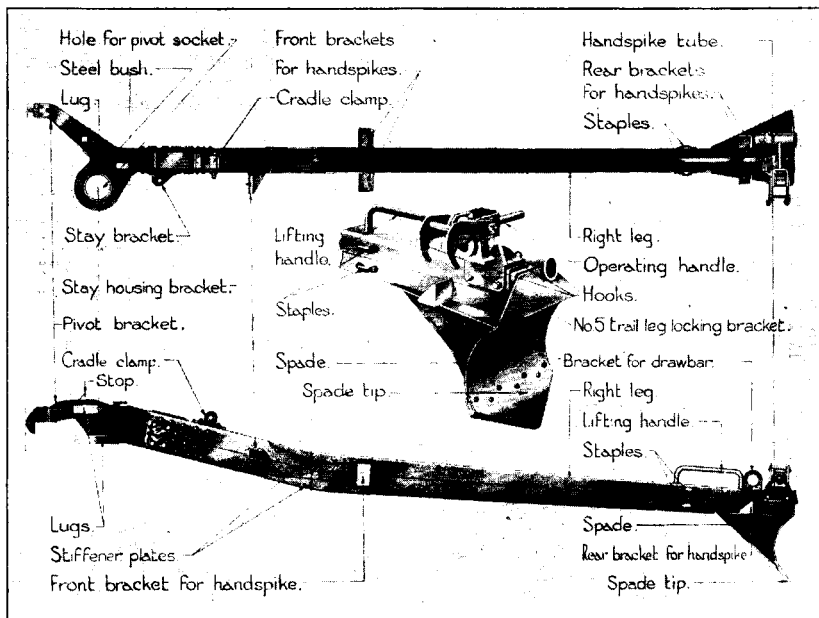


Fig. 1.—Right trail leg

on the left leg. Two hooks for engaging the screwed pins on the trail eye bracket of the left leg pivot on a fulcrum pin, to which is attached a stirrup-shaped operating handle. To unlock the trail legs, the handle should be raised. The pressure on the pintle will thus be eased, and the hooks can be disengaged from the screwed pins.

On the under side is welded a spade with a renewable tip riveted in position. Forward of the trail leg locking bracket and on top of the trail leg is a lifting handle and drawbar bracket. Brackets,

and staples for securing straps, are welded on either side of the leg to house the handspikes when not in use. A handspike tube and locking pin is situated in rear of the outside handspike bracket.

A steel positioning stay is hinged to a stay bracket on the inside of the right leg. The stay engages in the positioning stay socket on the left leg and keeps the legs fully apart when the gun is in the firing position. It is adjusted by an adjusting nut fitted over the centre of the stay.

On top, in front of the stay housing bracket, is a cradle clamp, which engages in the socket in the rear transom bracket and secures the gun for travelling.

The left leg is in general similar in construction to the right leg with the following exceptions.

At the rear end is bolted the trail eye bracket, consisting of a spring-loaded pintle and two screwed pins, which engage the trail leg locking bracket on the right leg.

On the right of the leg below the pintle is the trail eye, which

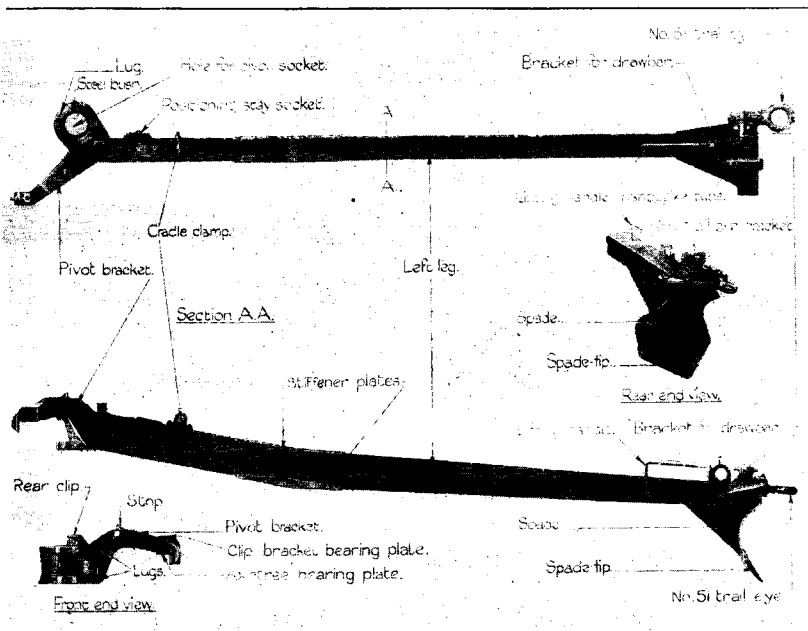


Fig. 2.—Left trail leg

can rotate in either direction. The rotation is limited to 40 degrees on either side of the horizontal by a rotation limiting stop. Should the angle of the towing vehicle require the gun to tilt more than 40 degrees, the lugs on the trail eye will shear a section of the stop and prevent severe damage to the towing attachment.

(b) *The pivot (or hinge) brackets* are riveted to the front ends of the trail legs, and are formed with upper and lower lugs through which the pivot socket passes.

The forward parts of the brackets are extended downwards to fit over the axletree and act as stops, the flanged parts being strengthened by webs. Clip bracket bearing plates are fitted on top and axletree bearing plates below.

On top of the brackets are stops to engage against the saddle and limit the movement of the leg. Rear clips engage in the bevelled flanges on the saddle supporting bracket.

(c) *The saddle supporting bracket* is fitted by its stem into a bushed hole in the centre of the axletree, and secured by a nut.

The rear of the bracket is, in general, circular and formed with upper and lower lugs, shaped to receive the pivot socket. Two bevelled flanges are welded to the under surface of the upper lug to engage in the rear clips on the hinge bracket.

(d) *The pivot socket* is bored to receive the saddle pivot, the stem of which protrudes through the nut at the base of the socket.

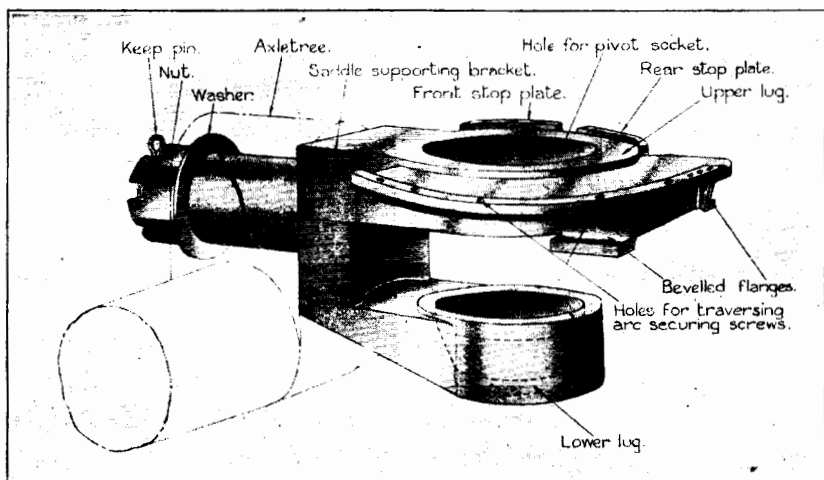


Fig. 3.—Saddle supporting bracket

The upper part is flanged to form a bearing surface and the lower part provided with an external screw thread for the pivot socket nut.

The centre of the socket is coned and the lower end reduced in diameter. The interior is fitted with two phosphor-bronze bushes, the upper one of which is flanged.

The pivot socket nut is screwed on to the base of the socket, flanged at the lower end, and provided with six Tommy holes for adjustment. Three grub screws prevent the nut from unscrewing. Counter-sunk in the upper surface of the socket nut is a pivot pin bearing washer secured by screws.

Ten oil holes in the socket and socket nut and external grooves convey grease from the pivot to the steel bushes of the pivot brackets.

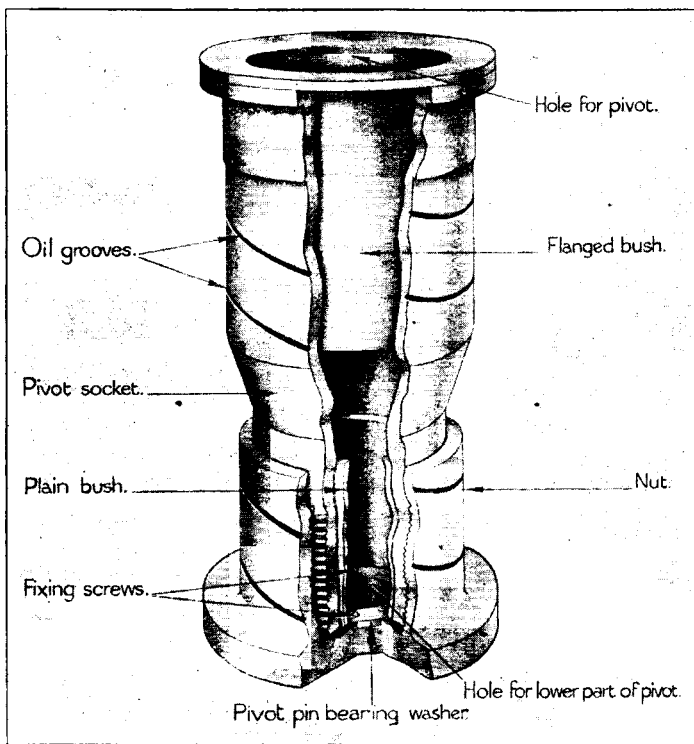


Fig. 3a.—The pivot socket.

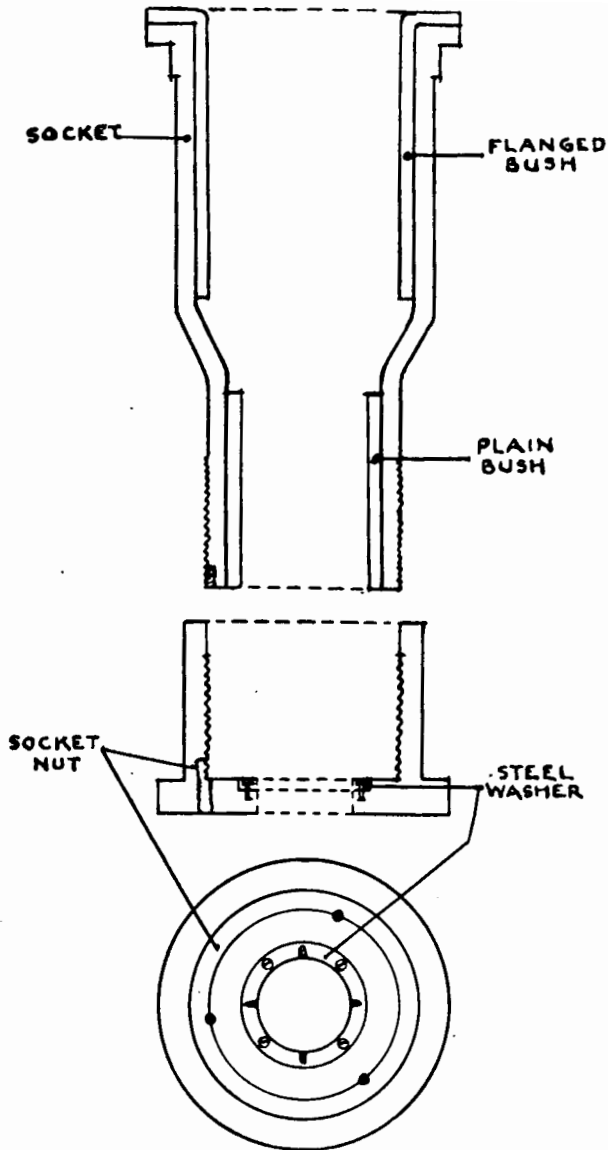


Fig. 4.—The pivot socket

(e) *The axletree.*—The Mk. I, No. 228 special axletree is a plain steel tube. In the centre is fitted a rounded vertical lug, which is bored and bushed to form a bearing surface for the stem of the saddle supporting bracket.

On either side, about 1 ft. from the lug, are top and front facing plates, which form bearing surfaces for the ends of the hinge brackets. Next to the facing plates are the leg hinge clip brackets, secured by bolts. A projection on top is fitted with an adjusting screw, which should be adjusted to suit the trail hinge bracket. The adjusting screw is retained by a locking plate.

The axletree is reduced in diameter towards each end to attach the stub axle brackets.

The No. 232 special axletree differs from the No. 228 in that it is a box-shaped welded unit, whose ends are inclined towards the trail eye. The clip brackets are replaced by vertical clip supporting plates, and towards the centre are secured facing and stop plates, which work in conjunction with the hinge brackets of the trail legs.

The Mk. IA axle tree is similar in general shape to the No. 232.

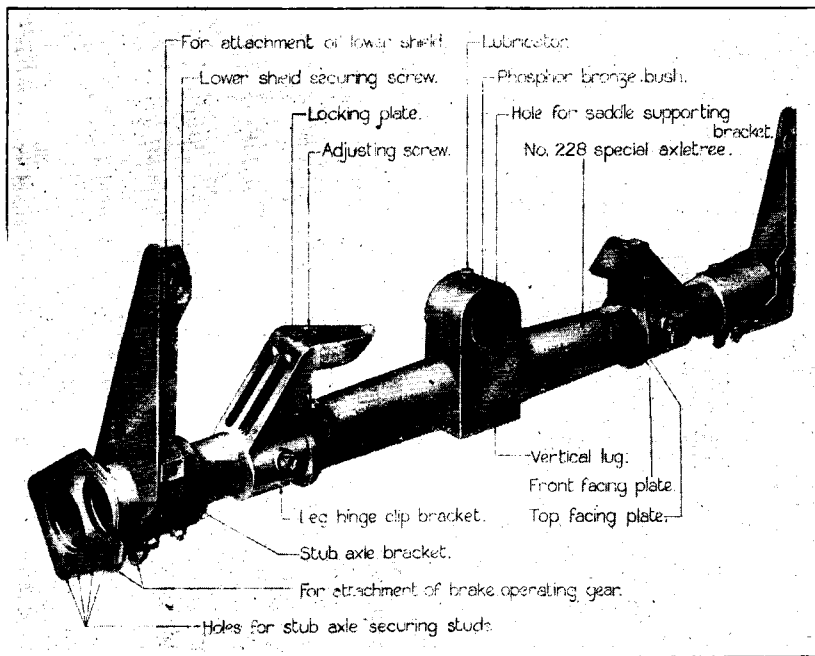


Fig. 5.—The axletree

(f) *The stub axle brackets* are secured to the tapered ends of the axletree by bolts. The outer flanges, to which the stub axles are secured, are rectangular in shape. Supporting plates are welded to the brackets for the attachment of the pawl quadrant and cam lever of the brake operating gear. Shield stays are welded to the brackets, each with two facing plates, to which is secured the lower shield.

(g) *The wheels and braking gear.*—Each wheel consists of an anti-friction detachable wheel hub, cover plate, operating cam and cam lever, brake shoe pivot pin, and brake shoe. The brake operating gear provides an independent system of braking for each wheel, operated by a hand lever on either side of the carriage. The gear can be adjusted by means of an adjusting screw.

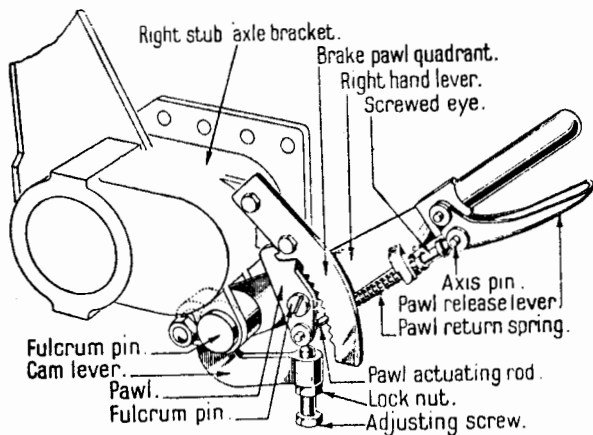


Fig. 6.—The brake operating gear

(h) *The lower shield* is in two parts, a main and a flap plate. The main plate is attached to the stub axle bracket. The centre of the plate is cut away to clear the ends of the trail legs and is covered by an arc-shaped saddle bracket cover plate. The flap plate is hinged below the main plate. Two staples fit hooks on the main plate and hold it in the travelling position.

(i) *The side shield* is filled with a bracket or a stay to hold it in position and lifting handles to facilitate handling it.

The *Mark I* No. 1 portable shield (see following figure) consists of a main plate and two subsidiary plates of bullet-proof steel. To the centre rear of the upper edge of the main plate is riveted a hinged socket, through the tubular portion of which passes a stay. The tubular portion is split at the lower end and is provided with a clamp with clamping handle. Riveted to the lower edge of the

main plate are two triangular-shaped feet to engage in the ground, whilst two lifting handles are positioned on the rear face.

The subsidiary plates are each provided with two lifting handles on the front face and two clip plates, with distance pieces, are riveted at the upper edge. In the centre of the rear face, just above the lower edge, is riveted a distance piece to position the subsidiary

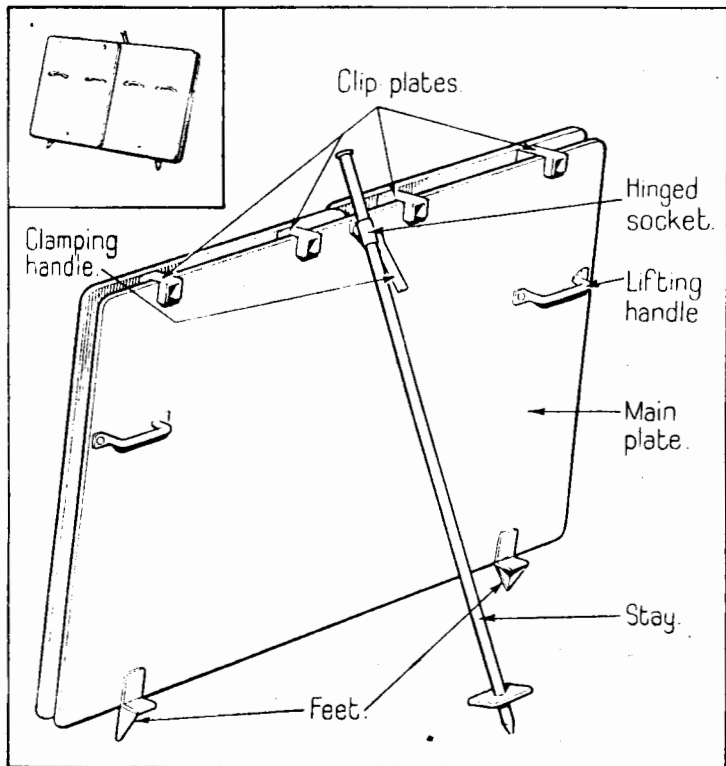


Fig. 6a —No. 1. Portable shield

plates about 2 ins. away from the main plate. The plates overlap one another, one plate being marked R (rear) and the other F (front).

The stay is of steel tube closed at the lower end by a spike whilst a disc is welded about 6 ins. above the spike to prevent it sinking too far into the ground. The upper end is closed by a plug having a flange to prevent the stay becoming detached from the tubular portion of the hinge socket of the main plate.

(j) *The trail castor* (see following figure) is clamped to the rear end of the trail and fits between the legs to enable a quick change of position to be carried out over short distances.

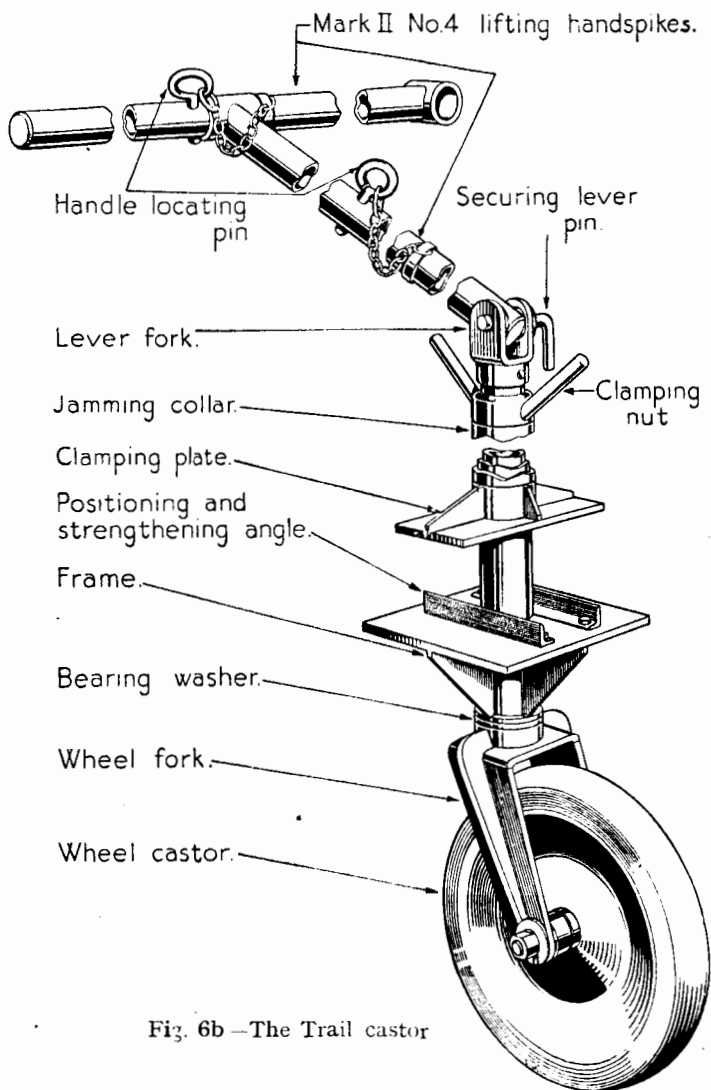


Fig. 6b —The Trail castor

It consists of a castor wheel made up of two steel pressings welded together and rotating on an axle fitted to a wheel fork. The wheel fork is an inverted U-shaped fitment to pass over the wheel which has a tubular extension screw-threaded at its upper end to receive a U-shaped lever fork. The lever fork is secured from independent rotation by a rivet passing through the fork and the tubular extension.

The lever fork is bored laterally and has two bosses welded to the inside of the arms of the fork opposite the boring, to receive a securing lever pin to secure a handspike to it.

Passing over the tubular extension of the wheel fork is a frame which is built up of a tube and angle pieces, all being welded together to form a platform on top of the castor wheel for the legs of the trail. After assembly, the legs are prevented from movement by an elongated clamping plate fitting on top of the legs over the tubular extension of the wheel fork. The whole is retained in position by a jamming collar and clamping nut.

To rotate the castor wheel and to apply pressure to permit movement of the rear end of the trail laterally or longitudinally, two No. 4 lifting handspikes are provided.

The *Mark II* No. 4 *lifting handspikes* have a hole at one end for the securing lever pin, whilst at the other end a tubular boss is provided to allow one handspike to pass through the other to form a T-handle. To prevent one handspike passing too far through the other a stop collar is secured to the handspike about the centre, where it is retained by a handle locating pin. The *Mark I* No. 4 trail lifting handspikes are obsolescent on the issue of the *Mark II*.

3. The superstructure consists of the following parts :—

- (a) the saddle,
- (b) the cradle,
- (c) the semi-automatic gear,
- (d) the elevating gear,
- (e) the sighting gear,
- (f) the firing gear,
- (g) the slipper,
- (h) the upper shield.

(a) *The saddle* consists mainly of a U-shaped frame and a pivot welded together and mounted in the pivot socket of the saddle supporting bracket. A semi-circular trunnion liner is secured to the top of each side of the frame. These, together with similar liners secured to the capsquares, which fit on to the top of the frame, form bearing surfaces for the trunnion arms of the cradle. The capsquares are extended and the upper shield attached to them, and supported

by two projections at the front. The elevating arc is secured to a projection on the left side of the frame. At the front and rear of the centre of the frame are the depression and elevation stops.

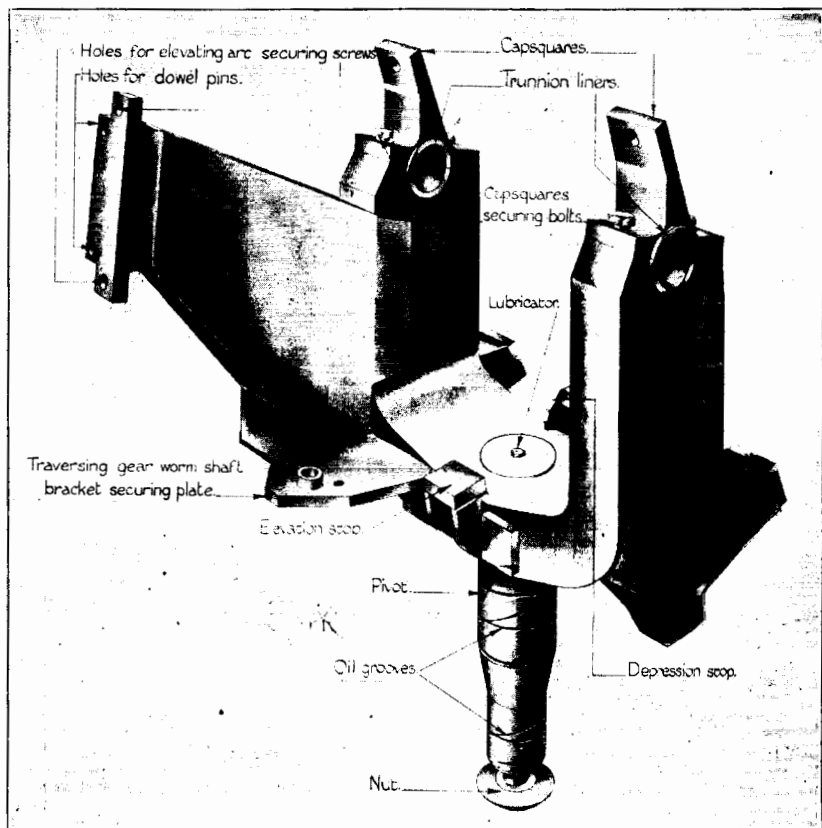


Fig. 7.—The saddle.

The *pivot* is cone-shaped and is provided with oil grooves. It passes through the pivot socket of the saddle supporting bracket, the short stem protruding through the nut of the pivot socket. A steel bearing washer is secured to the base of the pivot to rotate on the steel washer of the socket nut. The lower portion is threaded

to take a flanged nut, which is screwed hard up beneath the pivot socket nut and retained by a grub screw.

(b) *The cradle* is trough-shaped and generally tubular in section. The steel case is tubular with two slipper guides on top and two internal guides for the running-out springs compressor. A trunnion band with extended brackets and trunnion arms is welded to the case. The trunnion arms, which are provided with spiral oil grooves, fit into the trunnion liner bearings on the saddle. The rear transom bracket is welded to the rear of the case. Two lugs with

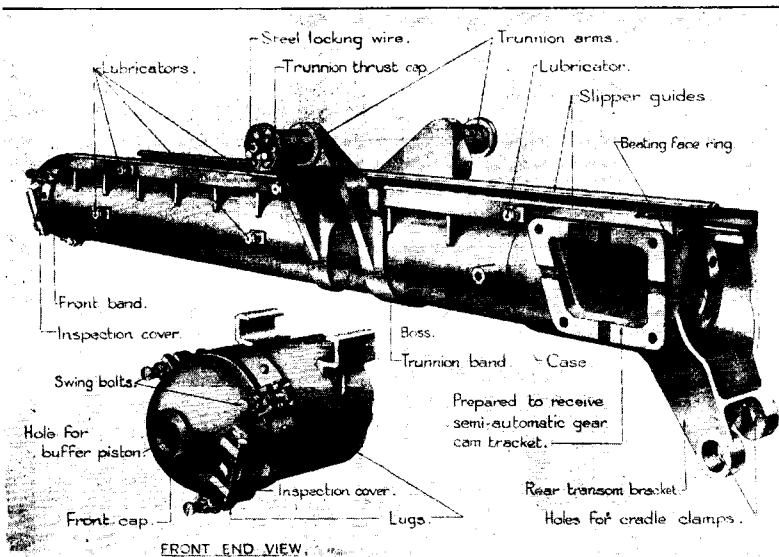


Fig. 8.—The cradle.

sockets engage the cradle clamps and secure the gun for travelling. On the rear face of the cradle a steel ring is welded, to form a bearing surface for the buffer cylinder. A beating face of rolled bronze, with an asbestos pad interposed, is secured to the steel ring.

On the left rear side, a machined surface receives the semi-automatic gear cam shaft. Forward of this is a boss, which holds the return spring hook of the firing gear. A similar boss on the right side holds the upper end of the firing lever connecting lever. The front band is riveted to the front end of the case and carries three sets of lugs with hinge bolts. These bolts engage in the lugs on the

front cap and are held in position by swing bolts. In the centre of the dome-shaped front cap is a hole for the piston rod with a flat at the top to prevent the rod from turning. On one side is a hinged brass inspection cover, through which the stuffing box gland can be inspected or adjusted. Lubricators are provided for the slipper guides and spring compressor.

(c) *The semi-automatic gear* is secured to the left rear of the cradle by the cam bracket, which is shaped to receive the component parts of the semi-automatic gear. The elevating gear wormshaft bracket is bolted to the upper arm of the bracket and supported by two dowel pins. Above the rear end is secured the firing gear levers supporting bracket, and the gunlayer's guard and traversing shoulder piece are screwed to the outer face. On the inner face is a cam which pivots at the front on a pivot lever. The front of the cam forms a bearing surface for a spring-loaded plunger contained in a chamber in the bracket. A cam shifting lever is pivoted on the bracket. The L-shaped arm, which engages under the cam, is fitted with a handle for moving the lever. A guide plate, on which are engraved the words HAND and S.A., is secured to the rear outer face of the bracket.

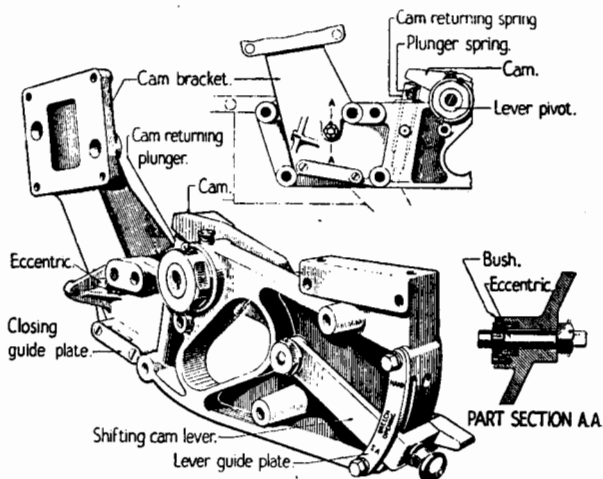


Fig. 9.—The semi-automatic cam bracket.

An eccentric is provided in the front of the outer face to allow the bracket to be adjusted to eliminate movement in the elevating gear due to wear. It is a short spindle, which fits into a boring in the cam bracket. The outer end is threaded for a square-headed nut which retains the eccentric in position. Towards the inner end is a

cone-shaped flange, which is serrated to engage in the serrations on the bush on the inner side of the cam bracket. The end is stud-shaped and offset from the centre of the spindle to form an eccentric. A key plate is held in a vertical slot in the rear end of the cradle and acts as a pivot for it.

(d) *The elevating gear* is contained in a wormshaft bracket bolted to the semi-automatic gear cam shaft bracket, and is operated by a

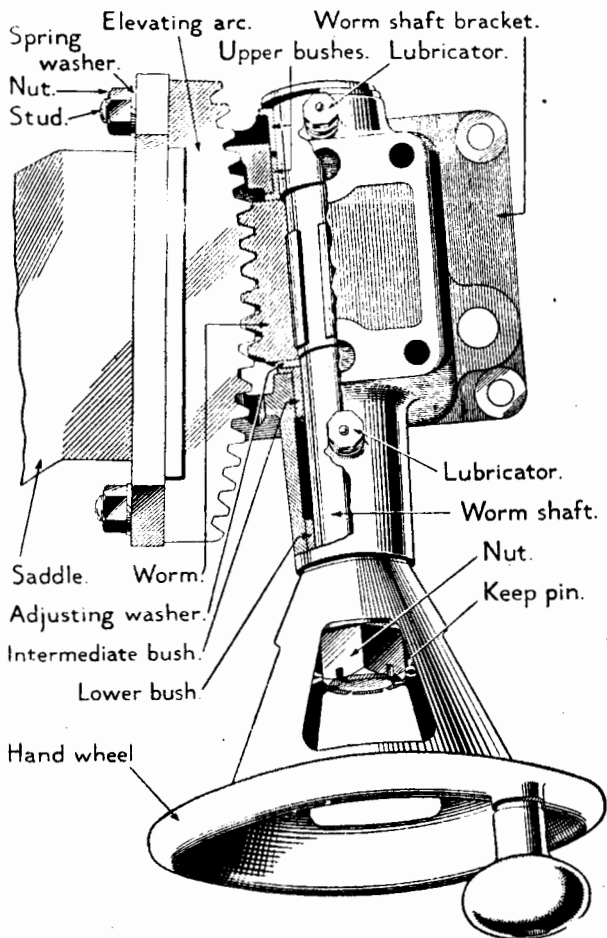


Fig. 10.—The elevating gear.

handwheel. The worm at the end of the wormshaft engages the teeth of the elevating arc, which is secured to the left side of the saddle. The wormshaft is rotated by the handwheel, secured by a nut and keep pin.

(e) *The sighting gear* consists of a sight supporting bracket, tangent elevation gear, telescope holder bracket, telescope holder, deflection gear with backsight, and a foresight bracket with foresight.

The sight supporting bracket is bolted to the wormshaft bracket of the elevating gear and supported by two dowel pins. On the front, two lugs house the connecting pin of the telescope holder bracket. The centre is bored for the tangent elevation eccentric, and two flanged bearing bushes are fitted to the centre of the bracket over which is bolted the quadrant. Below the bearings a stop screw acts as a rest for the tangent elevation gear.

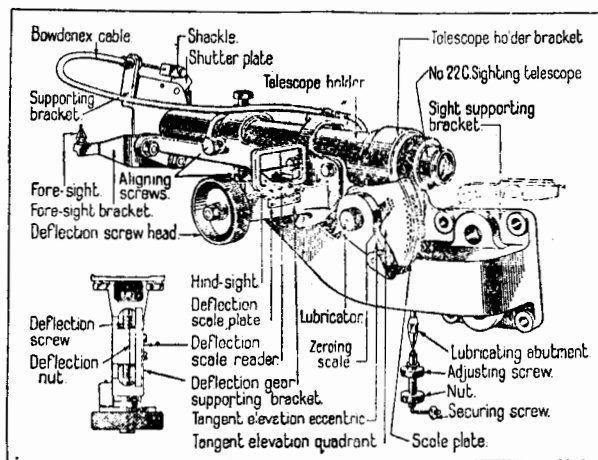


Fig. 11.—The sighting gear

The tangent elevation gear consists of an eccentric, shaped at its outer end to form a range reader arm ; a steel tangent elevation quadrant with detent holes to engage the range reader arm opposite the various ranges ; a scale plate graduated with " T " and the necessary ranges ; and a telescope holder bracket block bored to receive the eccentric.

The telescope holder bracket is of manganese bronze, with a lug on the under side about the centre to receive the sight supporting bracket connecting pin ; and at the rear a rectangular opening to receive the telescope holder bracket block and eccentric, to enable tangent elevation to be applied to the sight. Below the opening the

bracket has a machined surface to rest on the stop screw of the supporting bracket, and the upper part is in the form of two collars to receive the telescope. The front collar has four aligning screws to enable the telescope to be positioned in the bracket. Under the rear collar is a featherway to receive the screw on the telescope holder.

The front end is shaped to receive the foresight bracket.

The telescope holder is in the form of a steel tube, with front and rear bearings for the telescope, a telescope holder screw to prevent the holder rotating in the bracket, and an internal featherway to receive the feather in the telescope. On the rear there is a knurled locking nut to hold the telescope in position.

The deflection gear with backsight consists of a supporting bracket secured to the telescope holder bracket, a deflection screw, a deflection scale plate, a deflection screwhead (knurled on its rim), a deflection scale reader, and a back sight. The backsight may be a rectangular frame with crosswires, or a steel plate with a "U" cut in the centre.

The foresight bracket is attached to the front of the telescope holder bracket and carries the foresight, which may be either acorn-shaped or a fine steel pin. The foresight is screw threaded at the base to enable adjustments for elevation to be made.

Action of the sight. Movement of the range reader arm from "T" to the required range turns the eccentric, and raises the rear end of the telescope and backsight by an amount equal to the tangent elevation for that range. The sight is realigned on to the target by the elevating gear, and the correct tangent elevation is applied to the gun.

Sighting telescope shutter gear. This consists of a steel shutter operated by a Bowdenex cable. As the firing lever is pulled, or the firing grip squeezed, the shutter plate is pulled over the object glass of the telescope, protecting it from damage at the moment of firing. When the firing lever or squeeze grip is released, the shutter is pulled clear of the telescope by the shutter spring.

The telescope sighting 22c is of the fixed focus type, and has the following characteristics:—

Magnification ...	...	1 diameter.
Field of view ...	...	21° approximately.
Overall length ...	...	14·5 inches approximately.

It consists of a body, window, four lenses, glass diaphragm, and rain shade. There is a feather to prevent the telescope rotating in the holder.

On the surface of the glass diaphragm are etched a vertical and a horizontal cross line. The horizontal cross line thickens 1° 30' on either side of the centre, and this amount is divided by two short vertical lines into three equal portions of 30' each. By means of these short lines a total deflection of 1° 30' on either side of the

vertical cross line may be measured in units of 30'. The letters R and L are etched below the horizontal line on the left and right respectively of the vertical cross line.

(f) *The firing gear* is mounted on a supporting bracket secured to the semi-automatic gear cam bracket. It consists of an operating lever connected to a spring-return firing lever by a connecting rod and bell crank lever. A flat surface on the firing lever enables the gun to be fired should the firing gear be damaged or badly adjusted. The toe of the lever is threaded to hold an adjusting screw. (See Lesson 16, para. 2.)

(g) *The slipper* is the means by which the gun is attached to the recoil system. It is made up of welded plates and has a base plate to either side of which three bronze liners with lubricating grooves are fitted. The slipper slides in the guideways on the cradle. Slide cover plates and leather packing strips prevent dust and grit entering the cradle guideways. On top are a front and a rear band to house the gun. Two guideways in the rear band fit the gun guides and prevent the gun from turning. Two holes in the band are provided for bolting the slipper to the rear of the gun. Below the rear band a lug holds the buffer cylinder. A featherway engaging in the feather on the buffer cylinder prevents it from turning.

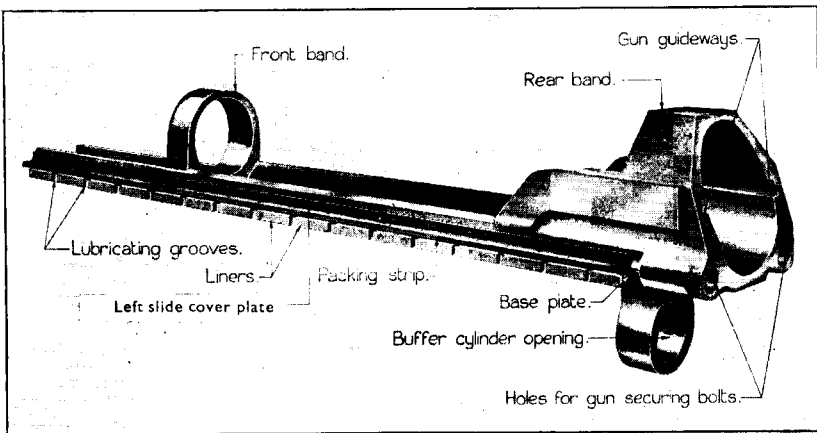


Fig. 12.—The slipper

(h) *The upper shield* is waved on top to assist camouflage, and is attached to the capsquares and saddle. A hole in the centre is provided for the gun and cradle, and on the left an aperture sight

box with a hinged lid houses the sighting gear. Brackets, clips, hooks and staples are riveted on the front and rear of the shield for carrying stores.

4. The recoil and recuperating system comprises a hydraulic buffer and a spring recuperator carried in the cradle. The buffer and the springs absorb the force of the recoil. The recuperator returns the gun to the run-out position and retains it there at all angles of elevation.

The exterior of the *buffer cylinder* is screw-threaded for approximately three-quarters of its length to take the running-out springs compressor. Near the rear is a collar against which the springs can be compressed. In rear of the collar is a feather which engages in the featherway in the slipper lug and prevents the cylinder from turning. The rear part of the cylinder has external screw threads to receive the gun securing nut and keep pin. The inside of the cylinder is polished and has five equally spaced grooves, which deepen from front to rear. Screw threads at the rear hold the rear plug, and at the front the stuffing box.

The *stuffing box* is flanged at the front, and at the rear is provided with external screw threads to fit into the front end of the buffer cylinder. A soft copper washer fits into the groove in the rear of the flange to make a liquid-tight joint. The flange has six semi-circular spanner slots, one of which is engaged by a key secured by means of a screw, to the right projection on the head of the compressor, preventing the stuffing box from turning.

Inside, at the rear, an L-shaped leather ring is retained by a screwed phosphor-bronze supporting collar which is slotted to receive a screwdriver. An asbestos packing ring, supported on each side by a cup-shaped bronze packing collar, is placed in front of the L-shaped ring. A bronze gland, with external screw threads, fits into the stuffing box. The bearing surface is shaped to reduce friction between the gland and the piston rod.

The *rear plug* is screwed into the rear of the buffer cylinder to form a control chamber, with a soft copper washer placed in front of the rear flange to make a liquid-tight joint. The interior of the front is threaded to receive a cylinder, and the rear is bored and threaded for the filling hole plug, air hole plug and run-out adjusting valve.

The *cylinder* is screwed into the rear plug. A throttling bush is screwed into the front of the cylinder, forming a bearing surface for the piston rod.

The gland locking plate is shaped to fit over the rear end of the run-out adjusting valve gland and air hole plug, to prevent them from turning.

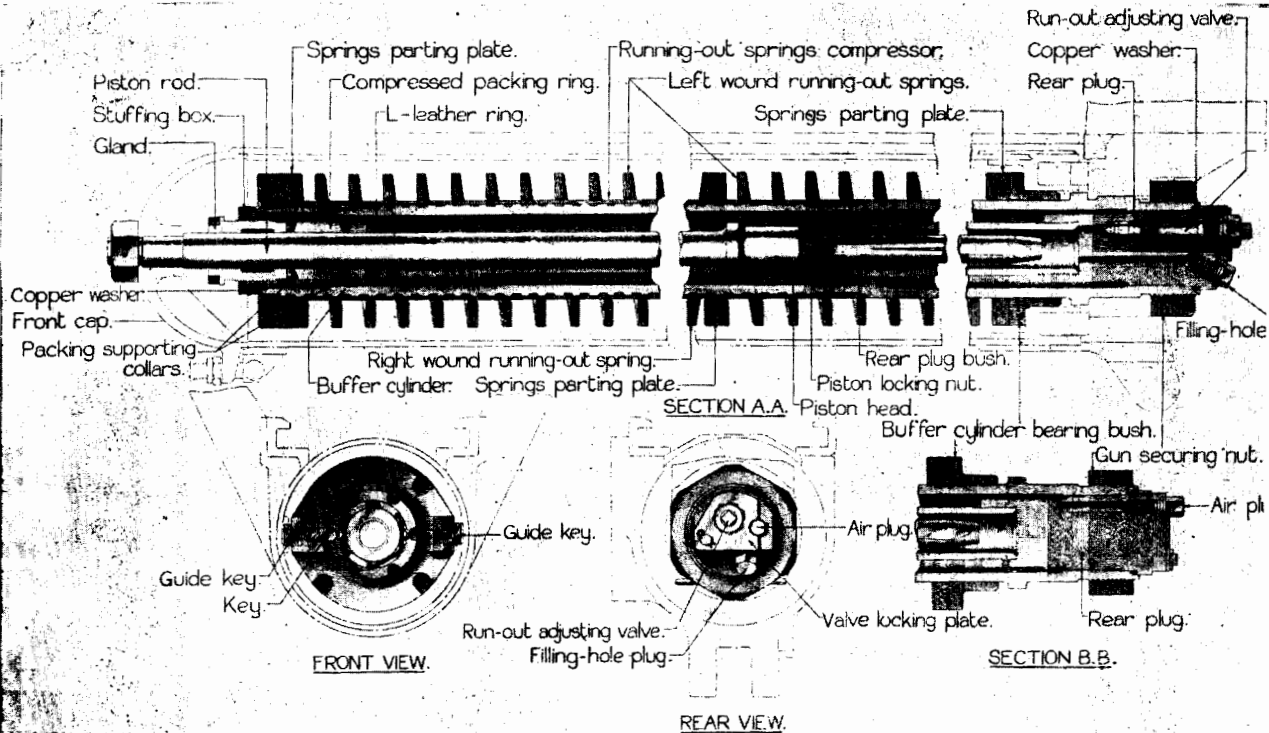


Fig. 13.—The recoil system

The piston consists of a piston rod and a piston head.

The piston rod is attached to the front of the cradle by a nut, and a flat behind the thread prevents the rod from turning. The piston head fits on to the rod towards the rear, being retained in position by a locking nut. The rear end forms a control plunger which operates in conjunction with the control chamber of the rear plug. There is a flat cut on the control plunger which tapers towards the front.

The recuperator consists of three springs, four parting plates, a buffer cylinder bearing bush and a running-out springs compressor. The springs, one right-handed and two left-handed, fit over the buffer cylinder, with the right-handed spring in the centre. The ends are squared to form bearing surfaces for the parting plates.

Two parting plates separate the springs, and one is placed at each end of the spring assembly.

The buffer cylinder bearing bush fits between the rear parting plates and the rear transom bracket of the cradle. It is L-shaped and the inner surface recessed to minimize friction between the buffer cylinder and the collar.

The running-out springs compressor has internal square threads at the rear to engage similar threads on the buffer cylinder. The head of the compressor is enlarged to form a bearing surface for the front parting plate and to hold the springs under initial compression. Two guide keys in the head engage in the guideways on the cradle, to prevent the compressor from turning and to support the front end of the buffer and recuperator.

5. Ordnance, Q.F., 6-pr. 7-cwt., Mks. II and IV.

The gun consists of a barrel, breech ring and muzzle recoil brake:—

(a) *The barrel* is either an autofrettaged or high tensile steel forging with right-handed polygroove plain section rifling. In rear of the rifling the barrel is coned to form a chamber for the cartridge. On the outside of the chamber are two ribs which prevent the gun from rotating in the slipper. Both ends of the barrel are threaded, left-handed at the front for a muzzle recoil brake, and right-handed at the rear for the breech ring. Fine axis lines are cut across the muzzle face, the lower horizontal one being displaced to allow for jump.

(b) *The breech ring* is a rectangular steel block screwed to the barrel and locked in position by a breech ring securing screw. It contains the breech mechanism, and acts as an anchor for the slipper. A recess in the rear holds the breech block. Two inclined grooves in the recess act as guides for the breech block. The front face of the breech block

recess is slotted to take the extractor levers, and the lower portion is inclined to clear the crank and a lower face prepared to act as a crank stop. On either side of the inclined plane are holes, lined with bronze bushes, for the actuating shaft and actuating shaft sleeve. Various other holes are provided for the breech and firing mechanisms.

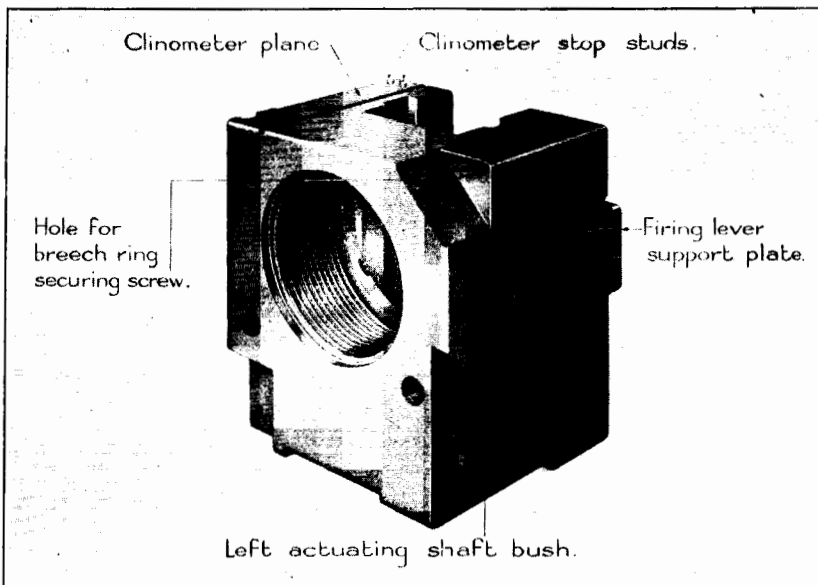


Fig. 14.—The breech ring (front)

- (c) *The muzzle recoil brake* is fitted over the muzzle end of the barrel to reduce the effects of bounce on the carriage. It is shaped in the form of a hollow bulb. The front end is bored for the passage of the projectile and the rear end is bored and fitted with a left-handed thread to screw on to the muzzle, to which it is secured by a set screw and locking nut. On each side is a rectangular hole. When the projectile reaches the front end of the brake the gases can escape through the holes in the side.

NOTE.—The Mark IV gun is similar in design to the Mark II, except that it is approximately 16 ins. longer, slimmer in construction and lighter in weight.

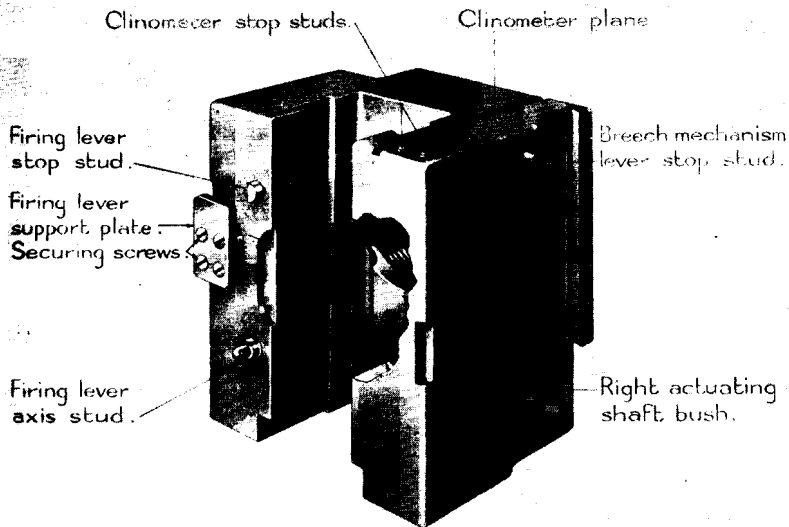


Fig. 15.—The breech ring (rear)

6. **The breech mechanism** is of the semi-automatic type. The gear on the cradle operates an actuating shaft, the rotation of which causes the breech to be opened, the fired cartridge case to be ejected and the striker to be re-cocked, as the gun returns to the run-out position.

The extractors hold the breech open until a fresh cartridge is inserted, when a spring, which has been compressed by opening the breech, is released and closes the breech. A breech mechanism lever is pivoted on the actuating shaft to allow the breech to be opened by hand.

The mechanism is arranged for percussion firing and safety arrangements are provided. Obturation, or sealing of the breech, is provided by the cartridge expanding in the chamber when the gun fires.

The breech mechanism consists principally of the following parts :—

- (a) the breech block,
- (b) the spring case,
- (c) the rack pinion,

- (d) the actuating shaft,
- (e) the breech mechanism lever,
- (f) the crank and cocking link,
- (g) the extractors,
- (h) the striker,
- (i) the firing lever.

(a) *The breech block* closes the breech end of the gun and supports the cartridge during firing. The semi-circular recess on top of the breech block provides a loading tray and centres the round during loading. A gas escape hole is bored from the top surface of the

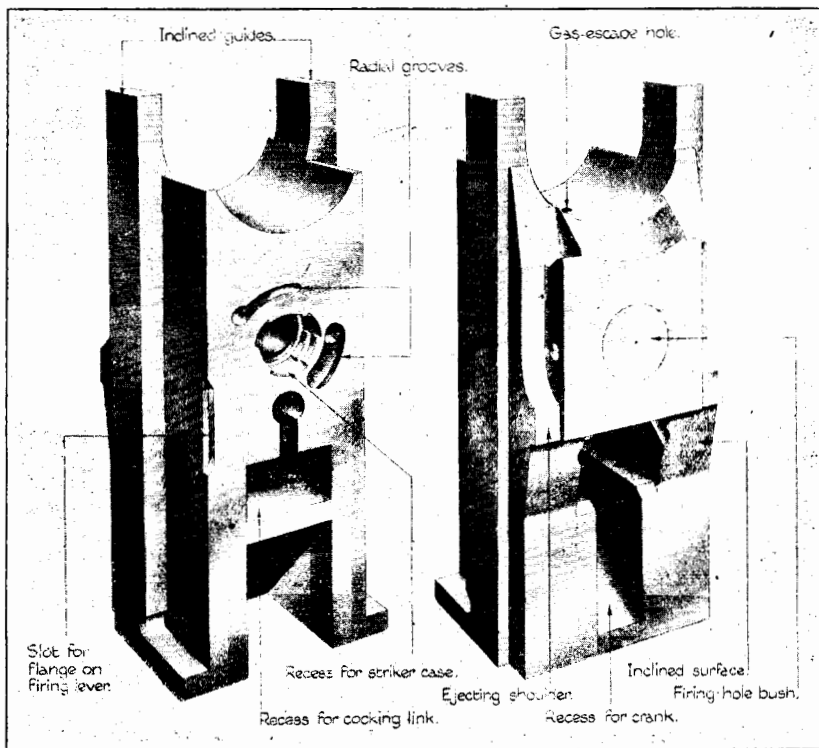


Fig. 16.—The breech block

block to the rear of the firing hole bush. To ensure that the gun cannot be fired until the breech is fully closed, a slot is cut in the left-hand edge of the rear face of the block. The gun can only be fired when the flange on the firing lever is opposite this slot.

On each side of the firing hole bush is a groove terminating in an inclined plane and shoulder. The extractors ride in the grooves and unseat the round from the chamber when they meet the inclined plane. The shoulders force the extractors to eject the empty case. When the breech block begins to rise, the hooks on the extractors engage in two stops on the face of the block, holding it down.

The block is bored to receive the striker mechanism, the cocking link and the crank. On the rear face are two grooves, in one of which rides the safety catch plunger and in the other the striker case retaining plunger.

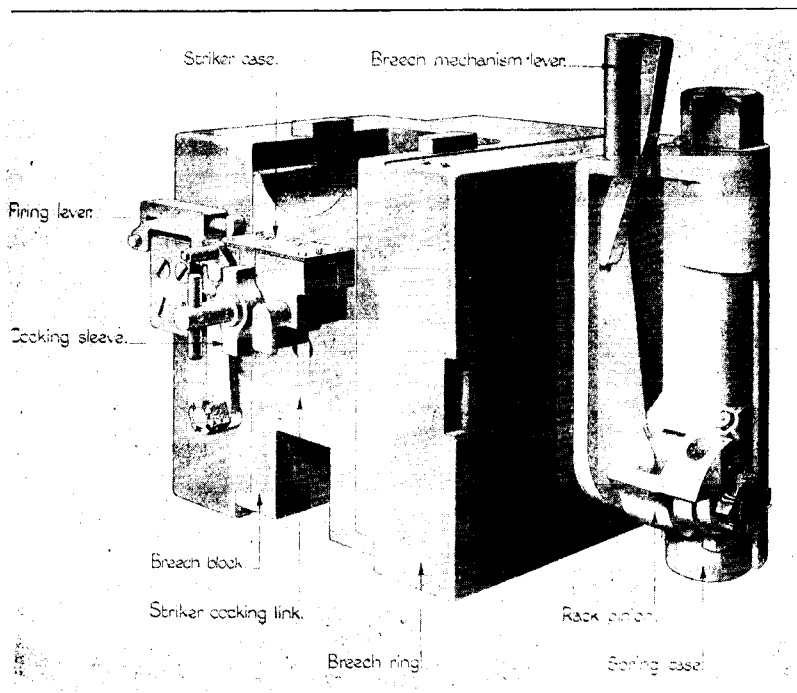


Fig. 17.—The breech closed

(b) *The spring case* is fixed to the right-hand side of the breech ring, and contains a spiral breech block actuating spring and a toothed rack, which compresses the spring when the breech is opened. The lower end of the case is cut away to allow the rack to engage the rack pinion. Tension can be increased on the spring by screwing down the cap which closes the top of the case, and locking it with the set screw.

(c) *The rack pinion* is bored, and feathers provided to fit the featherways on the actuating shaft. Five stub teeth engage in the teeth of the rack. A projection on the pinion is designed to engage the toe of the breech mechanism lever and a hole drilled for a tommy bar to assist in closing or opening the breech block.

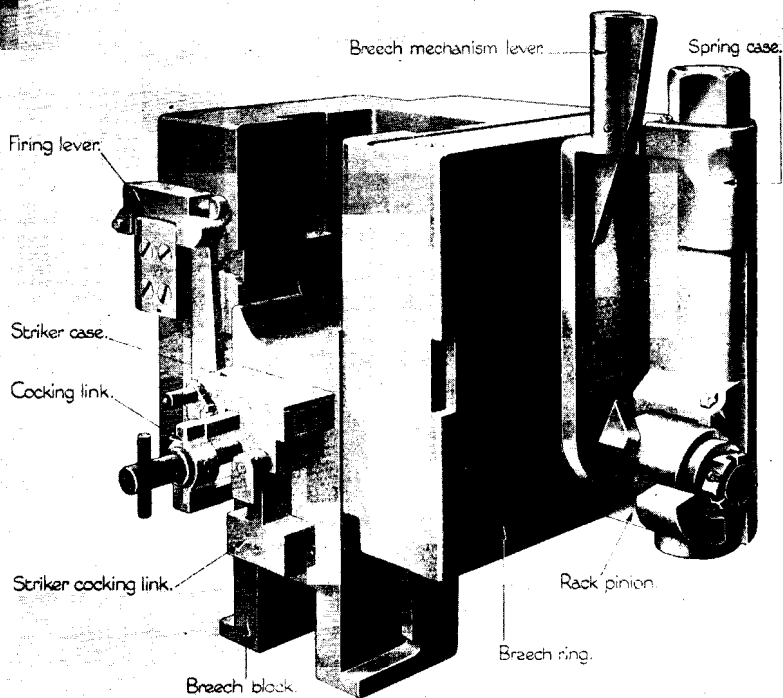


Fig. 18.—The breech open

The rack pinion provides the means by which movement is transmitted between the actuating shaft and spring.

(d) *The actuating shaft* operates in the lushed bearings in the breech ring and is retained by a slotted nut and keep pin at the right-hand side. Three featherways on the shaft engage the feathers on the crank, actuating shaft sleeve and rack pinion. A crank on the left end, to which a roller is fitted, operates with the cam of the semi-automatic gear.

(e) *The breech mechanism lever* is pivoted on the actuating shaft. A projection engages a similar projection on the rack pinion and enables the lever to open the breech block. The lever is retained in the upright position by a spring-operated retaining catch lever in the handle, which engages in a recess in the breech ring.

The actuating shaft sleeve fits over the actuating shaft, the feathers engaging the featherways on the actuating shaft. A flange

BREECH CLOSED.

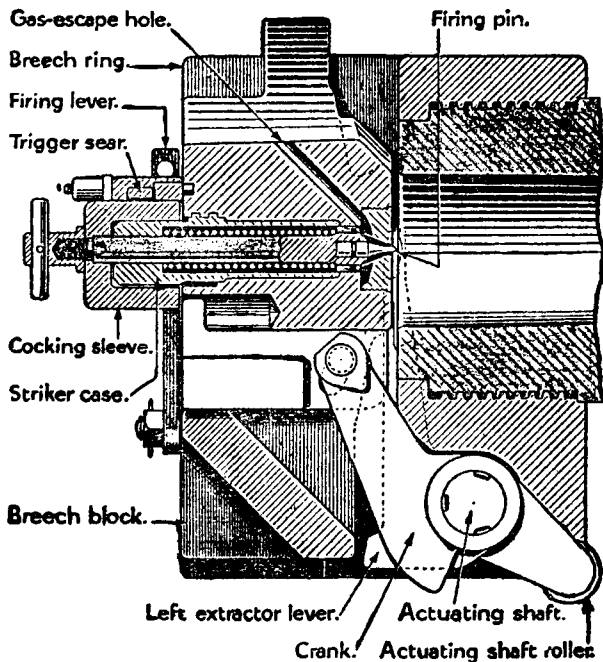


Fig. 19.—The breech closed

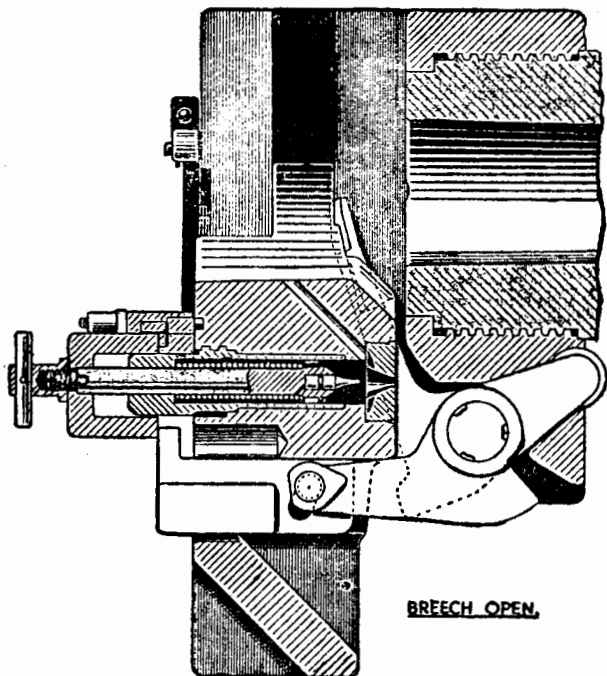


Fig. 20.—The breech open

on the right-hand side forms a bearing surface for the mechanism lever.

(f) *The crank*, which is attached to the cocking link by a pin, raises or lowers the breech block. The lower end of the arm is bored and feathered to fit over the actuating shaft. The upper end is forked, each fork being bored to receive the pin, and shaped as a trunnion to move in the groove and plane in the breech block. Flats on the forks retain the block in the closed position by bearing against the interior of the cocking link recess. A stop below the actuating shaft limits the downward movement of the breech.

The cocking link is a rectangular block with a guide on top, which moves in the guideways in the breech block. The toe at the rear of the rib engages the cocking sleeve of the breech. At the front an elongated hole allows the actuating pin to pass through and connect it to the crank.

(g) *The extractors* of steel are two in number, left and right. The upper end is prepared to engage with the rim of the cartridge case, whilst below, a hook is formed to engage the stops on the front face of the breech block when the breech is open, thus retaining the latter in the open position against the pressure of the breech block actuating spring until a cartridge has been inserted in the chamber.

The lower end of the levers is enlarged and bored to pivot freely on the actuating shaft. Lugs are provided which, when engaged by the inclined planes and shoulders on the breech block on opening, serve to operate the levers to unseat and eject the cartridge case.

(h) *The striker case* is attached to the breech block by interrupted thrust collars and contains the striker mechanism.

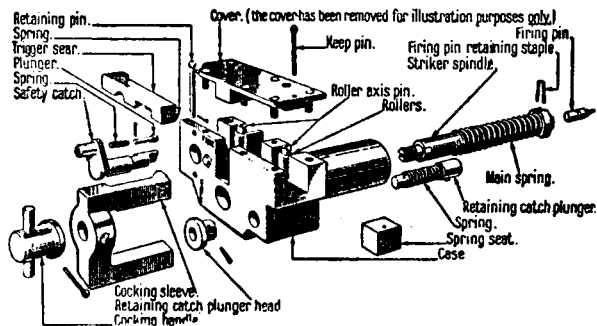


Fig. 21.—The striker case and components.

The trigger sear is a small steel bar with a groove to allow the cocking sleeve to move to the rear. A stop face at the end of the groove retains the sleeve in the cocked position, an inclined plane being prepared to ensure the action of cocking. A semi-circular slot in the lower surface allows the safety catch to enter. The right-hand end has a recess for the sear-spring. This is compressed against the sear spring seat, which is held in position by a keep pin.

Two rollers in the case reduce the friction of the sear on its bearings.

The safety catch consists of a spindle and an arm, with a spring plunger, shaped to fit into the recesses in the striker case, and retain it in the SAFE or FIRE positions. A flat cut in the spindle allows the sear to move when the catch is at FIRE, but fouls the slot in the sear when it is at SAFE.

The inner end of the spindle has a flat which prevents the striker case being removed when the safety catch is at FIRE.

The retaining catch plunger in the right-hand side of the case engages in the slot in the breech block and locks the case on the block. It is held in the slot by a spring, and a finger grip is provided on the end to enable it to be withdrawn.

The *cocking sleeve* fits on to the rear of the striker spindle immediately in front of the cocking handle, and an internal rivet engages a keyway in the recess of the striker spindle. It has two arms. The upper one is slotted to bear against the sear stop face and retain it in the cocked position, an inclined plane being prepared to ensure the action of cocking, and the lower one bears against the under surface of the case to prevent it from turning. The toe engages the cocking toe of the cocking link.

The *striker spindle* has a large head which forms a bearing surface for the front end of the main spring, which fits over the spindle, the rear end being held by the rear wall of the striker case.

Two slots are cut across the head for gas escape channels. The *firing pin* is held in position in the head by a staple. Towards the rear end of the spindle is a keyway which engages a rivet on the cocking sleeve and prevents the spindle rotating.

The *cocking handle* screws on to the end of the spindle against the cocking sleeve and is secured by a keep pin. It retains the cocking sleeve and striker spindle in position and the main spring under initial compression. A cross-handle enables the striker to be cocked by hand.

SECTION 3.—ORGANIZATION

ANTI-TANK PLATOON—INFANTRY BATTALION

Transport.

Organization.

Platoon Headquarters

Carrier, universal	...	Platoon commander (Captain). Driver-mechanic.
Motor cycle	...	Platoon 2 IC (Subaltern).
Motor cycle	...	Platoon orderly.
Truck, 15-cwt., G.S.	...	Platoon serjeant. Storeman. Driver-batman.
Truck, 15-cwt., G.S.	...	Fitter, M.V., R.E.M.E. Fitter, general, R.E.M.E. Driver-batman.

Three sections, each :—

Motor cycle	...	Section orderly.
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Detachment

Carrier, Loyd	...	Section commander (Serjeant). Corporal. 2 gun numbers. Driver-mechanic.
Carrier, Loyd	...	Gun number. Driver-mechanic.

Detachment

Carrier, Loyd ...	...	Detachment commander (Lance-Serjeant).
		3 gun numbers.
		Driver-mechanic.
Carrier, Loyd ...	...	Gun number.
		Driver-mechanic.

Total : Officers, 2 ; other ranks, 53.

SECTION 4.—GUN DRILL

General.

Instructor's Notes

1. *Stores required for all lessons in this section :—*

Equipment complete with vehicles, drill cartridges and boxes. When no vehicle is available, the gun numbers take up positions on the ground corresponding to their positions in the vehicles. The trail will be rested on a platform.

2. *Although the duties of each number are detailed separately in the following lessons, it must be understood that all numbers work simultaneously.*
3. *All executive words of command are in inverted commas.*

Explain :—

1. The detachment consists of the following :—

The detachment commander. (In odd numbered detachments the detachment commander carries out the duties of section commander.)

No. 1. (The layer.)

No. 2. (The loader.)

No. 3. (The second in command of the detachment and the link number.)

No. 4. (The ammunition number.)

2. The gun can be towed by any vehicle provided with a towing hook ; it is normally towed by a Loyd carrier.

3. The detachment should be trained in the duties of all numbers. The drivers should be trained as gun numbers and at least two gun numbers should be able to drive the carriers.

4. When the gun is not hooked-in, the " right " and " left " sides of the gun are referred to in relation to the direction in which the muzzle is pointing. When the gun is hooked-in, the right and left sides are termed " near " and " off " sides respectively.

5. The formation adopted for any platoon parade with vehicles must primarily depend on the ground available.

The following methods, are, however, suggested :—

- (a) *Inspections*.—The towing vehicles and 15-cwt. trucks are formed up in line, with the ammunition carriers covering off in rear. The detachments fall in in front of the towing vehicles, with the detachment commander in front.
- (b) *In column*.—On the order "**Fall in**" the detachments fall in as in Lesson 1, para. 1.

LESSON 1.—FALL IN—NUMBER—CHANGE ROUND —MOUNT—DISMOUNT—STAND FAST

1. "**Fall in.**"

- (a) The instructor details five men to act as the detachment. When the gun is hooked-in, the detachment falls in in single rank three paces from the muzzle; No. 1 covering the "off" gun wheel, Nos. 2, 3, and 4 on his left, and the **detachment commander** one pace in rear and in the centre of the detachment.
- (b) In action. The detachment will fall in as above, one pace in rear of the equipment, No. 1 covering off the "right" wheel.

2. "**Number.**"

The detachment will number in sequence, beginning with No. 1.

3. "**Change round.**"

The **detachment commander** takes a pace to his left and a pace to his left front. No. 1 takes a pace to his left rear and a pace to his left. Nos. 2, 3, and 4 take two short paces to the right.

The **detachment commander** will give the order "**Number**" immediately after the change round is completed.

4. "**Mount.**"

The detachment double to the carriers and take up the following positions in the vehicles :—

Towing carrier : **Detachment commander** on the left of the driver; No. 3 on the right of the driver; No. 2 behind the detachment commander; No. 1 behind No. 3.

Ammunition carrier : No. 4 on the left of the driver.

5. "**Dismount.**"

The detachment double to their positions as for "**Fall in.**"

6. "Standfast."

All numbers will stop whatever work they are doing. On the command "Go on" work is continued.

LESSON 2.—TO MOVE THE GUN

1. "With dragropes—prepare to advance."

The **detachment commander** goes to the muzzle. No. 2 goes to the right side of the trail, inserts the handspike through the trail rings and puts in the locking pin. No. 1 goes to the left side of the trail and puts the locking pin in the handspike. No. 3 removes the lower dragrope and attaches it to the left wheel dragrope washer. No. 4 removes the upper dragrope and attaches it to the right wheel dragrope washer. All numbers then take up positions ready to advance.

"**Quick.**" The **detachment commander** bears on the muzzle. Nos. 1 and 2 lift the handspike. Nos. 3 and 4 take the strain on the dragropes.

"**March.**" The detachment move the gun forward under the control of the **detachment commander**.

"**Halt.**" The detachment lower the handspike and ropes and stand to attention.

"**Fall in.**" No. 2 replaces the handspike. Nos. 1 and 2 replace the locking pins and Nos. 3 and 4 the dragropes. The detachment then fall in. (See Lesson 1, para. 1 (a)).

2. "Without dragropes—prepare to advance."

The **detachment commander** goes to the muzzle, No. 2 goes to the right side of the trail, inserts the handspike through the trail rings and puts in the locking pin. No. 1 goes to the left side of the trail and puts the locking pin in the handspike. No. 3 takes up a position on the left side of the shield and No. 4 on the right side.

"**Quick.**" The **detachment commander** bears on the muzzle. Nos. 1 and 2 lift the handspike. Nos. 3 and 4 prepare to push on the lower shields.

"**March.**" The detachment move the gun forward under the control of the **detachment commander**.

"**Halt.**" Nos. 1 and 2 lower the handspike and all numbers stand to attention.

"**Fall in.**" No. 2 replaces the handspike. Nos. 1 and 2 replace the locking pins and the detachment fall in. (See Lesson 1, para. 1 (a)).

LESSON 3.—PREPARE FOR ACTION

Instructor's Notes

This lesson will be carried out at the commencement of all subsequent drill periods.

"Prepare for action."

The **detachment commander** doubles to the muzzle. No. 1 doubles to the left side of the breech cover and No. 2 to the right side. No. 3 doubles to the left side of the shield and No. 4 to the right side.

The **detachment commander** removes the muzzle and cradle covers, bears down on the muzzle and orders "**Open**". When the trail legs are open, he ensures that the muzzle brake, if fitted, is properly secured, or that the counterweight is removed; that the gun, buffer and recuperator are properly connected; inspects the bore and reports "**Bore clear**". He supervises the work of the detachment and orders "**Close**" when Nos. 1 and 2 are ready. He satisfies himself that the detachment and gun are ready for action. When necessary he will replace the muzzle and cradle covers.

No. 1, with the assistance of No. 2, removes the breech and sight cover and opens the trail legs. He examines the left trail leg, the left wheel, brake and shield, the sight and sight port cover. He tests the free traverse of the gun and the elevating gear. When No. 2 has closed the breech he will test the firing gear, easing the striker forward with one hand. Assisted by No. 2 he closes the trail legs when ordered by the **detachment commander**, and replaces the breech and sight cover.

No. 2 assists No. 1 to remove the breech and sight cover. He unlocks the trail legs and assists No. 1 to open them. He opens the breech by pulling down the breech mechanism lever, and returns it to its upright position. When the **detachment commander** has reported "**Bore clear**", he examines and closes the breech by pressing forward the extractors and controlling the upward movement of the breech by means of the breech mechanism lever. He examines the right trail leg and the positioning stay and ensures that the handspikes are securely strapped. He examines the right wheel, brake, and shield. He assists No. 1 to close the trail legs, locks them and assists No. 1 to replace the breech and sight cover.

No. 3 examines the lower dragrope, the shield flap and, assisted by No. 4, all the ammunition and stores in the carriers.

No. 4 examines the upper dragrope and the shield flap. He then assists No. 3 to examine the ammunition and stores.

On completion of their duties the detachment fall in and report the state of the gun to the **detachment commander**, who in turn reports to the platoon or section commander "**No. . . . gun ready for action**".

LESSON 4.—ACTION

1. On selecting a suitable position in which to bring the gun into action, the **detachment commander** orders the driver to slow down, dismounts and doubles round to the off side of the vehicle, placing himself so that he can see when the gun is on the required position. He then raises his right hand and orders: "**Halt—Action rear— . . . boxes**".

On this order Nos. 1 and 2 dismount. No. 1 places himself on the off side and No. 2 on the near side of the trail. No. 1 depresses the catch of the vehicle towing hook, calls "**Lift**", and, assisted by No. 2, lifts the trail clear of the hook and reports "**Unhooked**" to the **detachment commander**. Nos. 1 and 2 then lower the trail to the ground. The **detachment commander** drops his hand as a signal to the driver to move forward two yards. Nos. 3 and 4 remove the boxes ordered and No. 4 orders the driver to proceed to the vehicle position detailed by the **detachment commander**.

The **detachment commander** removes the cradle and muzzle covers, if necessary, and places them on the right of the gun. He bears down on the muzzle, orders "**Open**", and takes up a position a short distance from the gun on the up wind flank, from which he can control the fire of the gun.

Nos. 1 and 2 remove the breech and sight cover and place it on the right of the gun.

No. 1 assists No. 2 to open the trail legs and, when the legs are fully open, applies the left brake. He depresses the gun until it is approximately horizontal. He then takes up a position on the left of the gun, kneeling on his right knee with the traversing shoulder piece under his right arm pit, his right arm pointing to the rear and downwards and his left hand holding the elevating handwheel. His eye must be twelve inches from the telescope.

No. 2 releases the trail clamp and, with No. 1, opens the trail legs. When the legs are fully open, No. 2 houses the positioning stay and applies the right brake. He then takes up a position kneeling on his left knee on the right side of the breech. He opens the breech, obtains a round from the box and holds it with his right hand on top at the point of balance and his left hand on the base.

Nos. 3 and 4, assisted by the driver, remove the side shields and ammunition ordered from the vehicles, placing the boxes in a convenient position for No. 2. They lower the shield flap and fix the side shields in position. No. 3 then takes up a position crouching behind No. 1, with his left hand on the traversing shoulder piece and his right hand behind his back. No. 4 takes up a position from which he can assist in preparing ammunition or carrying out such other duties as may be ordered by the **detachment commander**.

NOTE.—Whenever possible the trails should be dug in. If time

does not permit this, the trails should be dropped from breast height, provided that the ground is suitable.

2. "**Halt—action front** (or **right**, or **left**) . . . **boxes**".

(a) When "**Action front**" is ordered, the procedure is the same as for "**Action rear**", except that the trail is carried round to the right until the muzzle is pointing in the required direction. On a side slope the trail is carried downhill.

(b) When "**Action right**" is ordered the trail is carried round to the right until the muzzle is pointing in the required direction. (See Section 4, Gun Drill, General, para. 4).

(c) When "**Action left**" is ordered the trail is carried round to the left until the muzzle is pointing in the required direction. Numbers will always position themselves on the side of the trail from which, having lifted it, they can push, not pull, it round to the required direction. (See Section 4, Gun Drill, General, para. 4).

3. "**Stand clear.**" On this order No. 2 replaces the round in the box, and the detachment fall in. (See Lesson 1, para. 1 (b)).

4. "**Take post.**" On this order the detachment take up their positions in action at the gun.

LESSON 5.—PREPARE TO MOVE—RUN UP—CEASE FIRING—HOOK IN

1. "**Prepare to move.**" When time permits, this order will be given by the **detachment commander** before "**Cease firing.**" The vehicles are brought as close to the gun position as possible. Ammunition and stores not immediately required at the gun are loaded. Preparations for a quick move are made, but the gun remains in action until the order "**Cease firing**" is given.

2. "**Run up.**" This order is given by No. 3 after the **detachment commander** has ordered "**Cease firing.**" If the gun is loaded, No. 3 orders "**Unload**", or, if the round has separated, "**Fire.**" No. 3 then orders "**Run up**" and mans the left trail leg. No. 1 brings the gun to the centre of its traverse and releases the left brake. No. 2 replaces the round in the box, releases the right brake and mans the right trail leg. No. 3 orders "**Heave**" and the spades are cleared. He then orders "**Take post.**" (See Lesson 4, para. 4.) In addition, Nos. 1 and 2 apply the brakes.

NOTE.—(1) Where the ground makes it necessary, No. 3 will order the handspikes to be fitted to the rear socket of each trail leg before ordering "**Heave.**"

(2) The order "**Run up**" is also used when No. 1 has reported "**Target right (left)**." In this case No. 3 orders "**Make safe**" (and not "Unload") and No. 1 applies the safety catch. (See Lesson 7, para. 5.) On "**Take post**" No. 1 sets the safety catch to "Fire."

3. "**Cease firing.**" The **detachment commander** signals for the carrier. No. 3 orders "**Unload**", or, if the round has separated, "**Fire.**" When the gun is empty, he orders "**Run up.**" As soon as this is completed he orders "**Cease firing.**"

The **detachment commander** positions himself at the muzzle of the gun. No. 1 releases the left brake, brings the gun to the centre of the traverse and to its maximum elevation, closes and secures the sight port cover.

No. 2 replaces the ammunition in the boxes, closes the breech, eases forward the striker, releases the right brake and rehouses the positioning stay.

Nos. 1 and 2 man the trail legs. When the **detachment commander** bears down on the muzzle and orders "**Close**", they lift and close the trail legs, No. 2 securing the trail clamp.

Nos. 3 and 4 raise and secure the shield flap and replace the side shields on the vehicle. The **detachment commander** takes up a position from which he can direct the movement of the towing vehicle and orders it to back towards the gun.

4. "**Hook in.**" As soon as the vehicle is in the correct position, the **detachment commander** orders "**Hook in**" and moves to the muzzle. Nos. 1 and 2 move to the trail eye and Nos. 3 and 4 to the rear of the shield, each on his correct side of the gun.

The **detachment commander** bears down on the muzzle and Nos. 1 and 2 lift the trail in the required direction. Nos. 3 and 4 push on the shield and the gun is hooked in. The detachment replace the remaining ammunition and stores in the vehicle and then mount. When the **detachment commander** has satisfied himself that the gun is ready to move, he orders "**Drive on.**" Covers are replaced at the first opportunity.

LESSON 6.—LOAD—UNLOAD—MAKE SAFE—REST

1. "**Load.**" When No. 3 has reported "**On**", No. 2 loads. He inserts the round over the breech block, pushing it home with his left hand and, when the breech is fully closed and his hand is clear, reports "**In.**" He then takes another round from the box. When loading, No. 2 should half clench the fingers of his left hand with the palm towards him. After the initial round, No. 2 loads and reports "**In**" each time the gun fires and an empty case is ejected.

If at any time the breech does not fully close, No. 2 will close it either by (a) pulling up on the cocking handle with the first two fingers of his left hand, or (b) using a tommy bar inserted in the rack pinion.

2. "**Unload.**" When this order is given by No. 3, No. 2 returns the round in his hand to the box, opens the breech slowly, removes the round and retains it in his hand.

3. "**Rest.**" This order is given when firing is temporarily suspended, but it is undesirable or impracticable to withdraw the detachment from the gun.

The **detachment commander** orders "**Make safe**" and gives orders for such work around the gun as may be necessary. When this is completed, he orders "**Rest.**" The detachment sit at ease in their action positions.

"**Rest**" is cancelled by the order "**Take post.**"

LESSON 7.—TO LAY—FIRE—STOP

Instructor's Notes

Before this lesson is taught, instruction and practice must have been given in aiming both with the telescope and the open sight. For this lesson a target should be represented by a vehicle or by a walking man.

The squad should be practised after the instructor has explained each paragraph.

1. Laying the gun.

(a) *Reference objects.*—The **detachment commander** details the reference objects in his arc of fire and orders the marking of the clock rays on the ground. (See Sec. 11, para. 2.)

(b) *Indication.*—"Target . . . o'clock." No. 3 repeats the indication and then traverses the gun in the required direction with his left hand on the end of the traversing shoulder piece. As soon as the gun is aligned on the target No. 3 reports "**On.**" No. 1 moves with the gun and identifies the target through the sights. No. 2 loads and reports "**In.**"

(c) *Range.*—" . . . hundred." No. 3 repeats the range, sets the range reader arm accordingly and reports "**Set.**"

(d) *Lead.*—" . . . (the lead)."

(i) *With the telescope*, the lead ordered will be repeated by No. 3 and No. 1. No. 1 will then lay on the target (with moving targets traversing ahead and allowing the target to run on to the lead ordered.) (See Lesson 26.)

- (ii) *With the open sight*, No. 3 repeats the lead ordered, sets the deflection scale accordingly and reports "**Set.**" No. 1 then lays on the target.

NOTE.—When conditions prevent No. 1 seeing the target through the telescope, he will change to the open sight on his own initiative, reporting "**Open sight (the lead).**" No. 3 sets the lead on the deflection scale and reports to the detachment commander: "**Open sight**" (the lead) "**set.**"

2. "**Fire.**" No. 3 repeats the order. No. 1, provided that he has a correct aim and has heard No. 2 shout "**In,**" grips and pulls the firing lever or the squeeze grip with a quick even movement. After the initial round No. 1 fires as soon as the aim is correct and he has heard No. 2 shout "**In.**" If No. 1 fires when the gun is incorrectly laid, he shouts "**Wrong.**" No. 3 repeats "**Wrong.**"

3. "**Stop.**" No. 3 repeats the order. No. 1 releases his grip on the firing lever and points his right hand downwards and to the rear, but continues to lay on the target. No. 2 ensures that the gun is loaded. "**Stop**" is cancelled by the order "**Go on**" or "**Fresh target. . . .**"

4. Corrections.

(a) *Range.* "**Add (or drop) . . . hundred.**" No. 3 repeats the correction, resets the range reader arm and reports "**Set.**" No. 1, on hearing "**Set,**" lays and fires.

(b) *Lead.* "**. . . (the lead).**" With the telescope, No. 3 and No. 1 repeat the correction. No. 1 then lays and fires.

With the open sight, No. 3 repeats the correction, resets the deflection scale and reports "**Set.**" No. 1, on hearing "**Set,**" lays and fires.

5. "**Target left (or right).**" If the target moves outside the traversing limits of the gun, No. 1 reports to No. 3 "**Target left (or right),**" at the same time bringing the gun to the centre of its traverse. No. 3 orders "**Run up**" (see Lesson 5, para. 2) and directs the movement of the trail by ordering "**Trail right (or left).**" No. 3 realigns the gun on to the target and reports "**On.**" No. 1 relays.

6. "**Target lost.**" Should the target disappear from the field of view through the sight, No. 1 will report "**Target lost.**" If No. 3 is able to see the target, he will realign the gun on to it and report "**On.**" If he cannot see the target, he will report "**Target lost**" to the detachment commander, who will give a fresh indication.

NOTE.—In the event of orders being repeated incorrectly or not at all, action will be taken as laid down in Sec. 11, para. 7 (c) to (f).

LESSON 8.—MISFIRES—UNEJECTED CASES—CASUALTIES

1. **Misfire drill.**—If the gun fails to fire, No. 1 releases the firing lever and orders "**Check the breech.**" The action of No. 2 depends on whether the cocking handle is in the cocked or fired position.

(a) *Failure of the firing mechanism.*—When the cocking handle is in the cocked position, No. 2 pulls upwards on the cocking handle and reports "**Closed.**" No. 1 pulls the firing lever. If the gun still fails to fire, Nos. 1 and 2 repeat their actions. On hearing "**Closed**" for the second time, No. 3 orders "**Emergency firing gear.**" No. 1 places his right hand on the elevating handwheel, and fires the gun with his left hand by means of the emergency firing gear.

(b) *Misfire.*—When the cocking handle is in the fired position, No. 2 recocks and reports "**Recocked.**" No. 1 pulls the firing lever. If the gun still fails to fire, Nos. 1 and 2 repeat their actions. On hearing "**Recocked**" for the second time, No. 3 orders "**Misfire.**" A pause of one minute is made, during which No. 1 continues to lay on the target, but does not attempt to fire. No. 3 then orders "**Unload misfire.**" No. 2 returns the round in his hand to the box, unloads carefully and examines the round. If the primer has not been struck, he removes the striker case, examines it and replaces any faulty component. If the primer has been fairly struck, the round is laid aside for further examination when time permits. The gun will be reloaded and the **detachment commander** will continue to engage targets.

(c) *Examination of a faulty round.*—If the primer has not been fired, a new primer is inserted. If the primer has been fired, the charge is withdrawn and destroyed under the supervision of an officer. Full particulars of such misfired charges will be noted. The charge should be destroyed by spreading it out in a thin line and lighting the upwind end.

2. **Unejected cartridge cases.**—Unejected cases indicate that the gun has failed to run out completely. No. 2 clears the unejected case by pulling down hard on the breech mechanism lever. If the next round is also unejected, No. 2 ejects it and reports "**Unejected cartridge case.**" No. 3 orders "**Assist runout**" and No. 2 heaves on the breech mechanism lever, in the direction of the runout, each time the gun is fired. The runout adjusting valve will be adjusted as soon as possible.

3. **Casualties.**—For the purpose of replacing casualties the order of importance of the gun numbers is No. 1, No. 3, the **detachment commander**, No. 2, and No. 4. Should casualties occur, gun numbers should be rearranged according to this order.

- (a) *In the event of one casualty*, the remaining numbers will be rearranged so that they become No. 1, No. 3 and **detachment commander**. No. 3 performs the duties of No. 2, and No. 1 sets the sights.
- (b) *In the event of two casualties*, the No. 4 is called in and the members of the detachment become No. 1, No. 3 and **detachment commander**. No. 3 performs the duties of No. 2, No. 1 sets the sights.
- (c) *In the event of three casualties*, the remaining members of the detachment become No. 1 and No. 3. No. 3 again performs the duties of No. 2 and **detachment commander**. No. 1 again sets the sights.

LESSON 9.—ABANDONING DRILL

1. The extent to which the gun will be disabled will depend on the time available and the probability of recapturing it.

In disabling equipment, all detachments should as far as possible follow the same procedure to ensure that, if a number of guns are captured, they will all be deficient of the same essential parts. The enemy will, therefore, be unable to render a number of guns serviceable by stripping the remainder.

2. *To disable the gun so that it can be brought into action immediately after recapture.*—Remove the breech mechanism. If time does not permit this, remove the firing mechanism.

3. *To disable the gun so that it can be brought into action after repair and the replacement of spare parts.*—Remove the breech mechanism, buffer cylinder securing nut and the rear plug of the buffer cylinder. Elevate the gun and push to the rear. Then dent the spring case with a crowbar or heavy hammer.

4. *To destroy the gun.*—Place a heavy metal object, such as a crowbar or the head of a hammer, or a few primers, stones and earth in the bore. Load, and set the S.A. lever halfway between the S.A. and HAND positions. The lever should be held in this position by plugging the hole below it. Then fire the gun from behind cover by means of a length of rope or telephone wire attached to the hand firing lever.

NOTE.—In addition to the parts removed from the gun, the telescope and all spare parts must always be taken away when a gun is abandoned. If possible the wheels should also be taken away or damaged.

SECTION 5.—FIELD SIGNALS

These signals are required for use in the anti-tank platoon in addition to the field signals contained in "Infantry Training, 1937," Secs. 30-32, and "Section Leading, 1938."

They will be more easily remembered if they are introduced when the relative stage of training is reached.

1. "**Action.**"—Both arms fully extended, raised from the sides to a position level with the shoulders and lowered again. This action is repeated quickly several times.

"**Cease firing.**"—The arm swung in a circle in front of the body.

2. Semaphore signals.

Letter A. Next senior.

AA. All N.C.Os.

B. More ammunition.

H. Vehicle forward.

3. Emergency action signals.

Arms crossed above the head, then one arm pointed in the direction of the tank threat.

Mutually supporting sections.

Letter U, then one arm pointed in the direction of the tank threat.

Inner crescent.

Letter N, then one arm pointed in the direction of the tank threat.

Outer crescent.

SECTION 6.—STRIPPING AND ASSEMBLING

Instructor's Notes

Stores :—Equipment and tool roll complete.

1. *Before starting lessons on stripping, the following "general points" must be emphasized :—*

- (a) *The correct tools for the task must always be used. If this rule is not observed, screws become burred and can only be removed by an artificer.*
- (b) *Direct hammer blows must never fall on the equipment.*
- (c) *In order to avoid damage to the gun by careless handling, no time limit will be imposed.*
- (d) *When parts have been stripped, they should be put in a clean place and, before assembling, care should be taken to ensure that they are free from dirt and grit.*
- (e) *After re-assembling, the correct functioning of the part will be tested.*
- (f) *Parts other than those enumerated in the lesson headings of this section may only be stripped by a qualified artificer.*

2. *After the stripping detailed in each lesson, the instructor should give a description of each part. The names of the parts should be revised in subsequent lessons.*

LESSON 10.—THE STRIKER CASE

1. **To remove the striker case from the breech block.**—Cock the striker by pulling the cocking handle to the rear and turn the safety catch to SAFE. Remove the striker case by withdrawing the retaining catch and turning the case one-sixth of a turn to the right.

2. **To replace the striker case in the breech block.**—Cock the striker and turn the safety catch to SAFE. Insert the striker case into the breech block and turn it one-sixth of a turn to the left, when it will be locked by the retaining catch.

3. Practise squad.

4. **To strip the striker case.**—Remove the striker case from the breech block and turn the safety catch to FIRE. Grasp the cocking handle in one hand and the case in the other, and press the toe of the trigger sear to ease the mainspring. Pull out the keep pin and unscrew the cocking handle. Withdraw the spindle and mainspring from the front of the case. Pull out the staple from the head of the spindle and withdraw the firing pin. Withdraw the cocking sleeve from the rear of the case. Pull out the keep pin from the safety catch retaining pin and the retaining pin from the top of the case. Withdraw the safety catch. Push out the keep pin from the spindle portion of the catch and remove the plunger and spring. Remove the trigger sear and spring from the left side of the case. Pull out the keep pin securing the trigger sear spring seat and withdraw the seat from the right side of the case. Pull out the keep pin and head of the retaining catch plunger and withdraw the plunger and spring from the front of the case.

5. **To reassemble the striker case.**—Reverse the above procedure.

6. Practise squad.

LESSON 11.—THE BREECH MECHANISM

1. **To strip the breech mechanism.**—Ensure that the breech block is closed and that the gun is approximately horizontal.

Remove the striker case and the traversing shoulder piece. Release the compression on the actuating spring. Raise the S.A. cam as far as it will go and support it in that position. Pull out the keep pin and slotted nut from the actuating shaft. Push out the actuating shaft until it is flush with the right side of the breech ring and remove the breech mechanism lever and the rack pinion.

Holding the breech block in position, withdraw the actuating shaft to the left. Remove the breech block and extractor levers. Push out the actuating pin of the cocking link and withdraw the cocking link to the rear.

Remove the actuating shaft sleeve.

2. To assemble the breech mechanism.—Reverse the above procedure. When replacing the actuating shaft sleeve, ensure that the groove and the master spline on the actuating shaft coincide. Ensure also that the roller is positioned at 8 o'clock and that the cocking link is flush with the rear face of the breech block.

3. Practise squad.

NOTES.—(1) On some guns it may be necessary to move the gun-layer's guard before the breech block can be removed.

(2) Although the breech mechanism can be stripped and assembled by one man, to avoid damage to the equipment it is advisable to have the assistance of a second man.

(3) After the breech block has been assembled, the compression of the actuating spring should be tested.

LESSON 12.—THE ACTUATING SPRING CASE AND BREECH RING

Instructor's Notes

The stripping of the breech ring will only be explained, as practice will damage the threads on the barrel and breech ring.

The breech ring should, however, be stripped once every three months to apply graphite grease to the threads at the breech end of the barrel and the inside of the breech ring.

1. To strip the actuating spring case.—Remove the breech block. Remove the check screw, and unscrew the spring case cap. Withdraw the actuating spring and bearing disc. Unscrew the two fixing screws and tap the case gently downwards. Remove the rack.

2. To reassemble the actuating spring case.—Reverse the above procedure. The compression of the actuating spring should then be tested.

3. Practise squad.

4. To strip the breech ring.—Lay the gun horizontal and lash the elevating handwheel. Remove the striker case, breech block and actuating spring case. Remove the buffer cylinder nut and keep pin, pull back the gun and slipper about 16 ins. and remove

the slipper bolts. Unscrew the securing screw and then unscrew the breech ring from the barrel until it can be lifted clear.

5. To reassemble the breech ring.—Reverse the above procedure.

SECTION 7.—MECHANISM

Before each lesson the Instructor should revise the description of the part concerned.

LESSON 13.—OPENING THE BREECH BY HAND

Instructor's Notes

Stores :—Equipment complete, dummy cartridge, gun nut spanner, pliers, tommy bar, screwdriver and 11-in. spanner.

Before the lesson the instructor should strip the breech mechanism, leaving the striker case assembled. After the mechanism has been explained, the explanation should be repeated with the breech mechanism assembled.

1. When the retaining catch is released, the breech mechanism lever can be rotated to the rear and downwards. The toe of the breech mechanism lever bears against the projection on the rack pinion and causes it to rotate. The teeth of the rack pinion are engaged in the teeth of the rack and, as the pinion rotates, the rack is moved upwards, compressing the actuating spring between the rack and the spring cap.

2. As the pinion and crank are keyed to the actuating shaft they rotate with it. The first movement of the crank pushes the cocking link slightly to the rear by the actuating pin of the crank travelling down the inclined slot in the cocking link, and the firing pin is withdrawn through the firing hole bush. During this first movement the breech block remains stationary, thus preventing damage to the firing pin. On the further movement of the breech mechanism lever the lugs of the crank bear on the breech block and on the actuating pin in the cocking link. This causes the breech block to move downwards and forces the cocking link farther to the rear. The backward movement of the cocking link causes the cocking sleeve to move back, taking with it the striker spindle and compressing the striker spring, until the cocking sleeve engages behind the trigger sear. The trigger sear is forced to engage by the action of its spring and the inclined plane on the upper arm of the cocking sleeve.

3. As the breech block moves downwards, the lugs on the extractor levers travel along the grooves in the breech block until

they meet the inclined surfaces, when a powerful pull unseats the cartridge case. When the shoulders strike the lugs of the extractors they force the arms, which are engaged behind the rim of the cartridge, sharply to the rear, thus ejecting the empty case. The downward movement of the breech block is stopped when the crank fouls the breech ring. If pressure is now taken off the breech mechanism lever, the actuating spring asserts itself and forces the rack downwards. This causes the rack pinion, actuating shaft and crank to rotate in the opposite direction and raise the breech block slightly. The lugs on the extractors are thus released from the shoulders of the breech block, allowing the extractors to fall to the rear under their own weight. The hooks on the extractors then become engaged against the stops on the front of the breech block and prevent any further movement of the block.

NOTE.—The mechanism of the striker on firing will be found in Lesson 16, para. 1.

LESSON 14.—OPENING THE BREECH, SEMI-AUTOMATIC—CLOSING THE BREECH

Instructor's Notes

To demonstrate the semi-automatic action it will be necessary to pull the gun back, using the dragropes, or alternatively, to remove the gun securing nut. Although the latter is the better method, to prevent wear on the gun securing nut, the former method should normally be used.

1. Opening the breech, semi-automatic.—Explain and demonstrate in turn :—

- (a) To allow the automatic opening of the breech, set the cam to S.A. This allows the cam free movement up and down. As the gun recoils, the roller on the actuating shaft passes under the cam, pressing it upwards until the roller clears the rear end. The spring and plunger then force the cam down again to a level just below the roller.
- (b) The gun now returns to the run-out position. During this movement the roller moves along the upper surface of the cam, causing the actuating shaft to rotate towards the rear. This rotation causes the same action within the breech block as opening it by hand, except that the breech mechanism lever remains stationary.
- (c) If the cam is set to HAND, the roller passes below the cam on the run-out and the breech remains closed.

2. Closing the breech.—As the gun is loaded the rim of the cartridge frees the hooks on the extractors from the stops on the breech block. When the hooks are clear, the actuating spring forces

the rack downwards, rotating the rack pinion and the actuating shaft. This causes the lugs on the crank to bear upwards on the breech block and to move the block to the closed position. The forward inclination of the breech block guides and guideways ensure the proper seating of the cartridge in the chamber.

Provided that the extractors are first freed, assistance can be given in closing the breech by using a tommy bar. The breech mechanism lever cannot be used for this purpose.

LESSON 15.—THE ELEVATING GEAR AND ADJUSTMENTS

Instructor's Notes

Stores : Equipment complete.

Before the lesson begins, the instructor should explain where the elevating gear is situated and the limits of elevation and depression.

1. Mechanism.—Rotation of the handwheel moves the worm shaft to which it is keyed. As the feathers on the outside of the worm shaft are engaged in the featherways of the worm, the worm rotates, travelling up or down the elevating arc according to the direction in which the handwheel is turned. This movement is now transmitted to the cradle and gun. The worm is prevented from running off the arc by the cradle fouling the elevation and depression stops on the saddle.

2. Adjustments.—Explain and demonstrate :—

(a) *that the following parts of the gear are likely to wear—*

- (i) the teeth of the elevating arc and of the worm ;
- (ii) the flat surfaces of the intermediate bush, washer worm, and the lower of the upper bushes.

(b) *to test for wear.*—Place the gun horizontal. Bear down and pull up on the breech ring. Any movement of the barrel indicates wear in the elevating gear.

(c) *to adjust for wear.*—Loosen the securing bolts of the S.A. gear bracket. Remove the keep pin from the slotted nut of the eccentric and loosen the nut. The eccentric can now be forced inwards slightly, releasing its serrations from those of its bush. Apply the No. 526 spanner to the square end of the eccentric and turn it until the teeth of the elevating worm and arc are correctly meshed. Tighten the slotted nut, replace the keep pin, and tighten up the securing bolts of the cam brackets.

Retest the gun. If movement is still seen, the gun should be taken to the armourer, who will adjust the gear by placing washers under the worm.

NOTE.—Guns manufactured in Canada have no eccentric. Wear is counteracted by placing packings or washers behind the elevating arc.

LESSON 16.—THE FIRING GEAR AND ADJUSTMENT

Instructor's Notes

Stores : Equipment complete.

1. **Mechanism.**—When the firing lever is pulled to the rear, the operating lever pivots on its fulcrum pin, extends the spring and also the Bowdenex cable for the telescope shutter and draws the connecting rod forward. This rotates the bell crank lever, the toe of which bears against the adjusting screw on the hand firing lever and turns it to the right, bringing the projection to bear against the roller of the breech ring firing lever. The lever is forced against the trigger sear, compressing the spring and releasing the bent from the upper arm of the cocking sleeve. This allows the mainspring to force the sleeve and striker forward and the firing pin to protrude through the firing hole bush, firing the primer.

As the gun recoils, the breech ring firing lever is moved clear of the sear by the spring plunger. When the firing lever is released the hand firing lever is returned to the left by the torsional spring, the remainder of the levers are re-positioned by the operating lever spring, and the telescope shutter by the shutter spring.

2. Adjusting the firing gear.

- (a) *The firing lever.*—If the pull is too long, loosen the locking nut and screw down the adjusting screw on the hand firing lever. Tighten the locking nut and retest the firing gear.
- (b) *The torsional spring.*—Remove the keep pin, castellated nut and washer. Control the movement of the firing lever and ease out the spring cap until it is free of the octagonal end of the spindle. To increase the tension gained, force the cap forward until it is keyed to the spindle. Replace the washer, nut and keep pin and retest the firing gear.
- (c) *The telescope shutter.*—Loosen the locking nut, move the adjusting screw until the correct movement is obtained, and tighten the locking nut.

LESSON 17.—THE RECOIL AND RECUPERATING SYSTEM

Instructor's Notes .

Stores :—If the system cannot be stripped from the gun, a diagram will be necessary.

1. The recoil and recuperating system limits the recoil of the gun and returns it to the firing position.

When the gun is fully run out, the buffer cylinder is fully forward, the springs are under initial compression only and the piston head is opposite the deepest parts of the grooves in the cylinder. The remaining space in the cylinder is occupied by liquid.

2. Action on recoil.—When the gun fires, it recoils. The gun moves backwards, taking with it the slipper, which pulls back the buffer cylinder. The piston rod is held stationary by the nut at the front of the cradle and the rear ends of the springs are held against a bearing in the cradle. As the cylinder moves back over the piston head, taking with it the running-out springs compressor, the springs are compressed. This movement causes the liquid in front of the piston head to be forced through the ports formed by the five longitudinal grooves in the interior of the buffer cylinder. At the same time, the head of the running-out springs compressor further compresses the springs between itself and the ring inside the rear end of the cradle.

During recoil, the flow space for the liquid gradually decreases as the buffer cylinder moves to the rear, owing to the five grooves being shallower towards the front of the cylinder ; therefore, the resistance to the force of recoil becomes greater, until the flow space is such that the resistance to the liquid is of sufficient magnitude to ensure that the gun is brought to rest. As the buffer cylinder is drawn over the piston, the control plunger leaves the rear plug cylinder, its place being taken by the liquid. The springs assist in bringing the gun to rest.

The working length of the recoil is 30 ins. Metal to metal contact occurs at 32 ins.

3. Action on run out.—When the recoil is complete, the springs exert pressure on the spring compressor and push the cylinder, slipper and gun forward. Liquid is forced to pass from in rear of the piston head to the front and helps to counterbalance the force exerted by the springs. The control cylinder rides over the control plunger and liquid is partially locked in the cylinder, being allowed to escape over the tapered flat and past the run-out adjusting valve. Liquid continues to pass over the flat on the plunger, but, as this shallows, the cylinder is eventually closed. The only remaining outlet for the liquid is then through the hole controlled by the run-out

adjusting valve and past the slotted flange on the exterior of the control cylinder. The increasing resistance offered to the passage of the liquid counteracts the effect of the springs and brings the gun gently to rest in the firing position. The final cushioning effect is made between the slipper lug and the beating face pad on the rear end of the cradle. Screwing or unscrewing the run-out adjusting valve makes the passage of liquid from the control cylinder more, or less, difficult. This regulates the final movement of the run-out.

SECTION 8.—MAINTENANCE

It is essential that every member of the anti-tank platoon should know thoroughly the instructions contained in this section. The efficient application of these instructions will not only ensure that the equipment is kept in good working order, but will avoid the possibility of damage and of injury to the detachment.

LESSON 18.—GENERAL—GUN STORES—FILLING THE BUFFER

Instructor's Notes

Stores :—The following stores are required for filling the buffer : Pump complete, adapter No. 15, bucket, oil mineral hydraulic buffer, pliers, spanners No. 526 and 11-in. adjustable, screwdriver, dragropes.

The filling of the buffer should be carried out as a drill and the sequence strictly observed, as correct filling is essential to the performance of the gun.

1. (a) **General.**—Since all equipments have a number of parts liable to damage by dirt and rust, cleaning and oiling are necessary to preserve them. Thorough and frequent lubrication of all working parts is essential. Whenever fresh lubricant is applied, the old should, where practicable, be wiped or scraped off and the parts well worked to distribute the fresh lubricant.

Lubricators and lubricating holes should be kept free from dirt to allow an uninterrupted passage to the working parts. Holes and channels should be cleaned out with a piece of wire. Lubricators and lubricating screws should be painted so that they can be more readily seen and, if lost or damaged, should be renewed.

The gun slipper and cradle guides should be kept well lubricated.

Oil only should be used in cleaning the mechanism and bright parts of the carriage, etc. No part should ever be polished with abrasive substances such as emery paper or bathbrick.

(b) **The breech.**—Breech fittings should frequently be stripped and examined to see that they are sound and in working order. They should be treated with care. Violence or jerks should be avoided and no unnecessary force employed.

All spare parts should be tested on the gun as soon as possible after they are received. The working surfaces and mechanism should be well lubricated, work easily and be free from burrs, which will be removed only by a qualified artificer. If a flaw or crack is observed in a gun, the gun will be put out of action and arrangements made for the E.M.E. to examine it. Should a similar defect be found in any other part of the mechanism, it will be replaced by the spare part and the defective part examined.

The whole of the exterior of the gun will be painted, with the exception of the breech end screw threads and portions engaging the carriage. Guns when not in use should have their covers in position.

(c) **Recoil system.**—The considerations affecting the correct working of the recoil system can be grouped under three headings :—

- (i) The correct filling of the buffer and assembly of the spring recuperator.
- (ii) Packings.
- (iii) Careful observation of the system both in and out of action.

To ensure that the buffer and spring recuperator are kept in good order, care must be taken to see that no grit or dirt enters the system. All adjustments and repairs will be carried out only by a qualified artificer.

The system must be correctly prepared for action or serious damage may result. Under peacetime conditions no liquid other than the correct service buffer oil may be used. On active service, however, should the supply of correct oil fail, any lubricating oil may be used, with the exception of illuminating oils such as kerosene or paraffin, and explosive oils such as petrol. In extreme cases the buffer may even be filled with water. These alternative liquids may cause damage if left in the recoil system for any length of time and, therefore, every effort should be made to obtain a supply of the correct liquid as soon as possible, and the system drained, cleaned and refilled.

Oil drained from the buffer cylinder should not be used again, except in an emergency.

Service buffer oil should remain unfrozen down to a temperature of 20° F., but during severe weather the

buffer should be protected as much as possible from the cold in order to prevent the possibility of freezing. Elevating, depressing or pulling back the gun occasionally will help to prevent this. Should the liquid freeze, the gun should not be fired and steps must be taken to thaw the liquid.

- (d) **The sights.**—The sights must be handled with great care. When it is necessary to strip them, this will be done only by a qualified artificer.

Exterior surfaces, except the lenses, should be cleaned with a soft cloth and a little oil. The lenses should be cleaned with a soft cloth which should be kept for this purpose alone. Telescopes should be tested frequently by a qualified person to see that they are in order and fit for immediate use. Damaged lenses, dented tubes and other similar defects must be reported at once and the parts repaired or exchanged. The bearing surfaces of the telescope should be carefully protected. Any burrs or dents throw the telescope out of adjustment.

Metal bearing surfaces should be covered with a thin layer of mineral jelly when not in use.

2. Lubricants.

NOTE.—The normal range of ambient (surrounding) temperatures, in degrees Fahrenheit, for various climatic conditions are:—

Normal, 110 to 40. *Cold*, 40 to zero. *Sub-cold*, zero to -60.

Grease, G.S.—To reduce wear on towing eyes and hooks, and in wheel hubs fitted with ball or roller bearings. Must be diluted with 15 per cent. (by weight) kerosene, burning, in cold or sub-cold climates.

Grease, graphited.—For external screw threads on gun and screw threads of the recoil system, etc. To be diluted with kerosene, burning, in cold or sub-cold climates.

Mineral jelly.—As a preservative generally and for ball and roller bearings. Should be warmed to facilitate application in cold or sub-cold climates.

Mineral jelly thinned with C.70 oil.—Enclosed gears where pressure lubrication is not used, nor any other lubricant specified. Must be diluted with kerosene, burning, in cold or sub-cold climates.

Oil, graphited, concentrate.—Gun slides or cradle guides having top oiler lubricators or where an oil-can can be applied direct. Must be diluted with kerosene, burning, in cold or sub-cold climates.

Oil, C.600 or M.800 with 10 per cent. oil, graphited, concentrate.—Gun slides or cradle guides having Tecalemit nipples. C.600 oil must be diluted with kerosene, burning, in cold or sub-cold climates, M.800 not being used.

Oil, kerosene, burning.—Cleaning clogged oil off gears and for use in diluting other lubricants for use in cold or sub-cold climates.

Oil, C.600 or M.800.—For forced feed lubrication and gear boxes. C.600 must be diluted with kerosene, burning, in cold climates, M.800 not being used.

Oil, M.65.—For forced feed lubrication and gear boxes in sub-cold climates. Must be diluted with kerosene, burning, in temperatures below -30 degrees F.

Oil, C.70.—Cleaning bright parts of guns and carriages, and for general purposes of lubrication. In cold climates "A" oil will be used. This oil will be diluted with kerosene, burning, for temperatures below 20 degrees F.

Oil, low-cold-test, No. 2.—Cleaning bright parts of guns and carriages, and for general purposes of lubrication in cold or sub-cold climates. Must be diluted with about 20 per cent. kerosene, burning, in temperatures below -40 degrees F.

Oil, low-cold-test, No. 1.—Diluted with kerosene, burning, for breech mechanisms where C.70 oil is specified, in cold or sub-cold climates.

NOTES.—It should be understood that the ambient temperature does not necessarily define the temperature or working condition of the gear or parts to be serviced. The equipment, or parts of it, may be at quite different temperatures from that of the air.

Where kerosene is to be used as a diluent, the lower the range of temperature the greater the proportion of kerosene necessary. Normally the proportion should not exceed 25 per cent.

3. Gun stores.—The following list comprises the stores which are required for the maintenance of the gun:—

Rolls, tool.

Pump, liquid, portable, No. 2.

Adapter, pump, No. 15.

Cap, sponge, No. 4.

Covers, gun and carriage, 6-pr.

Covers, muzzle, No. 1 or No. 47.

Covers, cradle.

Drift, No. 18.

Gauge, striker protrusion, No. 16.

Handspike, lifting trail, No. 4.

Injector, lubricating, Tecalemit, No. T.26.

Lanyard, cocking, No. 4.

Ropes, drag, No. 2.

Brush, sponge, No. 3.

Key, primer, No. 30.

Screwdriver, cabinet, 4-inch.

Gauge, pressure, tyre, $10-50$ lb. per square in

Can, lubricating, small, No. 11.

Pliers, sidecutting.

Case, striker, complete.

Pumps, tyre, foot, small.

Rod, brush, sponge, No. 9.

Tommy, actuating shaft.

Spanner, adjustable, 11-inch.

Tool, artillery, No. 229 (to remove packing collars).

Spanner, No. 526 (for run out adjusting valve).

„ No. 890 (for pivot socket securing nut).

„ No. 891 (for stuffing box and gland).

„ No. 892 (for rear plug).

„ No. 893 (for spring compressor).

„ No. 285 (for gun securing nut).

Wrench, breech mechanism, No. 247.

Brace, adjusting, wheel nuts.

Key, removing, jammed cartridges.

4. Filling the buffer.—Depress the gun fully and remove the keep pin, gland locking plate and filling hole plug. Open the run out adjusting valve a few turns and unscrew the air hole plug until the air hole is clear of the recess. Connect the adapter. Pump oil through the pump to remove the air and then connect it to the adapter. Pump the oil into the buffer very slowly until air bubbles cease to appear in the oil which escapes through the air hole. Close the run out adjusting valve and elevate the gun to the horizontal to allow surplus oil to escape. When approximately one tablespoonful, or 1/36th of a pint, has flowed out, screw home the air hole plug, disconnect the adapter and pump and replace the filling hole plug. Replace the gland locking plate and keep pin.

After filling, test the correct working, using drag ropes with four or five men on each rope. Pull the gun back to the fully recoiled position, then release the ropes and watch the run out.

LESSON 19.—DAILY AND WEEKLY MAINTENANCE AND CLEANING

Instructor's Notes

Stores :—Equipment complete, covers, spanners adjustable, screw-driver, pliers, rod and brush, oil, etc.

The instructor should emphasize that the daily cleaning of the gun is of vital importance.

1. Daily cleaning.

(a) Clean the barrel if necessary and re-oil it, using the rod and brush. When drying and oiling, rags can be wrapped round the brush in the form of a mop. Paraffin may be

used if the bore is very dirty, but should be removed afterwards and the bore re-oiled. Under no circumstances will soda be used in the bore.

- (b) Clean and re-oil the breech fittings without stripping. When the gun is ready for immediate action, the firing mechanism will be stripped and cleaned daily.
- (c) Clean and examine the carriage and check the working of the gears. (The detachment should carry out, as far as possible, the same duties as in preparing for action.)
- (d) Test and adjust the sights. Each member of the detachment should be capable of doing this. The detachment commander should, therefore, detail a different member of the detachment to do so each day.
- (e) Pull back the gun to ensure that the recoil system is working correctly. This action will also disturb the oil in the cylinder, preventing pitting and freezing during very cold weather.
- (f) Ensure that the wheel securing nuts are tight.

2. Weekly cleaning.—The gun will be cleaned as for daily cleaning, with the following additions :—

- (a) Clean and oil the barrel.
- (b) Strip and clean the breech and firing mechanisms. These should then be laid out for inspection by an officer. When passed they will be well oiled and assembled.
- (c) The spare parts will be treated in the same way.
- (d) Lubricate the carriage, first removing the old lubricant. Where possible moving parts should be worked to distribute the new lubricant.
- (e) Fill the buffer (*see* Lesson 18).
- (f) Check the tyre pressures. Normal tyres should be inflated to a pressure of 40 pounds per square inch, run-flat tyres to 25 pounds per square inch.
- (g) Remove and examine the telescope. When reassembling ensure that the telescope is correctly fitted to the adapter. The feather on the base of the telescope must engage in the featherway of the adapter, and the telescope locking ring at the rear of the telescope must be screwed tight. Remove the top aligning screw and ensure that the adapter is correctly fitted into the sight bracket. The feather in the base of the adapter must engage in the featherway on the telescope holder bracket. Tighten all aligning screws and locking nuts.

LESSON 20.—POINTS BEFORE AND DURING FIRING

1. Before firing.—The gun will be cleaned as for weekly cleaning with the following additions :—

- (a) Thoroughly dry and inspect the barrel.
- (b) Gauge the protrusion of the striker. With the breech block removed from the gun, but with the striker case assembled and the striker in the fired position, apply the No. 16 striker protrusion gauge to the face of the breech block. The firing pin should clear the 0·11-inch slot and foul the 0·09-inch slot in the gauge. If the protrusion is not within these limits, change the firing-pin.
- (c) Prepare the ammunition. The paperboard cylinders should be examined and replaced loosely over the rounds. If necessary a number of rounds should be prepared as ready use ammunition, otherwise the boxes will be repacked and the lids secured. Ammunition should be kept in its own batch as far as possible.
- (d) Prepare the equipment for travelling. The detachment commander should ensure that the covers are on correctly and securely fastened ; that the tyres are inflated to the correct pressure ; that the brakes are released ; that the handspikes are fastened to the trail legs ; that the cradle clamps are engaged and the trail leg locking gear is secured ; that the trail eye moves freely in the bracket and the shearing stop is exposed one unit ; that the wheels are secure ; that the buffer cylinder and piston nuts are secure, the run out adjusting valve correctly set, and the trailing box, gland and joint rings are not leaking.

NOTE.—When the gun is attached to the towing vehicle, a little grease G.S. should be smeared around the inside of the trail eye.

2. During firing.

- (a) The action of the recoil system should be watched carefully and any faults remedied at once. The correct functioning of the system should be judged by its performance in action rather than by tests (see Lesson 21).
- (b) The ammunition supply must be maintained.
- (c) Breakages must be replaced as soon as possible.
- (d) During a temporary cessation of firing, clean and re-oil the breech mechanism ; replenish the ammunition supply and collect the clips, containers and other salvage. During inclement weather, protect the equipment and ammunition as much as possible with the covers.

LESSON 21.—FAULTS, CAUSES AND REMEDIES

The following table gives the more common faults that are likely to occur. The remedies are set out in a sequence which, if followed, will ensure that the more probable faults are eliminated first.

Fault	Cause	Remedy
Recoil violent or excessive.	Air in the buffer cylinder ...	Slacken the air hole plug and refill the buffer.
	Insufficient liquid in the buffer.	As above.
	Weak or broken springs ...	Exchange the springs.
Recoil short ...	Worn piston ...	Renew the piston.
	Damaged slides ...	Repair.
	Packings too tight ...	Slacken the gland and, if leakage is excessive, exchange the packing.
Run out slow ...	Run out adjusting valve incorrectly set.	Open valve.
	Burrs or grit on the slides...	Remove the obstruction.
	Weak or broken springs ...	Exchange the springs.
	Packings too tight ...	Slacken the gland and, if leakage is excessive, exchange the packing.
Run out violent ...	Run out adjusting valve incorrectly set.	Close the valve.
	Insufficient liquid in the buffer.	Fill the buffer.
Failure to run out	Worn throttling bush ...	Renew the bush.
	Too much liquid in the buffer.	Slacken the air hole plug, and drain the excess.
	Air in the buffer ...	Slacken the air hole plug.
	Run out adjusting valve closed.	Open the valve.
	Burrs or grit on the slides...	Remove the obstruction.
	Weak or broken springs ...	Exchange the springs.
	Packings too tight ...	Push the gun to the front and slacken the gland.

NOTE.—Should the gun fail to run out completely, it is nearly always possible to bring it to the firing position by depressing and pushing the gun forward and then making any necessary adjustments to the run out adjusting valve.

LESSON 22.—POINTS AFTER FIRING

1. **On the range.**—After firing, guns will be inspected to see that they are unloaded. The barrel should be pulled through and oiled. All ammunition and stores should be checked and the equipment prepared for travelling

2. On return to camp.

- (a) Dry the barrel. Place an empty case in the chamber and elevate the gun. Fill the barrel with boiling water. Close the muzzle with a cloth plug and depress and elevate the gun a few times. Remove the plug and allow the water to run out. After repeating the procedure dry the barrel, clean and re-oil it.

The barrel should be cleaned daily until the sweating of the bore has ceased. If boiling water is not available, the gun should be cleaned with a brush.

- (b) Strip, clean and oil the breech mechanism.
(c) Clean and lubricate the carriage. Examine it for damage.
(d) Check the working of all gears.
(e) Fill the buffer.
(f) Check and return to the magazine all ammunition, clips and boxes.
(g) Enter particulars of the firing in the Memorandum of Examination (Gun History Sheet).

LESSON 23.—ADDITIONAL POINTS OF MAINTENANCE

Instructor's Notes

Before starting the lesson, the instructor should explain that the tasks and adjustments detailed in this lesson will only be carried out by a qualified artificer, but that in cases of extreme urgency when it is essential to keep the gun in action and an artificer available, other competent persons present may remedy the

1. **To empty the buffer.**—Elevate the gun fully. Remove the keep pin, valve locking plate, filling hole plug and air hole plug. Allow the liquid to run into a clean receptacle. To ensure that it has all drained off, depress and elevate the gun slowly a few times. Leave the gun at full elevation until the cylinder is empty. The liquid drained off should not be used again in the buffer except in an emergency.

2. **To tighten the stuffing box gland.**—Lift the inspection cover on the front cap of the cradle. If there is an oil leak, tighten the gland one-sixth of a turn with the gland spanner. Pause for a few minutes before inspecting the gland. If the leak has not stopped, repeat the process.

3. **To remove the spring recuperator.**—Depress the gun and secure it to the cradle. Remove the piston rod nut and cradle front

cap. Remove the keep pin from the gun securing nut and unscrew the nut. The buffer cylinder and spring recuperator can then be lifted out from the front of the gun.

4. To dismantle the spring recuperator.—Replace the gun securing nut and keep pin and remove the stuffing box key. Using the correct spanners, hold the gun securing nut to prevent the cylinder from rotating and unscrew the spring compressor. Lift off the springs, parting plates, etc.

5. To assemble the spring recuperator.—Pass the bearing bush, with the flanged portion forward, over the buffer cylinder from the front. Against the bearing bush place a parting plate, a left-handed spring, another parting plate, and a right-handed spring. Over the rear of the spring compressor place a parting plate, a left-handed spring, and another parting plate. Place the spring compressor over the front end of the buffer cylinder and screw fully home. The right-handed spring must be in the centre of the recuperator to counteract the tendency of the spring bank to buckle during recoil. Replace the stuffing box key and grease the springs before inserting the recuperator into the cradle.

6. Adjustments.

- (a) *The cradle clamps.*—The coned ends of the cradle clamps should fit securely into the sockets in the rear transom bracket, to prevent undue strain on the elevating gear during travelling.

If the clamps engage loosely in the sockets, slacken the clamp locking nuts, screw home the clamps, and retighten the locking nuts.

If the clamps are too low to engage correctly, place packings beneath the clamps.

- (b) *The axle tree clip brackets.*—The brackets, which prevent articulation between the axle tree and the hinge brackets of the trail legs, are fitted with adjusting screws.

To adjust, remove the set screw and locking plate, and turn the adjusting screw until the play is taken up. Secure the adjusting screw by means of the locking plate and replace the set screw. During the adjustment the trail legs should be closed.

- (c) *The brakes.*—To test the brakes, jack up the axle tree. With the brake off, the wheel should revolve freely. When pressure is applied to the brake, the wheel should stop. To adjust, loosen the locking nut and move the adjusting screw until the correct action is obtained. Retighten the locking nut and remove the jack.

SECTION 9.—SIGHT TESTING AND ZEROING

LESSON 24.—SIGHT TESTING

Instructor's Notes

Stores:—Equipment complete, cross wires, sight-testing target, spanners and screwdriver.

1. Explain:—

- (a) That the object of testing the sights is to parallel the bore, telescope and open sight.
- (b) That, due to the fitting of the telescope in the sight bracket, this alignment may be lost. The sights must, therefore, be tested daily, after a move and after prolonged firing.
- (c) That most guns have a certain amount of DROOP (the curve of the piece). The action of sight testing compensates for half this droop, the other half being compensated for in zeroing.
- (d) That every gun has a certain amount of JUMP (the deflection of the shot up or down, at the moment of departure, in relation to the original axis of the bore). In the case of the 6-pr., 7-cwt., the average jump is 11 mins. downwards. This downward jump is compensated for by a lower axis line on the muzzle, 0.34 in. below the horizontal axis line. By using this axis line for sight testing, the barrel has a tangent elevation of 11 minutes before any range is set on the quadrant. Thus, after sight testing, when a range is set on the quadrant, the gun is elevated 11 mins. above the correct angle of elevation for that range. The jump of the gun will depress the bore by 11 mins., and the shot will leave at the correct elevation.
- (e) That, if the bore and sights are both laid on a point not less than 1,000 yds. from the gun, they will for practical purposes be parallel.

2. Procedure.

(a) *Before testing the sights, the following preparations must be made:—*

- (i) Place the gun on firm, level ground.
- (ii) Select a well-defined, distant object, not less than 1,000 yds. away, on which to lay. If no object can be found, set up the sight-testing target about 50 yds. in front of the gun.

The target must be at right angles to the axis of the bore and inclined at the same angle as the gun.

- (iii) Remove the striker case, and attach cross wires of fine thread to the vertical and lower horizontal axis lines on the muzzle.

TARGET, TESTING, SIGHT.

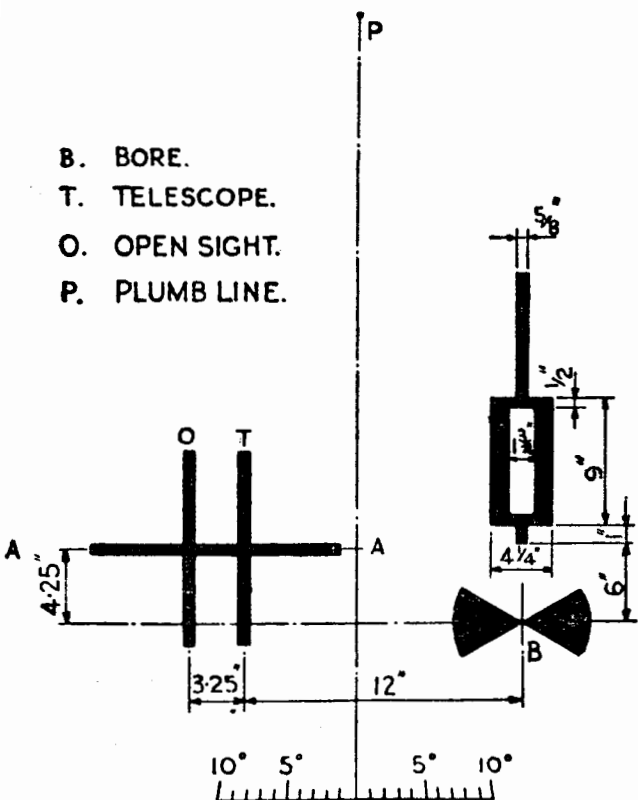


Fig. 22.—Sight-testing target

- (iv) If the gun has not been zeroed, set the range reader arm to the figure 6 on the quadrant, or to "T" on the sight scale plate. If the gun has been zeroed, set the eccentric to the sight testing figure marked on the shield. (See Lesson 25, para. 2.)

- (b) *To test the sights.*—Align the axis of the bore on the distant object (or point " B " on the sight-testing target), using the intersection of the cross wires as a foresight and the hole in the firing hole bush as a back sight. The line of sight through the intersection of the telescope graticules and the open sight should now be on the distant object (or on the intersection of the lines " T " and " AA ", and " O " and " AA " respectively on the sight testing target).

3. To adjust the sights.

- (a) *The telescope.*—Slacken off the four adjusting screws on the sight bracket, and ensure that the locking nuts are screwed close to the heads of the adjusting screws.

Lay the telescope on the distant object for elevation, using the top and bottom adjusting screws, leaving the screws finger-tight and the locking nuts loose. Lay for line, using the lateral adjusting screws. Tighten all four adjusting screws about a quarter turn, using a spanner.

Check the alignment and tighten up the locking nuts, taking care not to move the adjusting screws in doing so. Check the alignment again to ensure that the telescope has not been moved by the tightening of the locking nuts.

- (b) *The open sight.*—If the sight is not correct for line, align it by turning the deflection screw. Slacken the two clamping screws of the reader plate, move the plate until the deflection scale reader is opposite zero, and tighten the clamping screws.

If the sight is not correct for elevation, slacken the clamping nut of the foresight, screw the foresight up or down until the elevation is correct, and reclamp.

LESSON 25.—ZEROING

Instructor's Notes

Stores :—Equipment complete, 9 ft. zeroing target, cross wires for the muzzle, and spanners.

The target should be placed 800 yards from the gun before zeroing commences.

1. Explain

- (a) *That the objects of zeroing are :—*

- (i) To ensure that the point of impact coincides with the point of aim at the maximum opening range.

(ii) To allow for individual errors in the gun, caused by jump and droop, which have not already been compensated for in sight testing, and by wear; and to record a setting of the sights at which this is achieved.

(b) *That the sights are graduated in accordance with the range table, but that the following factors may cause variations in individual performance :—*

(i) *Jump.*—The jump of the gun may be more or less than the amount allowed for in sight testing, causing the shot to fall low or high.

(ii) *Droop.*—As only half the droop is compensated for in sight testing, the remaining half must be compensated for by zeroing.

(iii) *Wear.*—As the gun becomes worn, the muzzle velocity decreases, and more elevation is required to achieve a given range. This extra elevation is added during the process of zeroing.

(c) *That the following factors will affect the procedure of zeroing :—*

(i) *Round to round variation,* due to slight differences in the weight of the projectile and of the propellant.

(ii) *Wind.*—In order to obtain accurate results, zeroing should be carried out on a calm day.

(iii) *Temperature.*—Variations in the temperature of the charges from 60 degrees F.

As a result of these factors, the information afforded by one round cannot be relied upon, and it will be necessary to establish an M.P.I. This is achieved by obtaining three hits on the target with the same point of aim.

2. Procedure.

(a) *Before zeroing,* the following preparations must be made :—

(i) Bring the gun into action on a level platform.

(ii) Test sights (*see Lesson 24*).

(iii) Set up at 800 yards from the gun, a target 9 ft. square with a white cross painted on it.

(iv) Fire a " settling-in " round.

(b) *To zero the gun :—*

(i) Set the sights at 800, lay on the intersection of the white cross on the target, and fire a round. If the

round hits, fire two more rounds at the same elevation, relaying carefully between each, and after the last round.

- (ii) If the first round does not hit, apply the rules for corrections until a hit is obtained. Fire two more rounds at this elevation, relaying as in para. 2 (b) (i).
- (iii) If, after establishing an M.P.I. with the three rounds, the sights are not at 800, set them at 800. Then, without altering the setting of the range scale, adjust the line of sight by means of the vertical adjusting screws, until the telescope is laid for elevation on the M.P.I. of the three rounds, and tighten the clamping nuts.
- (iv) Put the crosswires on the muzzle, remove the striker case, and lay the bore on a distant object. Lay the telescope on the distant object by moving the range reader arm. *The position of the adjusting screws must on no account be altered.* Note the reading on the zeroing scale.
- (v) Set the sights at 800 and fire a checking round, which should strike not more than half the vertical measurement of the group of three rounds from the horizontal line.
- (vi) In all subsequent sight tests, set the range reader arm at the figure on the zeroing scale found in para. (iv) above.

3. By using the figure on the zeroing scale in subsequent sight tests, and by bringing the telescope parallel to the bore by means of the adjusting screws, the same setting for the telescope will be obtained as that achieved in para. (iv) above. Consequently, if the range reader arm is set to 800, the point of aim will coincide with the point of strike. Sight testing at this figure, therefore, ensures that the gun is also zeroed.

SECTION 10.—LAYING AND AIMING

LESSON 26.—LAYING

Instructor's Notes

Stores :—Diagrams or blackboard.

This lesson should take the form of a lecture and be given before the practical lesson on aiming. (Lesson 27.)

1. **The point of aim** is the centre of the visible portion of the

target. The turret is excluded from the visible mass, to minimize the possibility of shots within the natural spread of the gun passing through the vacant space on either side of it, except in the case of hull-down targets, where there is no alternative but to aim at the centre of whatever is visible.

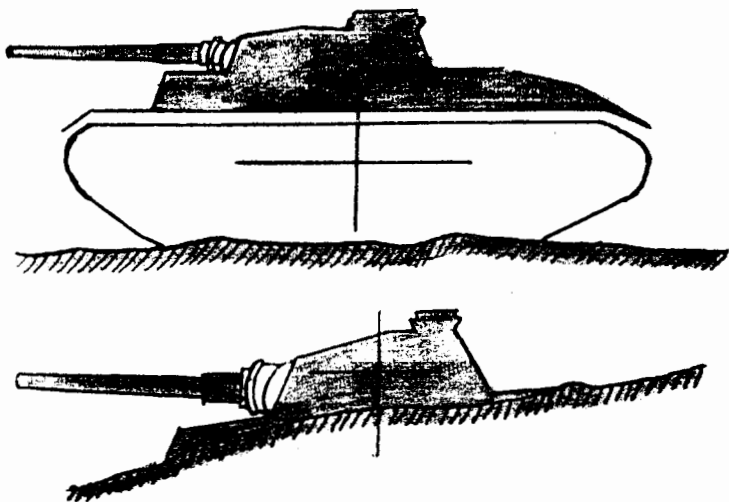


Fig. 23.—Point of aim

2. **The bore** is directed the correct distance above the line of sight by the layer, who, when No. 3 has set the range ordered by the detachment commander on the sight, lays the horizontal crosswire in the telescope on the point of aim.

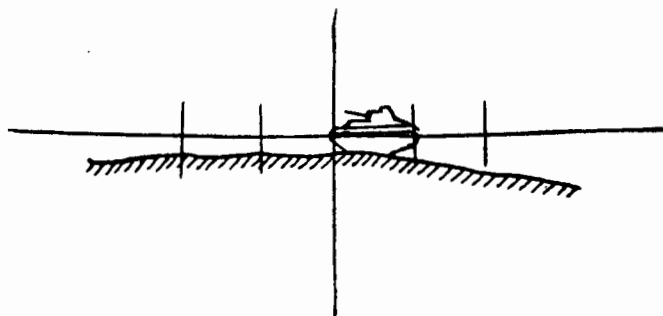
3. **Lead** is the directing of the bore in front of the target to allow for the movement of the target during the time of flight of the shot, so that both target and shot arrive at the same place at the same time. Units of lead are marked on the horizontal crosswire in the telescope on either side of the vertical centre line, which represents the direction in which the bore is pointing.

The layer lays first for elevation, aligning the horizontal crosswire on the centre of the target as it moves across the field of view of the telescope. The gun is fired when the centre of the target has reached the lead graticule ordered.

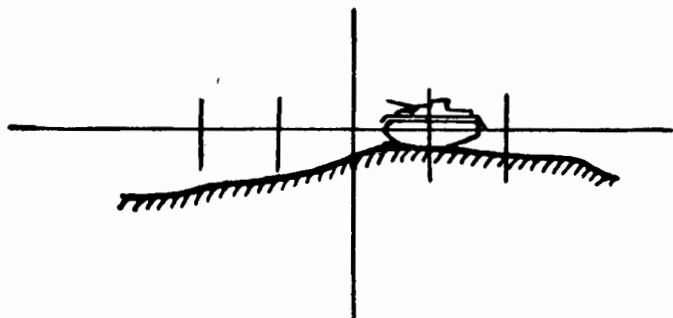
The layer will traverse the gun a short distance in front of the target, and allow the target to run on to the lead ordered.

Under certain circumstances it may be necessary to make finer adjustments to the lead than those marked on the telescope, in

which case the point of aim may be changed to the centre of the right or left edge of the visible mass. Similarly, fine adjustments to elevation may be obtained by aiming at the ground line.



Left $\frac{1}{2}$



Left 1

Fig. 24

4. The open sight is provided for use in an emergency. Its use is essential at dawn, dusk, when visibility is bad, and when the lead gratitudes and target cannot be seen through the telescope.

The sight consists of a bead foresight and a frame backsight, in which are a horizontal and a vertical crosswire, carried on the deflection gear supporting bracket. Units of lead are marked on the deflection scale plate on the supporting bracket, and applied by rotating a deflection screw head, which moves the backsight and deflection scale reader along the scale plate. No. 3 is responsible for setting the lead ordered, and consequently the layer does not repeat the lead. The layer lays first for elevation by aligning the inter-

section of the crosswires in the backsight and the bead of the foresight on the horizontal centre line of the target, traverses a short distance ahead and allows the target to run on to the intersection of the crosswires.

With both the telescope and open sight, the layer must be prepared to make final adjustments to elevation to conform to any unexpected movements of the target.

5. To ensure a high standard of laying, the following principles should be taught.

- (a) *Consistency*.—The effective application of the rules for corrections in fire control are dependent upon consistent laying. Therefore, the layer, when he realizes that the gun was fired when incorrectly laid, must shout "**Wrong**" (which will be repeated by No. 3) as a warning to the detachment commander not to make a correction on that round.
- (b) *Accuracy* in the point of aim is necessary, if the target is to be killed in the least possible number of rounds. If the layer takes a consistently inaccurate aim, it may still be possible for the **detachment commander** to obtain a hit by ordering a false lead or range, but it should be remembered that any unnecessary rounds will only serve to reveal the position of the gun and enable the target to return the fire.
- (c) *Speed* in laying is important, but only when combined with consistency and accuracy. The layer must be practised until he can, while still maintaining a consistent and accurate aim, make his traverses short, so that he is ready to fire immediately the gun is loaded.

LESSON 27.—AIMING

Instructor's Notes

Stores :—Equipment complete, tank models or vehicles.

Before the lesson begins, tank models or stationary vehicles and hull-down targets should be placed in front of the gun at ranges between 200 and 300 yds. and at various angles of approach.

1. Explain the rules of aiming :—

- (a) With the eye 12 ins. from the telescope, align the intersection of the horizontal crosswire and the lead graticule ordered on the point of aim.
- (b) With the open sight, align the bead of the foresight and the intersection of the crosswires in the backsight on the point of aim.

NOTE.—In order to ensure that a correct aim is obtained, the sights must be upright. This is achieved by setting the gun on a level platform. (See Lesson 29.)

2. Lay correct aims on the targets with the telescope and open sights at various leads, the squad viewing each aim.

3. Practise squad, checking each aim.

SECTION 11.—FIRE CONTROL

1. General.

(a) The effective application of the fire of the detachment depends on the fire control exercised by the **detachment commander**. He will normally be working on his own and is, therefore, solely responsible for killing any tanks which appear in the arc of fire of his gun, in accordance with any orders given regarding the range at which fire is to be opened.

(b) In order to ensure that the target is killed with the least possible delay and expenditure of ammunition, the fire controller must attain a high standard in the following subjects, in addition to fire control:—

A.F.V. recognition,
Judging distance,
Judging lead.

(c) The sequence in which a fire order is given is as follows:—

- (i) Indication of the target.
- (ii) Range.
- (iii) Lead.
- (iv) " Fire."

2. **Indication of the target.**—It will normally be necessary to select the target from amongst a number of enemy tanks. The most dangerous tank should be engaged first. This is not necessarily the closest tank, since a close moving tank may produce less effective fire than a more distant stationary one.

Since the **detachment commander** is unable to direct the bore on to the target himself from a flank, a clock reference system is used to indicate the target to No. 3.

(a) *The clock reference system.*—The **detachment commander** points out to No. 3 a distant reference object in the centre of the arc, to be known as the 12 o'clock ray. Reference objects representing the left and right of the arc normally become 10 o'clock and 2 o'clock respectively. No. 3 then marks on the ground under the breech a rough clock, with the clock rays pointing in the direction of the reference objects. The **detachment commander** marks a similar clock at his position on the flank.

Although only three rays are detailed, the **detachment**

commander may use in his indication the intervening hours of 11 and 1 o'clock, if desired.

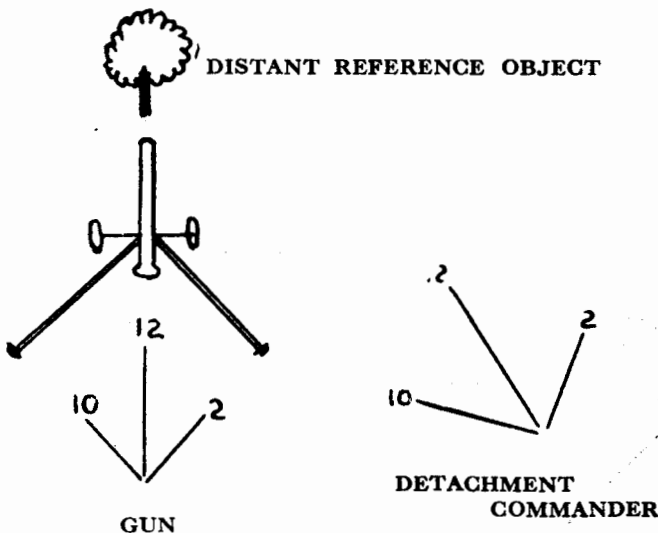


Fig. 25

(b) *The sequence of indication.*—To indicate a target, the **detachment commander** will order :—

- (i) The type of target ("Target," or "Target hull-down" or "Fresh target").
- (ii) The clock ray.
- (iii) The direction of movement.
- (iv) The position in relation to other tanks in the same body.

Examples :—

"Target—2 o'clock—moving left—second of four."

"Target hull-down—12 o'clock."

Only information sufficient to ensure that No. 3 can identify the target will be given.

e.g. If only one tank is seen :—

"Target—10 o'clock."

If there are no other tanks moving in an opposite direction on the same ray :—

"Target—12 o'clock—last tank."

To avoid confusion in indicating the position of a tank

in a body, the words "*far tank*", "*close tank*", "*front tank*" and "*last tank*" should be used.

When engaging a fresh target in a group of tanks, of which one has already been knocked out, the indication can be "Stop—last tank—go on." (See para 7 (g)).

3. Opening range.—The following rules will be applied :—

Range to Target	Set on Sights
0—400	400
Over 400	Range to Target

4. Opening lead.—The opening lead is based on the speed and direction of movement of the target and is unaffected by the range.

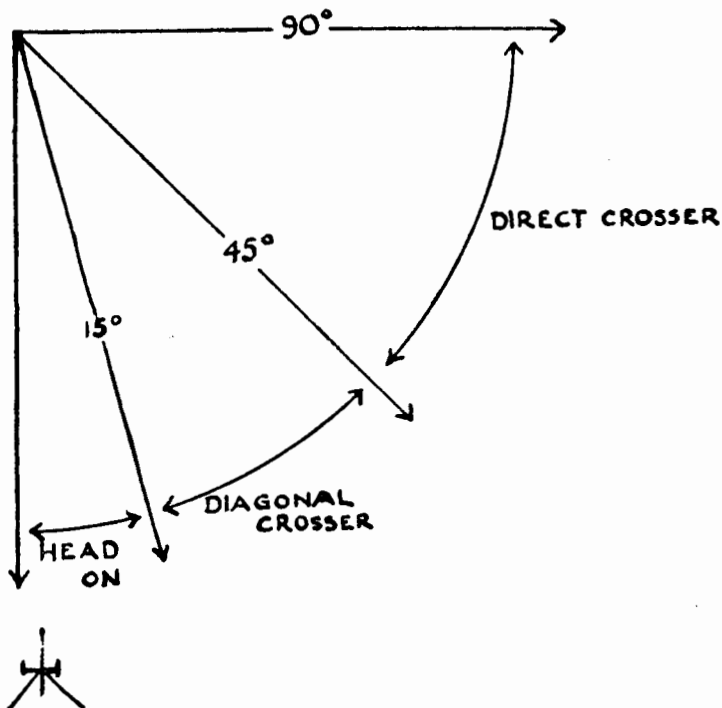


Fig. 26.—Direction of movement

Direct Crosser		Diagonal Crosser	
Speed	Lead	Speed	Lead
15	1	15	$\frac{1}{2}$
30	2	30	1

Rules for opening lead.

The appropriate lead for speeds between the above figures can easily be calculated.

A right mover requires a right lead and a left mover a left lead. Direct approachers and stationary tanks normally require a lead of "zero."

5. "**Fire.**"—This order is only given when the **detachment commander** has identified the tank as hostile, it is within effective range, and he feels certain of obtaining a hit with the first round.

6. **Corrections.**—If the first shot misses the target through incorrect estimation of the opening range or lead, corrections must be made to ensure a hit with the second round. In order to avoid creeping towards the target, the amount by which the shot is corrected will not be less than the figures stated in the tables. If, however, the shot misses very badly, then the correction may exceed the figures given.

(a) *Lead.*—Corrections to lead should be made before corrections to range, since a reliable indication for range cannot be obtained, unless the line is approximately correct. It will seldom be possible, unless the round misses below the target, to correct both lead and range as the result of the observation of a single round.

Range to Target	Correct by		
	Direct or diagonal crossers	Head - on	Hull - down
0—300	2	1	$\frac{1}{2}$
over 300—600	1	$\frac{1}{2}$	Zero - right (or left) edge
over 600	$\frac{1}{2}$	Zero - right (or left) edge	Zero - right (or left) edge

NOTES.—1. *Hull-down or head-on.*—It may sometimes be necessary to use "Zero—right (or left) edge" at ranges below those given in the table.

*For example :—*Range to target, 200 yds. Opening lead, zero.

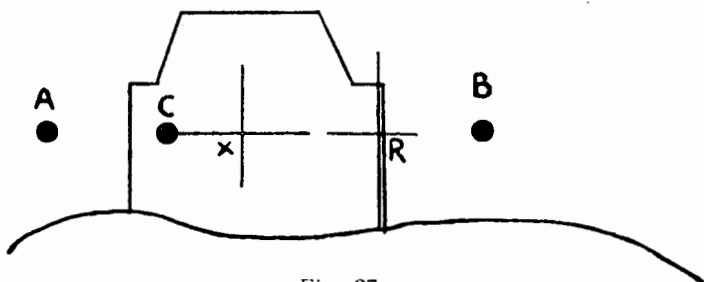


Fig. 27

Opening round, "A", misses left.

Corrected to "Right $\frac{1}{2}$ ", shot "B" misses right.

Corrected to "Zero—right edge", shot "C" hits.

The layer, with shot "A", laid the zero line on "X".

"Right $\frac{1}{2}$ " having proved too much, if zero is laid at "R", the shot should hit at "C".

2. "Zero—right (or left) edge" is cancelled by the order "**Centre**" or by "**Fresh target . . .**"

3. *Lead is not cumulative.*—A correction cancels the lead previously given, e.g. a correction from zero of one unit is given as "Left 1." A further correction of one unit is given as "Left 2", and not "Left 1."

- (b) *Range.*—Range corrections are ordered by the use of the words "**Add**" and "**Drop**". The corrections are, therefore, cumulative; that is to say, a fresh correction does not cancel the previous one.

Rules for corrections are given in the following table :—

Type of Target	Range to Target	Correct by
Direct or diagonal crosser, or head-on.	0-400	400
	over 400-800	200
	over 800	100
Hull-down ...	any range	100

NOTE.—Use of “Ground line” as a point of aim.

1. *Direct or diagonal crossers and head-on.*—Should a miss occur over the top of the target when the sights are set at 400, the order “**Ground line**” is given. No. 1 transfers his point of aim to this line.

2. *Hull-down targets.*—“**Ground line**” is again used when, at any range, a correction of “Add 100” results in a miss above the target. If, however, a correction of “Drop 100” results in a miss below the target, “**Add 100—ground line**” is ordered.

7. Engagement of targets

- (a) The **detachment commander** gives the fire control orders. No. 3 repeats all orders. When the target has been indicated, No. 3, having repeated the order, aligns the bore on to the target and reports “**On**”. For range, after repeating the order, he sets it on the range scale plate and reports “**Set.**”

With the open sight, having repeated the lead, No. 3 sets it on the deflection scale reader and reports “**Set.**” No. 1 repeats the lead ordered, except when using the open sight.

- (b) Strict co-ordination is necessary between the **detachment commander** and No. 3 in the giving and receiving of fire orders.

- (c) *If No. 3 does not repeat an order :—*

(i) *Opening range and lead, or lead corrections.*—Repeat until the order is acknowledged.

(ii) *Range corrections.*—Precede the repetition by “**Last order was . . .**”

e.g. **Detachment commander** : “Add 400.”

No. 3 : does not repeat.

Detachment commander : “Last order was—add 400.”

- (d) *If No. 3 repeats an order incorrectly :—*

(i) *Opening range and lead, or lead corrections.*—Repeat until the order is acknowledged correctly.

(ii) *Range corrections.*—Precede the repetition by the word “**Wrong.**”

e.g. **Detachment commander** : “Add 400.”

No. 3 : “Add 200.”

Detachment commander : “Wrong—add 400.”

No. 3 : “Wrong—add 400—set.”

- (e) When No. 3 receives a correction for range which necessitates setting the maximum or minimum ranges on the range scale, he will acknowledge it, set it, and report " (maximum or minimum range)—set."

Examples :—

- (i) Sight graduated from 300–2,500.—The range scale is set at 500.

Detachment commander : " Drop 200."

No. 3 : " Drop 200—300 set."

- (ii) Sight graduated from 400–1,200.—The range scale is set at 600.

Detachment commander : " Drop 200."

No. 3 : " Drop 200—400 set."

When No. 3 receives a correction which would necessitate setting a range beyond the maximum or minimum ranges, he will acknowledge it, set as much as possible, report the amount set and the maximum or minimum range.

Examples :—

- (iii) Sight graduated from 300–2,500.—The range scale is set at 500.

Detachment commander : " Drop 400."

No. 3 : " Drop 400—drop 200—300 set."

- (iv) Sight graduated from 400–1,200.—The range scale is set at 500.

Detachment commander : " Drop 200."

No. 3 : " Drop 200—drop 100—400 set."

- (f) If No. 3 does not hear an order or a particular part of an order, he will shout "**Check order**" or "**Check . . .**" followed by the part of the order he did not hear.

- (g) Fire is controlled by the words "**Fire**" and "**Stop**." "**Stop**" is cancelled by "**Go on**" or by "**Fresh target . . .**" followed by a new fire order.

When switching to another tank in the same group, the procedure is as follows :—

Detachment commander : " Stop."

No. 3 : " Stop."

Detachment commander : " Last tank—go on."

No. 3 : " Last tank—go on."

8. Principles of fire control

- (a) *Indication of the target* must be brief, clear, and simple. Tank attacks may be expected on a 600 to 800 yd. front with 50 to 60 tanks. The indication must, therefore, be clear

to avoid confusion by No. 3, and brief, since there will be little time in which to engage each target.

- (b) *Open fire quickly.*—Normally fire is not opened above a range of 800 yds. In order, however, to avoid delay in opening fire at that range, a fire order should be given on any tank that appears in the arc, at whatever range, as soon as it is seen. The **detachment commander** can then identify the tank, giving the order "**Fire**" as soon as it reaches a point 800 yds. from the gun. If there are only a small number of tanks in the arc, fire may be withheld longer. On the order "**Stop**," No. 1 continues to lay, so that if "**Go on**" is ordered, he can again open fire quickly.
- (c) *The first round must hit.*—As the 6-pr. is a flat trajectory weapon, provided the opening range and lead are correct, the first round should hit. It is important that it should do so, since the flash from the gun is likely to give the position away as soon as the gun fires. Fire controllers must, therefore, be accurate in judging distance, speeds, directions of movement, and be able to estimate instantly the range and lead necessary.
- (d) *Think ahead.*—Speed in the giving of orders is essential, particularly since each order must pass through No. 3, before it reaches the gun. The **detachment commander** must anticipate the next order that will be necessary. Any delay may enable No. 1 to fire again at the wrong range or lead, or at a tank that has already been killed, thus wasting both time and ammunition.
- (e) *Corrections must be logical and bold* if the first shot misses. Should the first shot miss, it is even more important that the next shot should hit. To ensure that it does, the following points must be observed :—
- (i) *Watch the target and not the gun.*—The fire controller cannot observe tracer accurately unless he concentrates on the target exclusively.
 - (ii) *Believe the strike of the shot.*—It is accurately aimed unless No. 1 shouts "**Wrong**." Nos. 1 must be trained to recognize the importance of warning the fire controller if the shot is incorrectly aimed.
 - (iii) *Apply the correct correction.*—Results will not be obtained by creeping, either for range or lead. The rules are compiled on the principle that if a shot misses on one side of the tank, it is not possible, having applied the correction, to miss on the other side of the target.

- (f) *Conservation of ammunition.*—The object of anti-tank fire is to kill the tank with the expenditure of the least possible number of rounds and time. No number of rounds is ordered and as soon as the tank is killed the **detachment commander** orders “**Stop.**” No. 1 stops firing, but continues to lay on the target, until the next target is indicated.

SECTION 12.—ADVANCED HANDLING

1. Naturally concealed gun positions, into which guns can be towed by the carrier, are difficult to find. It is most important that no tracks should be made near the gun, because they will at once give the position away. Detachments must, therefore, be trained to manhandle their guns into position.

2. The carrier can tow the gun over most types of ground, but should it meet an obstacle that it cannot cross or avoid, it will be necessary to manhandle the gun over the obstacle.

3. Frequently the carrier will not be available for moving a gun to its alternative or second positions and again manhandling will be necessary.

4. The weight and shape of the equipment make the 6-pr. an awkward gun to manhandle, particularly with a small number of men. Each detachment must, therefore, be trained to develop its maximum physical strength. This can only be achieved by applying the correct methods of lifting and pulling as taught in modern physical training. The co-operation of the A.P.T.C. staff should be obtained in this training.

5. *The sequence of training in handling is as follows :—*

- (a) *Manhandling.*—Instruction in pulling, lifting, and the aids to manhandling.
- (b) *Rough ground handling.*—Instruction in bringing the gun into action on rough ground after manhandling it from the vehicle.
- (c) *Advanced training.*—Instruction in bringing the gun into action to cover a certain arc of fire, after crossing an obstacle course.

LESSON 23.—LIFTS, PULLS AND AIDS TO MANHANDLING

Instructor's Notes

Stores :—Equipment complete and 2 boxes of ammunition.

A demonstration and explanation of each phase of the lesson should be given, followed by practice by the detachment.

1. In order to avoid unnecessary strain and to conserve energy when lifting heavy objects, the feet should be approximately 12 ins.

apart and parallel, the knees bent and the back straight. Full use should be made of the big muscles of the buttocks and legs.

2. The collier's lift.—Turn the back to the object and grasp it; the arms and back must be straight and the knees bent. Lift by straightening the knees, using the leg and buttock muscles.

3. The rope pull.—Face the gun and hold the rope under the right armpit, grasping it with both hands close together, the left hand in front with the palm downwards and the arm straight. Place the feet one on each side of the rope and at right angles to it, to give lateral control and to prevent swaying. Keep the leading leg, which acts as a pivot, straight, and the rear leg 12 ins. from it, and bent to provide the driving power.

Should it be necessary to pull from the right-hand side, the rope is held under the left armpit with the right hand in front.

On level ground the pull is divided into two phases, "*taking the strain*" and "*heaving*." On sloping ground a third phase is added, "*holding*."

(a) *Taking the strain.*—Allow the body to fall back in a straight line from the sole of the leading boot to the crown of the head, to an angle of 45 degrees. Dig the sides of both feet into the ground and take the strain on the rope.

(b) *Heaving.*—Keeping the strain on the rope, lower the angle of the body and heave by a powerful stretch of the legs and body. At the same time move both feet in the direction of the pull. Avoid bending the body when taking the strain and heaving.

(c) *Holding.*—Maintain a steady strain on the rope to prevent the gun slipping back. Chocks should be placed behind the wheels and the brakes applied to prevent waste of energy.

When pulling with more than one man on the rope the shortest must be nearest to the gun and the tallest at the end of the rope. The rope should be pulled in the direction in which the gun is to move and not at an angle to it.

4. Aids to manhandling.

(a) It is essential that the manhandling of the gun should be *under the direction of one man alone*, who decides the methods to be employed and the route, and issues the orders.

(b) It is generally best to *move the gun with the muzzle leading*. Two boxes of ammunition slung over the barrel will provide a counterweight to the trail and release an extra man for pulling.

The handspikes should be inserted in the handspike tubes

to provide leverage for the trail, which need only be lifted a short distance above the ground, except on level ground, when the handspikes can be supported on the shoulders.

The detachment commander should be at the trail, where he can control the movement of the gun and the detachment. The remaining numbers, according to size, should handle the dragropes, or two be placed on the dragropes with two pushing on the shields or wheels.

- (c) *The brakes* must be applied quickly on order by the detachment commander when holding, and released when taking the strain. On more gentle slopes or flat ground the spades provide a satisfactory brake or check.
- (d) *Chocks*, such as stones, pieces of wood or steel helmets, should be used to prevent the gun slipping back after heaving, or to form steps to break down the height of an obstacle.
- (e) *Ramps or planks* should be used, if available, for crossing ditches. If they are not long enough to bridge a ditch completely, the gun should be run down on one set of ramps, muzzle leading, and pulled up the other side. The side shields may also be used for this purpose.
- (f) In normal pulls, the dragropes may be attached to the drag-rope washers of each wheel, but, if the gun is to be moved over difficult ground, out of holes or up steep slopes, they must be attached to the drag-rope plates as "*wheel purchase*."

In the latter case, the gun is pulled muzzle first in a series of diagonal movements, the strength of the whole detachment being applied to each wheel in turn. Additional leverage may be obtained by pushing sideways on the handspikes. It is important that the detachment should be quick in changing the ropes when the brakes are applied after a pull.

- (g) One of the handspikes can be removed from the trail and used as a crowbar to obtain additional leverage under a wheel or under the axletree.
- (h) When moving over difficult ground or for the initial pull, the detachment should face the gun (*see* para. 3). Once the gun is moving freely, it will be found more comfortable and less tiring to face the direction of movement. The numbers nearest the gun pull with one arm straight back on the rope, which passes the waist. Those on the ends pull with the rope over their shoulders.

LESSON 29.—ROUGH GROUND HANDLING

Instructor's Notes

1. *The lesson should be taught by the platoon commander or by a fully trained N.C.O., since the detachment commander will be under training with his detachment.*

2. *The instructor should choose a piece of ground and a gun position suitable for emphasizing the lessons he wishes to teach.*

3. *Three discussions should be held, one after the detachment commander's reconnaissance, the second after the move and the third after the occupation. If at any stage a serious error is made, the lesson should be interrupted while this is corrected.*

4. *At the end of the lesson, practice in concealing and camouflaging the position must be given, and the detachment made to view it from an enemy standpoint.*

1. Explain :—

- (a) That rough ground handling forms a link between drill and handling in the field. Previous to this the gun numbers have had no experience in bringing the gun into action on rough ground in reference to an arc of fire.
- (b) That detachment commanders must learn rapidly to select the best route for manhandling the guns.
- (c) That the ground has been chosen to bring out certain lessons.
- (d) That the lesson will begin at a point which represents the nearest point to the gun position to which the gun can be towed.

2. Allow the detachment commander to make a reconnaissance of the route to the gun position, and explain his proposed method of advance. Then comment on the route and method chosen.

3. The detachment moves the gun under the control of the detachment commander over the route chosen. Once the gun is on the position, comment on the following :—

- (a) The control exercised by the detachment commander during the move.
- (b) The methods used to manhandle the gun.

4. The detachment gets the gun into action with the wheels and spades on the positions indicated by the instructor. Comment on the following :—

- (a) The position of the spades and wheels in relation to the ground. The ideal position should allow the wheels and spades to be on even ground. However, the ground may

make this impossible, and the following positions may have to be adopted :—

- (i) Wheels on uneven ground, spades level.
- (ii) Wheels on level ground, spades on uneven ground.
- (iii) Both wheels and spades on uneven ground.

In (ii) and (iii), the ground must be dug until the spades are level.

(b) Barrel clearance.

(c) The gun pit and the digging and concealment necessary.

LESSON 30.—OBSTACLE COURSE

Instructor's Notes

Once the detachment have mastered the methods of manhandling the gun, they should be exercised over an obstacle course. The course should be taken slowly at first, instruction being given in the best method of crossing each obstacle in turn. The detachment can then manhandle the gun over the course under service conditions, finally bringing it into action to cover an arc, as taught in Lesson 29.

The course should be about 440 yds. long, with a suitable gun position at the end. &

This lesson is a combination of the two previous ones, and should be given before platoon training exercises in the field.

1. The following obstacles should be included.

- (a) A ditch, 3 ft. deep by 4 ft. wide.
- (b) A sandpit, 10 ft. deep by 10 ft. wide.
- (c) A water obstacle.
- (d) A railway embankment.
- (e) A mine or shell crater.
- (f) A wood, with a fallen log in it.
- (g) An anti-tank ditch, 10 ft. wide by 6 ft. deep.
- (h) A mound of earth 12 ft. high.

Usually these obstacles will have to be improvised, although it will be more satisfactory to include natural objects within the course.

2. The following paragraph gives suggested methods of crossing the principal types of obstacles. Any obstacles which are not included in the list can be crossed by applying the appropriate methods set out below.

- (a) *Wide slit trenches, hollows, or ditches.*—Lower the gun with the muzzle leading, one wheel at a time, until the gun is in the ditch. Drag it to the proposed point of exit, and place the shields or any available planks as ramps. "Wheel-purchase" each wheel out in turn, using the brakes and chocks to prevent them slipping back.

- (b) *Steep inclines*.—Move the gun diagonally up the slope, with the muzzle leading, by using "wheel purchase" on each wheel in turn. Apply the brakes and use chocks, if necessary, after each heave and before changing the purchase to the other wheel.
- (c) *Railway lines*.—Move with the muzzle leading, using "wheel purchase" until both wheels touch the rails. "Wheel purchase" each wheel over the rails in turn. The detachment commander can give assistance by moving the trail sideways as the detachment heaves. Great assistance can also be given by one man levering under the axle tree.
- (d) *Fallen trees*.—Approach the obstacle trail first, and lift the trail as far over the tree as possible. "Wheel purchase" each wheel over in turn, using steel helmets to provide chocks and steps to break down the height of the trunk. Once the wheels are on the top, the gun will slide down of its own accord, under control of the detachment.

SECTION 13.—BATTLE DRILL

LESSON 31.—THE SITING OF ANTI-TANK GUNS

Instructor's Notes

All the lessons contained in this section should initially take the form of lectures. They should be followed by practical periods and exercises. (See Sec. 15.)

1. The platoon commander is responsible for the tactical siting of the infantry anti-tank guns. Normally, when he has allotted to the section commanders approximate gun areas and tasks, the detailed siting of the guns must be left to them. The platoon commander must, however, co-ordinate the siting of the guns at the earliest opportunity.

2. The principles of siting.

The following principles of siting must always be applied :—

- (a) *Defilade*.—The gun will always be defiladed from the likely tank run for which it is sited. The rigid application of this rule will conceal the pronounced muzzle flash of the gun from enemy tanks, and reduce the likelihood of the gun position being located. It will also enable the gun to attack tanks in the sides and rear, where they are less heavily armoured. It is, therefore, important that guns should not be sited to fire frontally, except in emergency action. It must be remembered that enemy fire, including mortars, will be brought to bear on the gun as soon as it has been located, and that guns should also, where possible, be defiladed from likely enemy O.Ps.

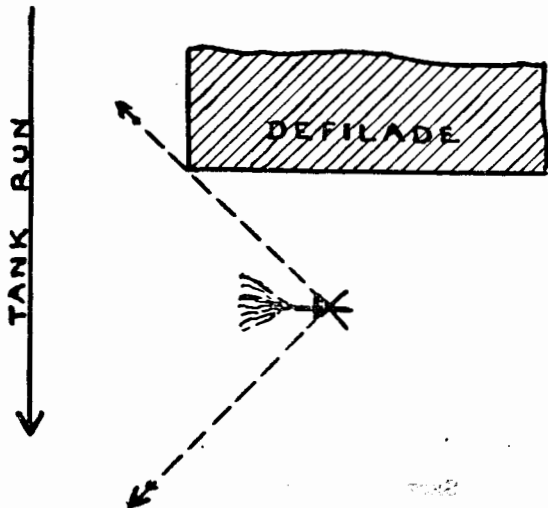


Fig. 28.—Defilade

(b) *Mutual support.*—Guns must be sited so that they are mutually supporting. Thus they will be able to fire towards each other across the tank run for which they are sited. Should one gun be attacked by tanks, the mutually supporting gun will be able to retaliate.

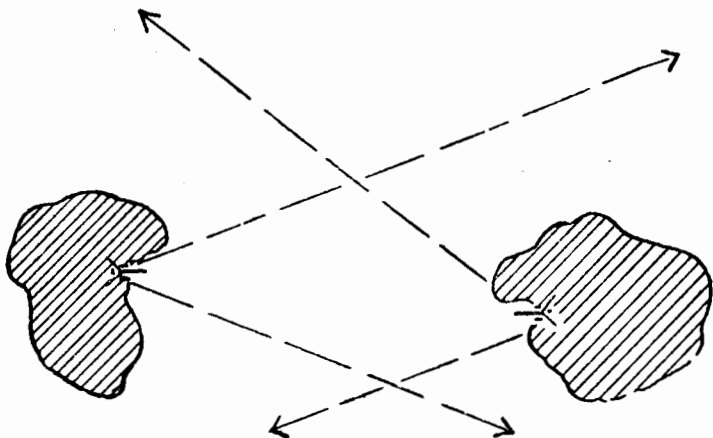


Fig. 29.—Mutual support

(c) *Concealment.*—Although the correct siting of the gun is of primary importance, great attention must also be given to concealment from ground and air observation ; in addition, to achieve the maximum protection, guns must whenever possible be dug in. For a quick occupation and when on the move, full use should be made of natural vegetation to break the outline of the gun and to make it blend with the background. Natural garnish can be bound to the barrel and attached to the front and side shields by means of string nets or wire kept permanently in place for the purpose. Full use should also be made of the 29 ft. by 29 ft. garnished net, the 25 ft. by 6 ft. roll of steel wool and the sheet of green or brown hessian, but care should be taken to ensure that they do not interfere with the traverse of the gun. Shadows thrown by the shields should be broken or extended, and care taken that the position is not given away by ammunition boxes in the open, spoil left uncovered or by the parking of vehicles near the gun site.

The concealment of the detachment is of equal importance, and strict camouflage discipline should be enforced. Use should be made of veils, and faces darkened. The making of unnecessary tracks must be avoided. Where this is difficult, tracks should be continued past the gun position. Personal kit must be kept under cover.

The fact that anti-tank guns are the primary concern of enemy air and tank reconnaissance and important targets for enemy high-trajectory weapons cannot be over-emphasized. Concealment must, therefore, be good at all times, and movement around and in the position reduced to a minimum.

(d) *Protection from infantry.*—The detachment has little chance of protecting itself against infantry attack by day or night. Guns must be sited within infantry company localities and within or close to a platoon post, in which position they can take advantage of the all-round protection afforded by the company. On occasions infantry may have to move in order to protect guns in positions which are more suitable for their tasks than those within the existing company locality.

(e) *Alternative positions.*—An alternative position, which must be selected for every gun, is one from which it should be possible to cover the same task and arc of fire as from the first position. Whenever possible, the two positions should be connected by a covered line of approach, should not be nearer than 100 yds. from each other, and must allow the gun to be manhandled quickly from one position to the other.

The detachment commander is at liberty to move to his alternative position on his own initiative, provided that he can cover the same task and arc as from his first position ; but he must report to platoon H.Q. as soon as possible the fact that the move has been made. If it will affect his task, he will move only on orders from the platoon commander. Full digging and preparation of the alternative position must be carried out as soon as the permanent position is developed.

- (f) *Defence against tanks.*—Guns must be protected against tank attack from directions in which they are not sited to fire. Guns should, therefore, be sited either against a tank obstacle, such as a thick wood, or with the blind side of the gun covered by the arc of another gun, or with a gun sited at the rear of the position.

The following additional principles of siting should be employed whenever circumstances permit :—

- (g) *The dangerous space.*—Anti-tank guns should be sited to ensure the maximum "dangerous space." This will be achieved by siting them to cover flat or slightly sloping ground. Plunging fire should be avoided.
- (h) *Fields of fire.*—The arc of fire of the guns should contain no ground which will afford hull-down positions to enemy tanks. It is also important that the gun should not be overlooked by enemy tanks from positions beyond its effective range.
- (i) *Covering obstacles.*—Whenever obstacles or broken ground, which will slow down the speed of enemy tanks, can be included in arcs of fire, more effective shooting will result.

LESSON 32.—ANTI-TANK MAP APPRECIATION

Instructor's Notes

Simple problems should be set on the blackboard at the end of the lecture, and the lesson followed by practice on a map.

1. By making an anti-tank map appreciation, the platoon commander can anticipate from the map the various anti-tank problems presented by the ground which the battalion is about to occupy. The appreciation will prepare the platoon commander for the task at hand before he sees the ground, and will save considerable time in the subsequent deployment of the platoon. At the first opportunity, the platoon commander should make a large-scale rough sketch of the area, on which to base his appreciation.

2. Procedure.—The following sequence will be employed in making the appreciation :—

- (a) *Shade in tank deterrents and obstacles.*—Examine the ground around the approximate battalion area for any main obstacles that will influence the direction of the tank threat.

Examine the approximate battalion area itself and shade in any definite tank deterrents, such as thick woods, marshes, railway cuttings, and such parts of the locality likely to be avoided by tanks. (See Appendix B.)

- (b) *Mark in the tank runs.*—Bearing in mind the main direction of the enemy threat, mark in the principal tank runs now emphasized by the shading, numbering them in order of priority.
- (c) *Mark in possible company localities.*—Select areas from which the runs can be covered and, bearing in mind likely positions for the infantry to defend, mark in possible company localities.
- (d) *Decide on a rough deployment of the platoon.*—At this stage it is only possible to decide on a rough deployment of the sections, and probable tasks for the guns, in order to cover the runs into the area. Individual gun positions cannot be selected from a map.
- (e) *Make notes.*—In addition to the information obtained by marking the map, further points will require attention. The answers to these will need confirmation from the ground, or from information received at a later date ; but notes should be made in the appreciation for reference while the area is being examined.
- (i) *Artillery anti-tank guns.*—Consider the possible task of any artillery anti-tank guns allotted to the battalion locality, and the necessary adjustment to infantry guns in view of this anticipated task.
- (ii) *Ground.*—Although a complete reconnaissance will be necessary in order to check the ground and the suitability of the deployment anticipated, a note of the ground requiring immediate attention should be made.
- (iii) *Road blocks.*—Note positions where road blocks formed by companies could aid in economizing guns and in simplifying the anti-tank layout.
- (iv) *Minefields.*—Consider the possible siting of small tactical minefields, which will also help in economizing guns and improving the potential layout.

LESSON 33.—RAPID DEFENSIVE OCCUPATION

1. As soon as the platoon commander receives a warning order to report to the battalion commander's O Group, he will :—

- (a) Give general information to all the N.C.Os.
- (b) Hand over the platoon to the second in command or the platoon serjeant.
- (c) Collect his reconnaissance party, which consists of the section commanders and the section orderlies.
- (d) Inform the section commanders and orderlies of the route to be followed.

If the platoon commander has been given an indication of the area to be occupied by the battalion, he will make an anti-tank map appreciation on his way forward to the O Group rendezvous. (See Lesson 32.) At times it will be advisable to detail one section commander to guide the vehicle while the appreciation is being made.

2. Procedure on a decision to occupy a position.—The platoon commander should accompany the battalion commander on his reconnaissance of the locality, and, together with the artillery anti-tank battery or troop commanders, must be present at his orders.

The platoon and battery or troop commanders must discuss briefly their respective appreciations both before and after the battalion commander's orders.

The following points must be included in the battalion commander's orders :—

- (a) The main direction of tank threat.
- (b) Company localities.
- (c) Allotment of tasks to infantry anti-tank guns, and company localities from which they will be carried out.
- (d) Allotment or confirmation of artillery anti-tank gun tasks and company localities from which they can be carried out.
- (e) The officer responsible for co-ordinating the layout.
- (f) Details concerning tactical, defensive, and protective mine-fields.

3. Duties of the platoon commander.—The platoon commander will now give orders to the section commanders. It may sometimes be possible to select a viewpoint from which the whole locality can be seen, in which event he will be able to give detailed orders to the three section commanders at once. When time allows or the ground makes it necessary, or when a reconnaissance of the locality has not been carried out before the battalion com-

mander's orders, he will give general orders to the three section commanders, then take each in turn to his area. Orders from the map alone should always be avoided.

The orders must include the following points :—

- (a) Main direction of tank threat.
- (b) Company localities.
- (c) Gun areas and tasks of all sections.
- (d) Gun areas and tasks of any artillery anti-tank guns allotted to the locality.
- (e) Present location of the platoon.
- (f) Platoon report centre.
- (g) Type of vehicle positions.
- (h) Time to be in action.

A message should be sent by an orderly to the second in command of the platoon, stating the position of platoon headquarters or a rendezvous at which he can meet the platoon commander. Should the second in command be otherwise employed, this message should be sent to the platoon sergeant.

NOTE.—For the duties of the platoon commander after the initial occupation, *see* para. 6.

4. Duties of a section commander.

- (a) If the section commander is not in his area when orders are given, he will immediately move there on the pillion of his orderly's motor cycle.
- (b) He will reconnoitre a position for his own gun in one of the gun areas allotted. When this has been selected, he will mark, nearby, with a flag or stick, a temporary position into which the gun will be put while the gun position is being developed. Exact gun positions must be sited with reference to the company commander of the locality, unless they have already been agreed with the platoon commander during his reconnaissance. The gun will be put into the temporary position by the orderly, who must be given the following orders :—
 - (i) Exact gun position.
 - (ii) Arc of fire.
 - (iii) Tank run the gun is to cover.
 - (iv) Approximate direction of the mutually supporting gun.
 - (v) Platoon report centre.
 - (vi) Where to find the section and the route to follow.
 - (vii) Where to bring the section.

The orderly will then be sent to lead the section forward

- (c) While the orderly is leading the section to the rendezvous, the section commander will select and mark the detachment commander's gun position.
- (d) He will then meet the section at the rendezvous, and, making any necessary alterations to the orders to the orderly, order him to put his own gun into position.
The section commander will put in the second gun himself.
- (e) Orders to the detachment commander must include points
 - (i) to (v) of the orders to the orderly. The following additional points must be added :—
 - (i) Direction of tank threat.
 - (ii) Company localities.
 - (iii) Positions and tasks of other sections.
 - (iv) Task of artillery anti-tank guns.
 - (v) Vehicle positions.
- (f) The orderly will put the section commander's gun into its temporary position, give the orders shown in para. (b) (i) to (v), and fetch the section commander on his motor cycle.
- (g) No. 3 will supervise the unloading of the stores and ammunition from the towing carrier, and the initial concealment of the gun.
- (h) The section commander, on his return, will check the gun position and order the orderly to report the section in action, at the platoon report centre. He will check the remaining points in the orderly's orders and include the additional points contained in paragraph 4 (e).

5. Duties of a detachment commander.—The section commander and the detachment commander will continue their duties as follows :—

- (a) *Detail the following points and duties :—*
 - (i) Concealment of the temporary position and track discipline.
 - (ii) Alarm signal for tanks and aircraft.
 - (iii) Anti-aircraft sentry and look-out.
 - (iv) Clock reference.
 - (v) Ready use ammunition.
- (b) *Make a reconnaissance for, and mark, the digging tasks.*—
Meanwhile, the detachment will continue with the camouflage and the unloading of the carrier.

(c) *Detail the digging tasks* for the gun position, in the following order of priority :—

Two weapon slits.

The gun pit.

The detachment commander's slit.

The ammunition pits.

(For details of digging, *see* Appendix A).

(d) *Test sights*, or order No. 1 to test them.

(e) *Make a range card*, and inform the detachment of the ranges to the points selected. If necessary, range marks must later be put out.

(f) *Select an alternative position* and covered route to it, and mark the digging tasks. Return and pass on the information to No. 3, taking him over the route and position at the first opportunity.

(g) *Report to the company commander* of the locality in which the gun is sited, and check the following points with him :—

(i) The final gun position and task.

(ii) The final platoon and section positions.

(iii) A ground task for the detachment Bren.

(iv) The company alarm signal and action to be taken.

(v) Feeding arrangements.

(vi) Latrines.

(vii) The use of the company RT set for communication with platoon headquarters.

Return and pass on the information.

(h) *Tabulate any questions* to ask the platoon commander when he visits the gun position.

(i) *Practise the detachment in the alarm action*, and, at dusk, the move to the alternative position.

(j) On completion of the first stage of the digging, prepare the alternative position to the same stage.

(k) Complete the digging of the first and alternative positions, and prepare the second position when one has been detailed.

(l) Prepare a *duty roster*.

6. Duties of the No. 3 of the section commander's gun.

(a) On arrival at the position, order the unloading of the towing carrier, and detail the vehicle position.

(b) Go with the orderly to the gun position, reconnoitre the route and control the manhandling of the gun into its temporary position.

- (c) Start the camouflage of the gun, and detail the moving of the stores to the gun position.
- (d) Hand over to the section commander on his return from the other gun position.

7. Duties of the platoon commander after the initial occupation.

- (a) Rapidly co-ordinate the platoon layout, changing gun positions where necessary, and checking with company commanders whose platoon posts necessitate the changing of a gun position.
- (b) Meet the platoon serjeant at the appointed rendezvous, and order the establishment of platoon headquarters, which should be near battalion headquarters.
- (c) As soon as all sections have reported their guns in action, report the platoon in action to battalion headquarters.
- (d) Meet the artillery anti-tank commander at the prearranged rendezvous, discuss the initial gun positions and any changes required to achieve co-ordination.

Allot, where necessary, secondary tasks to be carried out from the gun positions. Consider also second positions and tasks, to which certain guns will move should warning be given of a threatened attack from a particular direction.

The officer directed by the battalion commander to co-ordinate the battalion locality is responsible for preparing and sending to battalion headquarters a map enlargement of the locality, showing gun positions and tasks. The battalion anti-tank layout will be finally co-ordinated by the battery commander. (See Lesson 36.)

- (e) Visit detachments and issue such further orders as may be necessary. The second in command and the platoon serjeant should accompany the platoon commander.

8. Duties of the platoon second in command.—The principal duties of the second in command are :—

- (a) "Stand-in" for the platoon commander. When required, one anti-tank officer can always accompany the battalion commander, whilst the other controls the platoon.
- (b) Help in combined reconnaissance with the platoon commander.
- (c) Assist in co-ordination.
- (d) He will, when required, be able to attend the artillery anti-tank battery commander's orders and bring back the whole brigade anti-tank plan to the battalion.
- (e) Maintenance and administrative duties.

9. Duties of the platoon serjeant.

- (a) In the absence of the platoon commander and the second in command, he will command the platoon.
- (b) During the absence of the platoon commander and second in command on reconnaissance or while receiving orders, he will ensure that the platoon is ready to move on the return of the section orderlies.
- (c) He will establish and mark platoon headquarters as ordered by the platoon commander.
- (d) He will supervise the delivery and distribution of ammunition.
- (e) He will reconnoitre and organize platoon vehicle positions, and supervise the maintenance and repairs carried out under the orders of the second in command.
- (f) Help with the administrative arrangements within the platoon.

LESSON 34.—THE ATTACK

1. **The approach to contact march.**—One section of the anti-tank platoon will normally be placed under command of the advance guard company. The section commander will move with the advance guard commander, ready to deploy his guns for the protection of the company.

Two sections will normally move behind the R group at the head of the main body. If any antillery anti-tank troops are under command for movement, they will normally move at the rear or in the centre of the column.

Methods of protecting the column during this move are as follows :—

- (a) *Bound picqueting.*—This method will be used when the tank runs on either flank of the battalion's axis of advance are limited, the country is close, the ground does not allow rapid deployment along the axis of advance and the axis is sufficiently wide to permit the necessary movement.

The platoon commander, according to the orders of the battalion commander, will select the tank runs into the line of advance, and will, from the map or ground, detail and allot at least the first three bounds to sections. The remainder must be detailed as the advance continues.

Section commanders will put their guns into position at the bound ordered, moving to the flank until a clear field of fire is obtained. After the column has passed the section position, the section commander will move his guns past the other section to the head of the column again, remaining there until the next bound is reached.

b) *Guns concentrated.*—This method will be used when tank runs into the axis of advance are not clearly defined and cannot be anticipated, and when the ground is open and suitable for the rapid deployment of the four guns as a whole.

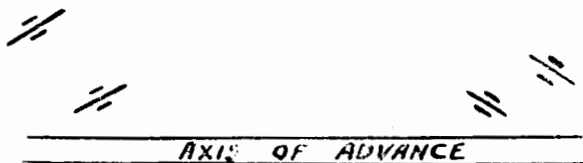
On sighting tanks, or a dangerous approach which it is necessary to cover at once, the platoon commander will give the appropriate signal to the sections moving at the head of the column. The sections will **at once** deploy rapidly in the direction ordered, using the emergency action formation indicated by the signal.

The formation to be used will be decided by the platoon commander according to the ground.

One of the three formations illustrated below will be used :—

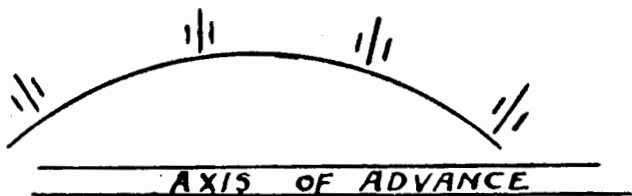
(i) Mutually supporting sections.

ENEMY



(ii) Outer Crescent.

ENEMY



(iii) Inner Crescent.

ENEMY

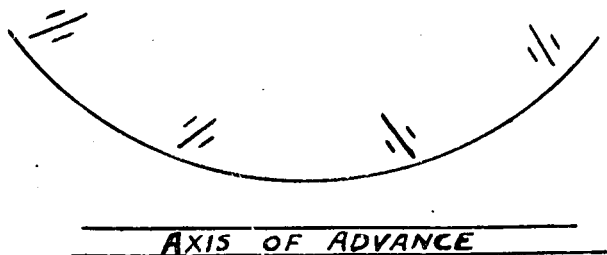


Fig. 30

NOTE.—For the appropriate signals, *see* Sec. 5.

- (i) The section orderly must remain close to the section commander during deployment. The section commander can then move the detachment commander's gun if it is necessary to do so.
- (ii) When the guns are in action, the carriers will proceed to a vehicle position behind them.
- (iii) The formation must be adapted to give the best fields of fire to the guns or to meet the imminence of the tank threat.

2. The assault and immediate consolidation.—The platoon commander, together with the artillery anti-tank battery or troop commanders, must form part of the battalion commander's O group.

The platoon commander will bring his own O group forward, leaving it under cover and within call.

- (a) *The following points must be included in the battalion commander's orders:—*
 - (i) The direction of tank threat.
 - (ii) Company objectives.
 - (iii) Allotment of sectors of responsibility and tasks to artillery anti-tank troops and the platoon.
 - (iv) Main effort companies with which sections are to move.
 - (v) Allotment of infantry for manhandling guns, if necessary.

(vi) Detail whether the platoon commander or troop commander will co-ordinate, if the battery commander is not present.

(b) *Duties of the platoon commander preceding the assault.*—Before leaving the O group R.V., the platoon commander will contact company commanders under whose command sections will move, and arrange the following rendezvous :—

- (i) R.V. for the section to meet the company fighting transport (A 1 echelon) with which it will move.
- (ii) R.V. for the section commander to meet the company commander.
- (iii) R.V. on the objective where section commanders will contact their sections, and where the sections deploy immediately on arrival.
- (iv) R.V. for personnel allotted for manhandling.

The platoon commander will now issue orders to the section commanders, including the following points :—

- (i) Companies with which they are to move.
- (ii) Company objectives and start lines.
- (iii) Sectors of responsibility on the objective and tasks.
- (iv) R.Vs. for company fighting transport, and time to move to them.
- (v) R.Vs. for section commanders to meet company commanders.
- (vi) R.Vs. for sections on the objective.
- (vii) Type of vehicle positions to be used.
- (viii) Allotment of, and R.Vs. for, manhandling parties, if any.

The platoon commander will now return to platoon headquarters and give the information and any necessary orders to the platoon serjeant regarding vehicle positions and the movement of platoon headquarters during the assault. He will then arrange the distribution of parties for manhandling, if any.

During the assault he will move either with the battalion commander or with the company commander in whose area the majority of his guns are to be deployed. The second in command will move either with the remaining section or with battalion headquarters.

(c) *Duties of a section commander.*—The section commander will return to his section from the platoon commander's O group and give orders to the detachment commander, whenever possible from a viewpoint from which the R.V.

on the objective can be seen. He will move the section at the given time to the company fighting transport R.V., and report with the orderly (dismounted) to the company commander.

He will move with the company commander during the assault and, on arrival on the objective, receive orders from him. The company commander will :—

- (i) Indicate or confirm the direction of tank threat, depending on the ground and whether enemy tanks are in sight.
- (ii) Allot section gun areas in relation to the final platoon posts.

The section commander will quickly select gun positions, and give orders to the orderly to put his own gun in position. The occupation will be completed in accordance with Lesson 33.

He will contact sections in neighbouring localities and rapidly co-ordinate the guns, making any adjustments necessary.

On occasions it will save time if the section commander can send his orderly to the R.V. in time to lead the section forward immediately on its arrival, and before it has carried out the automatic deployment mentioned below.

- (d) *Duties of a detachment commander.*—He will move with the section to the company fighting transport R.V. During the assault the section will be under command of the fighting transport commander and the detachment commander will move the section as directed by him.

On arrival at the R.V. on the objective, the detachment commander will immediately deploy the section, using the emergency action drills, to cover the main direction of tank threat.

On the return of the orderly he will move the section forward and will occupy the position, detailed by the section commander, as in Lesson 33, para. 4.

- (e) *Duties of the platoon commander during consolidation.*—The platoon commander will rapidly co-ordinate the battalion anti-tank layout to conform to the orders originally given by the battalion commander, or make any adjustments which the latter may have ordered on the objective.

He will co-ordinate with the artillery anti-tank troop or troops and complete the co-ordination drill as laid down in Lesson 36.

LESSON 35.—WITHDRAWAL

- 1. **General.**—The duties laid down in this lesson refer to the sion when the withdrawal has been premeditated and the

situation allows a comprehensive reconnaissance to be made of the next position in rear.

In other circumstances, the platoon guns may be leap-frogged back as companies withdraw, and the platoon commander will have little or no time for any detailed reconnaissance of the rear position. He must act in accordance with the immediate needs of the situation.

2. Procedure during the occupation of the position and in action.

(a) *The platoon commander.*

- (i) He will issue orders to his O group for the occupation of the position and for the tasks laid down by the battalion commander. (The occupation will be carried out in accordance with Lesson 33.)
- (ii) He will arrange to send an anti-tank representative to report to the officer detailed to reconnoitre the rear position. This representative will normally be the second in command of the platoon or, in his absence, the platoon serjeant (*see* para. 3 below).
- (iii) On the return of the platoon orderly from the rear reconnaissance with details of the platoon rear R.V., he will inform section and detachment commanders of the platoon R.V. and of any further details of the position, after consultation with the commanders of the companies concerned.
Sections and detachments allotted to companies will remain under command of those companies for purposes of the withdrawal, and will receive orders and timings for the withdrawal from the company commanders.
- (iv) He will arrange for the withdrawal of platoon H.Q., and will remain on the forward position to assist the withdrawal of sections and detachments.
- (v) At the platoon rear R.V. he will be given full details of the position by the commander of the rear reconnaissance party. He will co-ordinate the battalion anti-tank layout and carry out the duties laid down in Lesson 33, para. 7.

(b) *The platoon serjeant.*

- (i) He will assist the platoon commander and the second in command in the control of sections and detachments, and will carry out his normal duties as laid down in Lesson 33, para. 9.
- (ii) When ordered by the platoon commander, he will represent the anti-tank platoon commander during the reconnaissance of the rear position.

- (iii) At the platoon rear R.V. he will arrange for the replenishment of ammunition as detachments arrive.

(c) Section and detachment commanders.

- (i) Once details of the routes for the withdrawal have been given by the company commander, they will be responsible that the route back to the company R.V. is reconnoitred.
- (ii) They will make a plan for the removal of stores and kit when thinning out begins. Normally the ammunition carrier will be brought as near as possible to the gun position, and all surplus stores and ammunition loaded on to it. When the time for abandoning the position arrives, the remaining stores will be loaded on the towing carrier, the gun brought out of action, and the vehicles will proceed to the company R.V.
- (iii) They will ensure that second in commands of detachments understand the plan of withdrawal, and are capable of taking over, should the section or detachment commanders become casualties.
- (iv) They will move the section or detachment back along the route of withdrawal, under command of the company, until the point nearest to the platoon R.V. is reached. They will then report to the platoon serjeant, replenish ammunition, and contact the section or detachment guides.

3. Reconnaissance of the rear position.

- (a) When detailing the rear reconnaissance party, the platoon commander will include in his orders :—*

- (i) The composition of the party. This will normally consist of the second-in-command or the platoon serjeant, one guide per section and the platoon orderly.

When circumstances permit, however, one guide per detachment should be taken.

- (ii) Vehicles to be taken. Normally one of the platoon 15-cwt. trucks.
- (iii) A R.V. to which to report.
- (iv) Tools to be taken. These will enable the reconnaissance party, in the time available, to make hasty pits for the guns and to begin weapon slits.

(b) Duties of the commander of the party.

- (i) On arrival on the rear position he will be given approximate section tasks and the company areas,

- and will carry out the necessary reconnaissance, consulting company representatives in whose areas the guns will be sited.

- (ii) He will select the platoon R.V. as near to the battalion R.V. as possible, and will arrange for the guides to make a reconnaissance of the routes to the section R.Vs.
- (iii) He will give orders to the guides (*see Lesson 33, para. 4*).
- (iv) He will send the platoon orderly forward to the platoon commander with a marked map, showing the platoon rear R.V.
- (v) He will meet the guides at the platoon R.V., ensure that the routes have been carefully reconnoitred, and, on the arrival of the platoon, superintend the occupation of the position, giving full information to the platoon commander. Detachment commanders will be given all available information as soon as possible.

LESSON 36.—CO-ORDINATION

Effective co-ordination of a battalion anti-tank layout depends on the closest co-operation between the infantry and artillery anti-tank commanders.

Normally, the platoon commander is the anti-tank adviser to the battalion commander. If, however, an artillery anti-tank battery has been allotted to the battalion, the battery commander will act in this capacity.

The battalion commander must direct whether the platoon commander or the commander of any artillery troop allotted is responsible for co-ordination, in the absence of the battery commander. The final co-ordination of the layout is normally the responsibility of the commander of the artillery anti-tank battery allotted to the brigade.

The following procedure, if carefully applied, will ensure complete co-ordination between the infantry and artillery guns.

1. During the map appreciation, anticipation of probable artillery anti-tank tasks in the battalion locality.
2. Briefly discuss proposed plans with the artillery anti-tank commander before the battalion commander's orders.
3. Discuss again after orders. In addition, a rendezvous must be arranged at which to meet after the deployment of the guns.

4. After deployment, quickly co-ordinate and adjust the platoon layout. Meet the artillery anti-tank commander at the rendezvous. Indicate the respective gun positions and arcs of fire on a map, consider secondary tasks and second positions, and decide on adjustments necessary to improve the battalion anti-tank layout.

5. The anti-tank commander detailed by the battalion commander to co-ordinate will prepare an enlarged sketch map showing the battalion layout in detail, which will be sent to battalion headquarters.

6. Contact the anti-tank commander of neighbouring battalion localities and co-ordinate the two layouts.

SECTION 14.—AMMUNITION

1. **General.**—The ammunition used with the 6-pr. is of the fixed Q.F. type, comprising a percussion primer, a propellant charge in a brass case and a projectile with tracer, issued as one complete round. The cartridge being of the fixed type, it is not possible to alter the charge. Consequently, the normal round is filled with the full charge, but for practice purposes certain reduced charges may be issued. There is also a drill cartridge made of hard wood and correctly weighted.

2. **The projectile.**—The projectiles used are the armour piercing and practice shot.

A.P. shot is manufactured from solid steel or bar steel with a 1·4-calibre radius head. A recess is provided in the base for a tracer filling, the cavity being closed by a plug or closing plate.

Near the base is an undercut groove into which a copper driving band is pressed. Two waved ribs or two knurled rings in the groove prevent the driving band from turning on the projectile. The design of the driving band will slightly affect the ballistic properties of the projectile. In zeroing, therefore, only rounds fitted with the same type of driving band should be used.

Below the driving band is a further groove to secure the shot to the cartridge case.

Practice shot is normally manufactured from cast iron, but is otherwise similar in construction to A.P. shot.

3. The cartridge case.

(a) *The cartridge case* is of solid drawn brass and is slightly tapered throughout its length, the taper becoming more pronounced towards the mouth. The final $1\frac{1}{4}$ ins. are parallel to receive the projectile. A hole in the base is screw threaded to receive the primer, and the base has a

rim to permit the extractors to grip the round and eject it when the breech opens.

A No. 36 Q.F. cartridge clip protects the primer and prevents it from unscrewing. It must be removed before firing.

- (b) *The propellant* is either cordite (WT or WMT) or NH. The cordite filling comprises two inner bundles with an outer bundle wrapped around them, each tied with sewing silk. The whole fits tightly around the primer and against the base of the projectile.

An equivalent NH charge does not fill the whole case. It is packed tightly in the case by a leatherboard cup and distancing tube which bears on the base of the projectile.

With each filling a strip of tinfoil weighing 1 dram is included.

- (c) *The primer* is a Mk. II, No. 15 percussion primer, consisting of a body, cap, anvil, plug, screwed plug and magazine.

A paper envelope is secured to the inside of the magazine to receive the G.12 gunpowder.

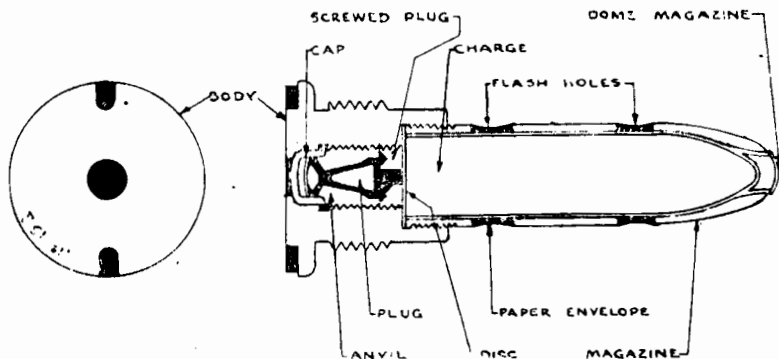
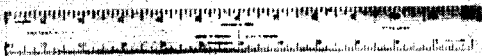
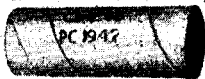
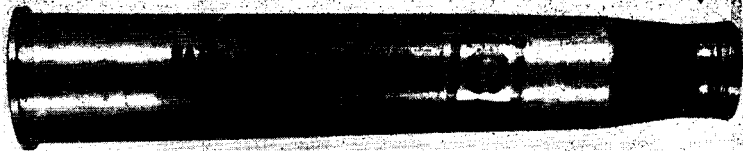


Fig. 31.—The primer. Mk. II, No. 15.

The Mk. I, No. 20, percussion primer consists of a body, percussion cap, anvil, copper ball, screwed plug, magazine and closing disc.

Action.—When the firing pin of the striker meets the cap, the detonating composition is ignited, the flash passes through the holes in the anvil and screwed plug to fire the magazine, and the flash from the magazine fires the main charge. Back pressure from the magazine forces the plug or ball into the fire channel in the anvil, so preventing the escape of gas to the rear.



4. **Markings.**—Ammunition is marked to make it easy to identify, to ensure that the correct type is used in the gun and to help in tracing defects in design and manufacture.

Markings are of two types, permanent and temporary. Permanent markings are stamped into the metal and relate, as a general rule, to the details of manufacture. Temporary markings are painted or stencilled and refer in general to the explosive contents of the round.

Great care should be exercised in handling ammunition to avoid damaging the markings, which if defaced, may make it impossible to identify the round.

The main principle observed in the system of marking is that it should always be possible to determine from the information on a box the details concerning rounds in it.

Ammunition is batched to record the various components employed in the composition of the round. Each batch contains a propellant charge of one "lot" only, but may contain more than one "lot" of other components. For example, as long as the other components of the rounds into which that "lot" of propellant has been fitted are those originally batched with that propellant, then those complete rounds are given a batch letter and number, e.g. Batch E.1.

If it becomes necessary to include "lots" of components, e.g. primers, other than those originally batched with the propellant, then the batch is divided into sub-batches. *For example :—*

Batch E.1.—contains rounds with the original components.

Batch E.1.A.—contains rounds with the second "lot" of components.

Batch E.1.B.—contains rounds with the third "lot" of components.

When the "lot" of propellant is exhausted, a new batch number is substituted.

A label is fixed to the inside of each box, giving particulars of the components of the ammunition in the box. The information on these labels must be altered as necessary, when any change is made in the components.

When it is necessary to replace original components by those of other "lots" (e.g. where the original components were faulty), the letter "x" will be added to the batch or sub-batch number on the box and stencilled on the side of the cartridge case. This letter "x" denotes that a box contains components other than those originally packed.

In the event of ammunition having to be replaced in the boxes from which it has been removed, e.g. unexpended ammunition after firing, care must be taken to ensure that only ammunition of the same batch or sub-batch is placed in each box. The stencilling on the cartridge cases will enable this to be done. If possible, the ammunition will be repacked in the boxes from which it was removed. Failing this, the batch or sub-batch numbers on the box must be amended to agree with the contents.

The following markings on 6-pr. ammunition are important and should be known by all members of the infantry anti-tank platoon.

(a) *The primer.*

Stamped :—

- (i) The number and mark of the primer.
- (ii) The lot number.
- (iii) The year of manufacture.

(b) *The cartridge case.*

Stamped :—

- (i) The designation of the gun.
- (ii) The year of manufacture.
- (iii) The letter "C", followed by the letter "F", for each time the case has been filled. The letter "F" is barred out thus, ~~"F"~~, each time the case has been filled, but not fired.

Stencilled on the base (in silver nitrate) :—

- (i) “ **A.P.** ”—when the cartridge is fitted with A.P. shot.
- (ii) “ **PRAC** ”—when the cartridge is fitted with a practice shot.
- (iii) “ **R** ”—when the cartridge has a reduced charge.
- (iv) “ **T** ”—when a tracer is fitted to the projectile.

Stencilled on the side :—

- (i) The batch letter, number and sub-batch letter as applicable.
- (ii) The propellant code letter in a square.
 - “ **E** ” denotes Cordite W.T or WMT.
 - “ **O** ” denotes NH.
 - or
- (iii) The propellant letter, e.g. WMT, NH, etc.

(c) *The projectile.*

Stamped on the side :—

- (i) The calibre and mark of the projectile.
- (ii) “ C.S.” for cast steel.
 - “ B.S.” for bar steel.
 - “ C.I.” for cast iron.
- (iii) The lot number.

Painted :—

A.P. and practice shot are painted black.

Stencilled round the head :—

- (i) A white tip denotes shot.
- (ii) A red ring denotes that the shot is filled wholly or partly with an explosive, e.g. tracer.
- (iii) A white ring below the red ring denotes A.P. shot.
- (iv) A brown ring below the white tip denotes a cast iron shot. A cast iron shot should not be fired through a gun to which a muzzle brake is fitted.

Stencilled on the body :—

- (i) A yellow band denotes a practice projectile.
- (ii) “ **T** ” (in red) when a tracer is fitted to the projectile.

(d) *Packing of ammunition.*—6-pr. Q.F. ammunition is issued in steel or wooden boxes holding four or six cartridges. A

paperboard cylinder is placed over the nose of each round to hold it in place in the box. The cartridge clip over the base of the round protects the cap of the primer.

Stencilled on the top of the box :—

- (i) The number of cartridges in the box.
- (ii) The calibre of the gun.
- (iii) The batch letter, number and sub-batch letter, as applicable.

The calibre of the gun and the batching also appear on the sides of the box.

5. Care and preservation of ammunition.

(a) *The following principles must be applied to maintain ammunition in a serviceable condition.*

- (i) Keep dry, protect from damp and do not oil.
- (ii) Protect from the direct rays of the sun.
- (iii) Maintain an even temperature in storage.

Care in handling, transporting and storing ammunition is, therefore, necessary. Boxes should be spaced in storage to prevent moisture forming on the top and sides.

(b) *Ready use ammunition* is that required for immediate action with the gun. It should be the minimum required for operational needs and a careful inspection of the following points must be made every day :—

- (i) That the rounds are dry, clean, and free from oil.
- (ii) That the primer is flush with the base of the case.
- (iii) That the case is free from dents and cracks. Cracks of not more than $\frac{1}{4}$ -in. near the mouth can be ignored.
- (iv) That the driving band is not seriously damaged. Small dents can be ignored, but if more serious damage is apparent the round should not be used.
- (v) That each round enters the chamber easily and smoothly. A stoppage caused by a jammed cartridge will cause delay in firing, which may cost the lives of the detachment. Each round must be tested in the gun. If it does not fit, it should be tried in the other guns. If it fails in all guns, reject the round and return it to the R.A.O.C.

In action, to prevent the possibility of a single enemy shell destroying all the ready use ammunition,

it should not all be stacked in one pit, but split into convenient groups.

NOTES.—(1.) Salvage of packages, cartridge cases, clips, etc., is of paramount importance.

(2.) *Never hammer or tap a cartridge case, however gently, while the primer is in position.*

6. The removal of a jammed projectile from the bore of a gun.

(a)—When the projectile is in the loaded position, *i.e.* has not taken the rifling.

(b)—When the projectile has been forced to take the rifling by firing, but has not left the gun.

(a)—The projectile will be ejected under the supervision of the platoon commander by using the ejector or by firing, as found most convenient.

By ejector.—Place a quantity of sacking or similar material in the chamber, to act as a cushion and to prevent damage to the projectile and breech mechanism, and close the breech.

Lay the gun in a safe direction, at slight elevation, and insert the ejector from the muzzle, taking care that the head fits snugly over the nose of the projectile. The final adjustment of the ejector should be carried out by one person, all others being behind the muzzle. Ropes, previously fitted to the stave of the ejector, are then taken down on each side of the gun and equally manned by the detachment. The stress is then taken and the projectile forced to the rear. Should this fail, the ejector may be withdrawn about 1 in. to 3 ins. by one person. The ropes are manned and a jerk given to them, which should move the projectile in most instances.

By firing.—Separate loading Q.F. guns can be cleared by loading a cartridge in the normal manner, laying the gun in a safe position and firing. Fixed Q.F. guns can only be cleared in this manner by the use of a shortened cartridge case, the propellant charge and primer being taken from another cartridge.

(b)—This is very unlikely to happen, but if it should, the incident should be reported at once to the R.A.O.C. for the attention of the I.O.O., who will make the necessary arrangements to clear the bore. On active service, if the assistance of the I.O.O. cannot be obtained in a reasonable time, the platoon commander may clear the bore by firing. This must be conducted under precautions as follows:—

Lay the gun in a safe direction, load a propellant charge, and arrange to fire by percussion, using a long lanyard (at least 15 yds.). Place all personnel under cover; and, when all is clear, fire from a covered position. The bore should then be inspected, and, if damaged, the gun should be placed out of action for technical examination.

SECTION 15.—TRAINING

1. **General.**—The standard to be aimed at in infantry anti-tank platoon training is for all members of every detachment to be interchangeable, and every N.C.O. to be capable of carrying out the duties of his immediate superior. It is essential, however, that in every detachment there should be at least two fully trained layers, and that Nos. 3 should be capable of carrying out the duties of a section or detachment commander.

In addition, at least two members of each detachment, and all N.C.Os., must be capable of driving and maintaining the detachment vehicles, and at least one member of each detachment must be trained in the duties of a motor-cycle orderly. It is vitally important that all motor-cycle orderlies and reliefs receive specialised training in map reading and in their battle drill duties.

2. **Platoon training syllabus.**—This paragraph shows a suggested syllabus upon which the training programmes of anti-tank platoons should be based.

The serial number indicates the sequence in which lessons should be taken throughout all subjects, although the amount of time or number of periods to be given to any particular lesson must be decided by individual requirements or limitations, and by the training facilities available.

Sub-para. (j) suggests extra training, which should be given to all N.C.Os. It will be advantageous to accomplish this training as early as circumstances permit, so that the platoon N.C.Os. are better qualified to carry out their duties and also to help in the instruction and training of the platoon.

	Serial No.	Subject	Sec.	Lesson No.
(a)		Lectures		
	1	Characteristics	1	
	6	Laying	10	26
	10	Fire control	11	
	19	Obstacles	Appendix B	
	21	Tank tactics		
	26	Zeroing	9	25
	31	Sighting	13	31
	37	Battle drill—defence	13	33
	51	Battle drill—attack	13	34
	55	Battle drill—withdrawal	13	35
	61	Ammunition... ..	14	
(b)		Gun drill		
	4	General	4	
		Fall in, number, change round, mount, dismount, stand fast	4	1
	5	To move the gun	4	2
	7	Prepare for action*	4	3

	Serial No.	Subject	Sec.	Lesson No.
		Gun Drill—(Continued)		
	9	Revision.		
	13	To come into action*	4	4
	14	Prepare to move, run up, cease firing, hook in...	4	5
	16	Load, unload, make safe, rest	4	6
	18	Aiming		27
	20	Revision.		
	22	To lay, fire, stop	4	7
	25	Revision.		
	30	Misfire, unejected cases, casualties	4	8
	34	Abandoning drill	4	9
		<i>Note.</i> —		
		(i) *These lessons should be revised at the beginning of all subsequent drill periods.		
		(ii) Further revision should be introduced as required.		
c)		Mechanical subjects		
	3	General description (3 periods)	2	
		Stripping :—		
	8	The striker case	6	10
	11	The breech block... ..	6	11
	17	The actuating spring case and breech ring ...	6	12
		Mechanism :—		
	33	Opening the breech by hand	7	13
	41	Opening the breech, semi-automatic and closing the breech	7	14
	53	The elevating gear and adjustments	7	15
	57	The firing gear and adjustments	7	16
	36	The recoil and recuperating system	7	17
	63	Equipment Bee.		
d)		Maintenance		
	20	General—gun stores—filling the buffer	8	18
	23	Daily and weekly maintenance and cleaning ...	8	19
	29	Points before and during firing	8	20
	60	Faults—causes and remedies	8	21
	46	Points after firing	8	22
	58	Additional points of maintenance	8	23
e)		Training layers and detachment commanders		
	24	Tracer simulator and blackboard range.		
	15	Judging distance and lead.		
		Miniature range :—		
	28	Stationary target—telescope.		
	32	Stationary target—open sight.		
	35	Moving target—telescope.		
	39	Moving target—open sight.		
	42	Moving targets—general fire control.		
	59	Night firing practice.		
		<i>Note.</i> —For details, see paras. 3 and 4 below.		
		Sub-calibre practices (Bren gun at 200–300 yards range) :—		
	45	General fire control—telescope.		
	48	General fire control—open sight.		
	64	Night firing practice.		

	Serial No.	Subject	Sec.	Lesson No.
		Training layers and detachment commanders —(Continued)		
		Service shooting :—		
	54	General fire control—telescope.		
	62	General fire control—open sight.		
	65	Night firing practice.		
		<i>Note.</i> —For details, see para. 4 (c), (iii) below.		
(f)		Sight testing and zeroing		
	12	Sight testing	9	24
	27	Zeroing	9	25
(g)		Advanced handling		
	38	Lifts, pulls and aids to manhandling	12	28
	40	Rough ground handling	12	29
	49	Obstacle course	12	30
(h)		Battle drill		
	43	Sand model exercise.		
	44	Reconnaissance of detachment positions.		
	47	Occupation of detachment positions.		
	50	Platoon training exercise—defence.		
	52	Platoon training exercise—attack.		
	56	Platoon training exercise—withdrawal.		
		<i>Note.</i> —For details see para. 6 below.		
(i)		Demonstration		
	2	Characteristics	1	
(j)		Additional training for N.C.Os.		
		Lectures :—		
		Training layers and detachment commanders...	15	paras. 3 and 4
		The roles of the infantry anti-tank gun ...	1	para. 4
		Map reading.		
		Anti-tank map appreciations	13	32
		Advanced handling	12	
		Co-ordination	13	36

(k) **Field signals.**—The signals shown in Section 5 must be introduced at the appropriate stage of training.

3. Training of layers.

(a) *The object of this training is to develop :—*

- (i) consistency ;
- (ii) accuracy ;
- (iii) speed.

(b) *The methods which should be applied are :—*

- (i) miniature range—0.22 and airgun attachments on a vaudrey or 125 range, or 0.303 attachment at 30 yards range ;

- (ii) spotlight projector ;
- (iii) 0.303 Bren gun attachment shooting ;
- (iv) service shooting.

(c) *The sequence of training which must be followed is :—*

(i) *Stationary targets :*

Without firing :—

- tank target with a lead of zero ;
- bulls-eye target with various leads ;
- tank target with various leads.

NOTE.—The instructor should check each aim and correct any faults that occur, until the squad can lay any lead ordered, rapidly and accurately. (See Lesson 27.)

With firing :—

Bull's-eye target on a miniature range, at which each member of the squad fires five rounds with a lead of zero, and at the same elevation, but laying off for elevation and direction between each round. This practice must be continued until the layer can obtain consistently a one-inch group with the five rounds.

Three or four targets on a miniature range are engaged with the same lead in an order selected by the instructor. The targets should necessitate changes in elevation. The standard to be obtained is the same as in the previous practice.

Three or four targets as in the previous practice are engaged with various leads in the order directed by the instructor. The standard to be obtained is the same as in the previous practice, the instructor checking with the aid of a checking scale.

(ii) *Moving targets :—*

Without firing :—

A man, to represent a moving target, moves about in front of the gun, and the squad is made to practise traversing with the lead ordered by the instructor.

Two or three men, representing various moving targets, are made to walk about in front of the gun. In this practice, the detachment commander should also be exercised in giving complete fire orders for the engagement of these various targets. The remainder of the detachment can also be practised in their duties at the gun.

NOTE.—In the above practices the instructor

will watch and check the swing of the gun during traversing.

With firing :—

A moving bull's-eye target on a miniature range is engaged with five rounds, at the lead ordered. The practice must be continued until each member of the squad can obtain consistently a one-inch group.

Two or more moving tank targets on a miniature range are engaged with five rounds with the various leads ordered and the varying elevations necessitated by the movement of the target. In this practice the detachment commander will again be exercised in giving complete fire orders for the engagement of the various targets. The same standard of laying must be achieved.

NOTE.—It is most important that these practices are carried out thoroughly and in sequence on a miniature range, and the required standard of a 1-in. group consistently obtained, before 0.303 Bren gun attachment or service shooting practices at longer ranges are begun. During these latter practices the layer, having qualified in the initial stages of his training, will be further practised, while the detachment commander is exercised in fire control.

The daily practice of layers is essential in order to achieve and maintain the standard of laying required of them.

4. The training of detachment commanders.

(a) *The object of this training is to develop :—*

The accurate judgment of distance and lead.

The giving of accurate initial orders quickly and clearly.
An instantaneous reaction to changes in the movement of targets.

The observation of tracer.

(b) *The methods which should be employed :—*

- (i) Blackboard range or blobstick.
- (ii) Tracer simulator.
- (iii) Gun drill practices.
- (iv) Miniature range—sub-calibre practices.
- (v) Bren gun attachment practices.
- (vi) Service shooting practices.

(c) *The following sequence of training must be adhered to :—*

- (i) The individual training of detachment commanders with blackboard range, a tracer simulator, and judging distance and lead practices,

- (ii) When detachment commanders are proficient individually in the above, their training can be combined with that of layers and the remainder of the detachment in gun drill and sub-calibre practices (*see* para. 3 (ii) above).

Bren gun attachment and full charge shooting represent the later stages of a detachment commander's training, in that fire control in these practices is dependent on observation of tracer.

- (iii) Full charge shooting.

The greatest benefit will be obtained from full charge shooting if the stages shown in Appendix C, culminating in the "Battle practice," are followed methodically when the platoon is under training on a full charge anti-tank range.

5. The use of critics.—When the training of the detachment commanders and their detachments is combined in drill, sub-calibre and full charge shooting practices, the greatest instructional benefit will only be obtained by the use of critics. The use of such critics is instructive to the numbers working at the gun, and much can be learnt by the critics themselves.

Spare numbers should be detailed to watch and criticise the drill and fire discipline of Nos. 1, 2 and 3.

A critic should also be detailed to watch and criticise the fire control of the detachment commander. If such criticism is to be accurate and constructive, a careful record of the shoot must be kept by the critic. A suggested analysis sheet with an explanatory note is shown in Appendix C.

6. Battle drill.

- (a) *General.*—Battle drill is a sequence of actions and duties to be carried out in the occupation of a position in attack, defence and withdrawal. *Its objects are :—*

- (i) To ensure that the position is occupied in the shortest possible time.
- (ii) To ensure that no detail is forgotten, and that the position taken up is sound.
- (iii) To give the confidence that results from a familiar and much practised procedure.

Battle drill must first be taught as a rigid procedure, but it must be borne in mind that flexibility is essential, and that once the basic drill has been grasped thoroughly, modifications must be made where necessary to suit varying circumstances and tactical situations.

The first lessons in battle drill can be introduced as soon as a satisfactory standard in drill and fire control has been reached, bearing in mind that the engagement of targets and fire control will always be introduced in the later stages of instruction in battle drill.

(b) *Sequence of training.*

- (i) *Reconnaissance of detachment positions.*—After the lecture on battle drill—defence (Lesson 33), and some simple exercises on a sand model have been carried out, section and detachment commanders and Nos. 3 should be exercised in the reconnaissance and selection of gun positions. The remaining numbers are not exercised at this stage, the object being to ensure that the detachment commanders and seconds in command have thoroughly mastered the battle drill before carrying it out with their detachments.
- (ii) *Advanced handling.*—Here, section and detachment commanders are for the first time given a detachment to command in the field. It thus has a double significance. It is a stage in the teaching of battle drill and is also the next stage to detachment drill in the training of gun numbers. After manhandling instruction, the detachment is exercised in bringing a gun into action on a given position in relation to a particular task.

The importance of concealment must be greatly stressed, and thorough instruction and practice in it carried out at this stage.
- (iii) *The occupation of detachment positions.*—In this, both the above stages are combined. The section commander, detachment commander and section orderly are exercised in their duties, and the remaining numbers in the occupation and development of the gun position.
- (iv) *Platoon training exercises.*—Exercises for the training of the platoon as a whole can now be started. Simple defensive occupations should be carried out until the drill has become instinctive, before exercises in the attack and withdrawal are begun.

The engagement of targets and practice in fire control should be introduced in all platoon training exercises, to test the effectiveness of the siting of the guns and the preparations made by the detachments.

7. **A.F.V. recognition.**—The importance of this subject cannot be overstressed in the training of the platoon. Details of the subject can be found in "A.F.V. Recognition, Part I, 1942, and Part II, 1943." Full use should also be made of all the training films, photographs and pictures available. In addition, or when such facilities are not available, great benefit can be obtained from home-made silhouettes and models, periodical tests for the platoon being carried out with the aid of newspaper illustrations, and photographs contained in official publications.

APPENDIX A

DIGGING

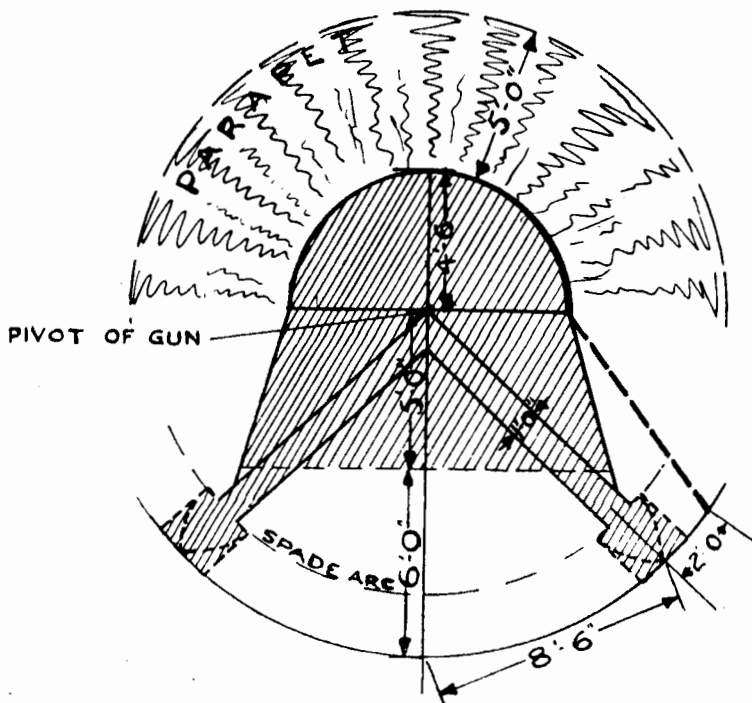


Fig. 32.—The gun pit

NOTES—(1) The following sequence for digging a detachment position should be followed :—

- (a) Two weapon slits for numbers 1, 2, 3 and 4 within 10 to 15 yds. of the gun pit, and sited so that the gun numbers can fight with their small arms weapons when necessary.
- (b) The gun pit, dug to stage 1. (*See figure and further details in para. 2 below*).
- (c) The detachment commander's weapon slit, sited on the upwind flank, from which he can control the fire of his gun. When time permits, another slit on the opposite flank may be dug, to allow for a change in the wind.
- (d) An ammunition pit or pits, in rear of the gun position, to house the remaining detachment ammunition which is not ready for use in the gun pit.
- (e) An alternative position similarly developed.
- (f) The completion of the first position.
- (g) The completion of the alternative position.

(2) The above figure (Fig. 32) shows a specimen gun pit, the dimensions of which must be known thoroughly by all detachments, although it must be borne in mind that each individual pit will vary considerably with the ground and the site selected for the gun.

The outline for the pit required must be taped or spitlocked before digging is begun.

Considerable experience and practice is necessary before gun pits can be dug at the speed which is necessary.

Stage 1.—In this stage, only the portions of the pit which are shaded in the figure will be dug, *i.e.* the forward portion and two slots for the trail legs, sufficient to sink the gun about 18 ins. below ground level. The depth of the gun pit will always be determined by muzzle clearance.

Stage 2.—In this stage, the remainder of the pit is completed and, if further traverse than 90 degrees is required, 2 ft. extra width for the spades is required for every 10 degrees.

The parapet should be built out to a distance of 5 ft. and banked up so that as much protection as possible is given to the wheels.

Thrown-up earth must be camouflaged as work progresses and the parapet finally covered with the turf which has been removed. To give concealment from the air, the floor of the pit and ready-use ammunition should also be covered with natural vegetation or camouflage material.

APPENDIX B

ANTI-TANK OBSTACLES

Obstacles are divided into two categories, natural and artificial. Further details of artificial obstacles will be found in "M.T.P. No. 30, Part III, 1940."

The following list gives the types and dimensions of obstacles necessary to stop tanks:—

- (a) *Ditches*, whose width is half the overall length of the tank, plus 1 ft., and whose depth is 5 ft. The face on the side opposite to the tank approach must be vertical and the approach to the ditch ramped, to prevent the tank destroying the vertical face by fire.
- (b) *Banks* with a 5 ft. vertical face.
- (c) *Water*, which must be 50 ft. wide and 4 ft. deep for 25 ft. of its width. If the bottom is muddy the depth should be measured from the hard under-surface. Less water is necessary if the obstacle has steep banks or a bad approach. For amphibian tanks the obstacle should be treated as a dry ditch.
- (d) *Slopes*, whose gradient is at least 60 degrees, or if the surface is loose, slippery or covered with scrub or boulders, of a gradient of 45 degrees.
If the slope is not sufficiently steep, it can be prepared by using logs or scarping.
 - (i) *Logs*. Pile the logs, which must be freshly cut and green, in a pyramid to a height which will increase the gradient to at least 45 degrees.
 - (ii) *Scarping*. Cut away the bottom of the slope to a depth of 5 ft. with a gradient on the face opposite the tank approach of 60 degrees, throwing the spoil in front.
- (e) *Trees*, whose diameter is at least 18 ins. Woods must be sufficiently thick to prevent the passage of tanks between the trees. They can be improved by adding wire and mines and felling trees.
- (f) *Vertical tree stumps*, 18 ins. in diameter, not less than 2 ft. 3 ins. high. The trees must be freshly cut.
- (g) *Minefields*.—Details of anti-tank mines can be found in "M.T.P. No. 40, 1942." Minefields should be sited in conjunction with existing obstacles and the fire and counter-attack plans. They are sub-divided as follows:—
 - (i) *Protective minefields*, to prevent penetration of a defended locality, post or road block.

- (ii) Defensive minefields, to prevent penetration between defended localities or into an outpost position.
- (iii) Tactical minefields, to canalise penetration within a defended area, or enemy movement round the flank of such an area.

Mines should be spaced either close, using two mines per yard of front, or open, using one mine per yard of front.

(h) *Road blocks*, 4 ft. in height, of massive structure, anchored firmly at both ends, and sited round a bend in a road to prevent the tank charging it. Oil spread on the road will stop wheeled vehicles. A wire stretched tightly across the road 3 ft. 9 ins. high will decapitate a motor cyclist. A 4 in. steel rope, left slack, 4 ft. 6 ins. above the ground at the centre and firmly secured at both ends, will stop a tank. A ground obstacle should be placed in front to prevent the tank charging the rope.

APPENDIX C

SUGGESTED METHOD OF PRACTICE ON FULL CHARGE ANTI-TANK RANGES

DRESS : Parts 1-4 inclusive in Drill Order, Part 5 in Battle Order, Part 6 in Drill Order until qualified in Part 4.

Part	Object	Guns required	Approximate range	Type of target	Conduct of practice	Frequency	Remarks
1 (a)	Demonstration to detachment commanders and Nos. 3 of the effect of leads of Right 1 and Left 1, misses below and above, and the appearance of a hit on a canvas screen.	1 per platoon	500 yds.	Stationary screen.	The gun is laid by the instructor. All detachment commanders and Nos. 3 watch.	Daily	
(b)	Estimation of ranges.	1 per platoon.	400-800 yds.	Three or four screens or natural features.	All detachment commanders and Nos. 3 estimate ranges to screens. The gun is laid and fired by the instructor at range given by the squad.	Daily.	Instructor must know the true range.

Part	Object	Guns required	Approximate range	Type of target	Conduct of practice	Frequency	Remarks
2	Instruction in course, speed, range. Demonstration of hits on a moving target, and holding fire until a certain hit is assured.	1 per platoon.	200-800 yds.	Direct crossers, diagonal crossers and approachers.	One gun detachment plus a chosen detachment commander. Remainder of detachment commanders and Nos. 3 watch. Detachment commander of the firing detachment gives lead and range (audible to all the squad) and chooses what he considers is the appropriate moment to order " Fire. " If the shot misses, the order " Stop " is given and then the cause of the miss is analysed before " Go on " is ordered. The instruction continues until hits are obtained consecutively.	Daily.	At the instructor's discretion, any of the squad can be ordered to give the next order. The instructor concentrates on the effect of fire and NOT on gun drill.
3	Instruction of layers in smooth laying.	All guns not employed in Parts 1 and 2 above.	As for Part 2.	As for Part 2.	On a platoon basis. Platoon officer selects target and orders lead. Layers engage.	Daily.	No alteration in range is ordered, as the range is normally applied by No. 3 and is not the concern of the layer. Sights are set at 400 yds. <i>At least one-third of the practice should be done with open sights.</i>

4	Training of the detachment as a team.	2 guns per platoon.	200-500 yds.	Moving, if possible, at varying speeds (10-20 m.p.h.) and varying approach angles.	One instructor per gun to criticise application of fire. Critics to watch gun drill. (See Sec. 15, para. 5.) <i>Hits to be counted and recorded and analysis board used. To qualify, the detachment must obtain at least 75 per cent. hits.</i>	Daily.	One target per gun is required. It is desirable that at least three layers per gun should complete this practice and that <i>one-third of the laying should be done with open sights.</i>
5	Battle practice.	Not more than one section at a time.	200-800 yds.	As many as possible, including "hull-down" targets.	One critic per gun for application of fire. Critics to watch gun drill. <i>Analysis boards kept and hits recorded.</i> Remaining sections to watch and be prepared to criticise (each man his opposite number).	Once during complete full-charge practice*	In battle order. <i>One-third of the practice should be done with open sights.</i>
6	Night shooting practice.	One gun per platoon to fire and five guns per platoon for silent practice.	300 yds. and less.	Moving at speeds not greater than $7\frac{1}{2}$ m.p.h.	Critic for firing gun as in previous practices. Silent practice guns to take orders from detachment commander of firing gun. Detachment commanders of silent guns to be prepared to criticise detachment commander of firing gun.	Nightly.	To be fired in drill order until qualified in Part 4.

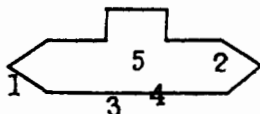
* Provided detachment has qualified in Part 4.

ANALYSIS SHEET FOR ANTI-TANK FIRING PRACTICES

ORDERS

Target 12 o'clock.

600. R $\frac{1}{2}$



ROUND	CORRECTION
1	R $1\frac{1}{2}$
2	✓
3	Add 100
4	Add 100
5	✓

Fig. 33

NOTES.—(i) The critic of the detachment commander uses this board to mark the fall of each shot, to make a note of the initial fire order and to note any corrections made.

(ii) *If fire control criticism is to be instructive, it must be constructive and not merely an account of the shoot.* The critic should, therefore, base his criticism upon the number of hits obtained on the target, whether the opening range and lead was correct and whether the appropriate corrections were applied.

He should ring any mistakes made or doubtful orders given, to assist him in giving his criticism after the shoot.

APPENDIX D

LUBRICATION CHART

Lubricators and lubricating holes. (Figs. 34 and 35.)

LUBRICATION CHART.

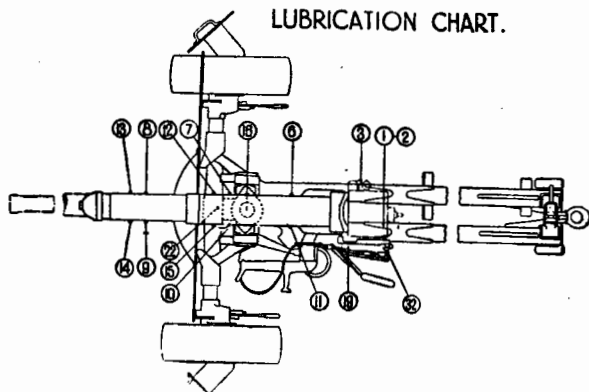


Fig. 34

Position of lubricators						Ref. No. on chart
GUN						
Breech ring—						
Shaft, actuating	...	...	...	...	...	1, 2
Case, spring	...	...	...	...	...	3
CARRIAGE						
Cradle—						
Trunnions (1 right, 1 left)	...	...	...	...	...	4, 5
Slides—						
Upper (3 right, 3 left)	...	...	...	...	...	6 to 11
Lower (2 right, 2 left)	...	...	...	...	...	12 to 15
Saddle pivot	...	...	...	...	...	16
Gear—						
Elevating, bracket	...	...	...	...	...	17, 18
Semi-automatic, bracket	...	...	...	...	...	19, 20
Locking, legs, bracket	...	...	...	...	...	21

Position of lubricators							Ref. No. on chart
Axletree ...	...	...	...	...	...	...	22
Shield—							
Bracket, right side	...	...	...	...	...	...	23
Bracket, left side	...	...	...	...	...	...	24
Wheels, axle (1 right, 1 left)			...	...	...	...	25, 26
Wheels—							
Bushes, cam, spindle (1 right, 1 left)				...	...	...	27, 28
Sight—							
Deflection gear	...	...	...	...	...	...	29
Shutter cable (nipple)		...	...	...	...	...	30
Gear, firing—							
Lever, firing	31
Lever, operating	32

LUBRICATION CHART

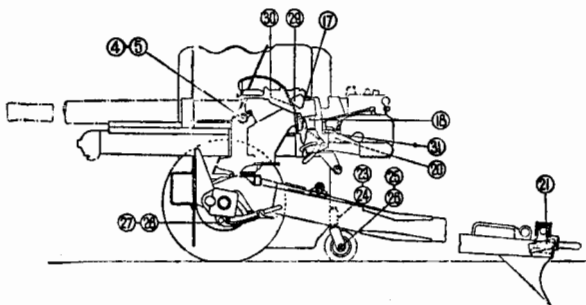


Fig. 35

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