SMALL ARMS TRAINING, VOLUME I, PAMPHLET No. 26

MORTAR (4·2-inch)

SECTION 1.—GENERAL

LESSON 1.—ORGANIZATION

Transport

Platoon headquarters

Universal carrier 1
Platoon commander (subaltern) (Pistol)
Corporal (O.P.A.) (Sten)
2 Driver/Operators (Rifles)
1 No. 18 set
1 No. 22 set (with remote control and
880 yds. cable)
1 telephone D Mk. V
3 cable drums (each 440 yds.)

Universal carrier 2
Second in command (subaltern) (Pistol)
Corporal (M.P.O.A.) (Rifle)
2 Driver/Operators (Rifles)
1 No. 22 set (with remote control and
880 yds. cable)
Telephone exchange U.C. 10
3 telephones D Mk. V
3 cable drums (each 440 yds.)
P.F.A.T. and 12 bombs

Motor cycles 1–3
Platoon serjeant (Sten)
2 Orderlies (Stens)

No. 1 section

Loyd carrier 1
5. Serjeant (sec. comd.) (Rifle)
Corporal/Driver Operator (Rifle)
Driver/Operator (Sten)
Batman (Rifle)
1 No. 22 set
Telephone loudspeaker No. 2 (junction box and batteries)

L.M.G.
1,000 S.A.A.
20 bombs

Mortar trailer 1
44 bombs

Loyd carriers 2–3 (each)
Corporal (No. 1) (Rifle)
Nos. 2, 3 and 4 (Rifles)
Driver/Mechanic (Sten)
22 bombs

Mortar trailers 2–3 (each)
4·2-in. mortar
Telephone loudspeaker No. 2 and
cable drum

DISTRIBUTION

Arms concerned Scale B+5 in
O.C.T.U. Mortar plas.
180 Support O.C.T.U. Scale II
S.A.S., Netheravon Wing 200
S.A.S., Hythe Wing 20
School of Infantry 20
Command Weapon Training Schools 5
Divisional Battle Schools 5
Advanced Handling and Fieldcraft School 5
Army Gas School 20
School of Artillery 10

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SMALL ARMS TRAINING, VOLUME I,
PAMPHLET No. 26
MORTAR (4½-inch)

SECTION 1.—GENERAL

LESSON 1.—ORGANIZATION

Transport

Platoon headquarters (Captain)
Universal carrier 1
Platoon commander (subaltern) (Pistol)
Corporal (O.P.A.) (Sten)
2 Driver/Operators (Rifles)
1 No. 18 set
1 No. 22 set (with remote control and
880 yds. cable)
1 telephone D Mk. V
3 cable drums (each 440 yds.)

Universal carrier 2
Second in command (subaltern) (Pistol)
Corporal (M.P.O.A.) (Rifle)
2 Driver/Operators (Rifles)
1 No. 22 set (with remote control and
880 yds. cable)
Telephone exchange U.C. 10
3 telephones D Mk. V
3 cable drums (each 440 yds.)
P.T.A.T.—and 12 brevets

Motor cycles 1–3
Platoon serjeant (Sten)
2 Orderlies (Stens)
No. 1 section

Loyd carrier 1
5. Serjeant (sec. comd.) (Rifle)
Corporal/Driver Operator (Rifle)
Driver/Operator (Sten)
1 No. 22 set
1 No. 41 set

L.M.G.
1,000 S.A.A.
20 bombs

Mortar trailer 1
44 bombs

Mortar trailers 2–3 (each)
Corporal (No. 1) (Rifle)
Nos. 2, 3 and 4 (Rifles)
Driver/Mechanic (Sten)
22 bombs

Mortar trailers 2–3 (each) 4½-inch mortar
Telephone loudspeaker No. 2 and
cable drum
2. Characteristics of the weapon

(a) **High trajectory.**—The elevation of the barrel varies between 45 degrees at extreme range and 90 degrees at shortest range. The mortar can, therefore:

(i) Engage AREAS BEHIND COVER which are inaccessible to flat trajectory weapons.

(ii) Be brought into action BEHIND HIGH COVER, and it is thus less vulnerable to enemy low trajectory weapons.

(iii) Give OVERHEAD SUPPORT in depth to our advancing infantry.

(b) **Time of flight.**—This is, on an average, 30 seconds and must be allowed for when giving supporting fire on a timed programme.

(c) **Bomb.**—The H.E. bomb, fitted with an instantaneous percussion fuze, weighs approximately 19 lb. 14 ozs. and gives a good degree of FRAGMENTATION and BLAST.

3. Characteristics of the platoon

(a) **Tactical unit.**—The tactical unit will always be the PLATOON of four mortars.

(b) **Fire unit.**—Normally the platoon, controlled from one O.P., will be the fire unit. Sections can, however, be fired separately or, if line communication to a second O.P. has been laid, simultaneously. Mortars will never be employed singly.

(c) **Communications.**—Three No. 22 wireless sets are provided. Two of these are solely for communication between the platoon commander and the second-in-command. The third provides the link between platoon and company H.Q. Each platoon has one No. 18 set for communication with the formation the platoon is supporting. In addition, each platoon is equipped with sufficient cable for line communication between O.P. and mortar position.

(d) **Mobility.**—Carriers and trailers permit good mobility across country. Owing to the weight of the weapon and its ammunition, and the few men available within the platoon, it is not possible to manhandle it over any distance.
4. The attack

(a) The main tasks of the 4·2-in. mortars in the attack fall under two headings:—

(i) As part of a co-ordinated fire plan.
(ii) Opportunity shooting.

(b) Part of a co-ordinated fire plan.

(i) The large beaten zone essentially confines the mortar platoon to the neutralization of areas.
(ii) The safety factor makes the 4·2-in. mortar an unsuitable weapon for shooting close to our infantry.
(iii) Mortar support should, therefore, be confined to neutralizing with H.E. or smoke, or a mixture of
(iv) Suitable targets are the objective until the infantry are within the Safety Limit, or features outside the safety limit to a flank or in depth. This safety factor may be relaxed when supporting tanks are unaccompanied by infantry. The 4·2-in. mortar can then, if necessary, give intimate support.

(c) Opportunity shooting.—It may often be necessary to come into action with reference to an arc only, withholding fire until the necessity arises. Normally, however, in addition to their tasks as part of a co-ordinated fire plan, mortars will be allotted an arc in which, when their primary task is completed, they will engage by observation any enemy interfering with the progress of the attack. In opportunity shooting particularly, the closest possible liaison with infantry must be maintained.

5. Defence

(a) 4·2-in. mortars will assist in harassing the enemy while they are forming up for the attack, in canalizing the attack, and in neutralizing unarmoured enemy troops who may have penetrated the defence. For these purposes the main tasks of 4·2-in. mortars in defence are:—

(i) Defensive fire tasks.
(ii) Support of counter-attacks.
(iii) Harassing fire.

(b) Defensive fire tasks.—These tasks will include the disorganization of the attack by firing on enemy headquarters and units forming up for the assault, on supporting weapons,
4. The attack

(a) The main tasks of the 4-2-in. mortars in the attack fall under two headings:

(i) As part of a co-ordinated fire plan.

(ii) Opportunity shooting.

(b) Part of a co-ordinated fire plan.

(i) The large beaten zone essentially confines the mortar platoon to the neutralization of areas.

(ii) The safety factor makes the 4-2-in. mortar an unsuitable weapon for shooting close to our infantry.

(iii) Mortar support should, therefore, be confined to neutralizing with H.E. or smoke, or a mixture of both, enemy localities which can interfere with the movement of our infantry at a distance.

(iv) Suitable targets are the objective until the infantry are within 400 yds. or features, 400 yds. or more to a flank, or in depth. This safety factor may be relaxed when supporting tanks are unaccompanied by infantry. The 4-2-in. mortar can then, if necessary, give intimate support.

(c) Opportunity shooting.—It may often be necessary to come into action with reference to an arc only, withholding fire until the necessity arises. Normally, however, in addition to their tasks as part of a co-ordinated fire plan, mortars will be allotted an arc in which, when their primary task is completed, they will engage by observation any enemy interfering with the progress of the attack. In opportunity shooting particularly, the closest possible liaison with infantry must be maintained.

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(i) Defensive fire tasks.

(ii) Support of counter-attacks.

(iii) Harassing fire.

(b) Defensive fire tasks.—These tasks will include the disorganization of the attack by firing on enemy headquarters and units forming up for the assault, on supporting weapons,
(b) The action and purpose of the locking wedge.

(c) (b) That the tripod is designed to form a firing support for the barrel.

2. Assemble the mortar.

(a) Explain the elevating gear, and show how the mortar is elevated and depressed by means of the elevating handle.

(b) Explain the traversing gear, and show how a limited amount of traverse is obtained without moving the legs of the tripod.

3. Lock the sight on to the bracket.

Explain:

(a) That the sight is provided for laying the mortar by indirect means.

(b) That it provides an all-round field of view for laying for line, except where the barrel obstructs the field of view.

(c) That, by means of the range scale and the elevation bubble, the mortar is laid at the required elevation.

4. Point out the cross-levelling gear.

Explain:

(a) That the sight must be kept in the vertical plane.

(b) That the cross level bubble is provided to compensate for difference in level of the tripod legs and/or the effect of the traverse.

(c) That when the cross level bubble is central, the sight is vertical.

5. Name the remaining principal parts and explain their functions.

These are:

(a) Leg stays and sleeve.

(b) Clamping handle.

(c) Cradle. (Sight supporting bracket and collar.)

(d) Elevating clamp. Elevating screw clamp.

(e) Breech piece.

(f) Striker stud.

(g) Rebound socket.

(h) Yoke.

6. Show bombs and cases.

7. Explain wet weather precautions:

(a) Great care will be taken to ensure that no water is allowed
Explain:
(a) That the breech end of the barrel fits into the baseplate, which takes the shock of firing.
(b) That the tripod is designed to form a firing support for the barrel.

2. Assemble the mortar.
(a) Explain the elevating gear, and show how the mortar is elevated and depressed by means of the elevating handle.
(b) Explain the traversing gear, and show how a limited amount of traverse is obtained without moving the legs of the tripod.

3. Lock the sight on to the bracket.
Explain:
(a) That the sight is provided for laying the mortar by indirect means.
(b) That it provides an all-round field of view for laying for line, except where the barrel obstructs the field of view.
(c) That, by means of the range scale and the elevation bubble, the mortar is laid at the required elevation.

4. Point out the cross-levelling gear.
Explain:
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(c) That when the cross level bubble is central, the sight is vertical.

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These are:
(a) Leg stays and sleeve.
(b) Clamping handle.
(c) Cradle. (Sight supporting bracket and collar.)
(d) Elevating clamp. Elevating screw clamp
(e) Breech piece.
(f) Striker stud.
(g) Rebound socket.
(h) Yoke.

6. Show bombs and cases.
7. Explain wet weather precautions:
(a) Great care will be taken to ensure that no water is allowed

PLATE 1—4.2 INCH MORTAR
(GENERAL ARRANGEMENT)
to enter the barrel before or during firing and that the bombs, particularly the charges, are kept dry.

(b) The muzzle cover, the tail unit covers, and the waterproof bomb cases give good protection if drills are carried out correctly.

(c) Failure to observe wet weather precautions may result in bombs falling short and endangering the lives of our own troops.

LESSON 5.—THE LIQUID PRISMATIC COMPASS

Instructor's Notes

Stores:

Liquid prismatic compasses.

1. The compass is employed in 4·2-in. mortar work for:
   (a) Laying out the line of the pivot mortar on a bearing.
   (b) Paralleling the mortars.
   (c) Measuring angles.

2. To lay on a bearing
   (a) Open the compass so that the lid is vertical.
   (b) Allow the card to settle and note, from the inner graduations, the approximate direction of the bearing.
   (c) Bring the prism to an upright position and focus it by moving it up its slide.
   (d) Hold the compass level, with the thumb of one hand through the brass ring and the fingers grasping the compass firmly. Look through the prism and bring the appropriate graduation into coincidence with the hair-line of the window, as seen through the centre of the slit. The compass is now laid on the bearing required.

3. To take a bearing on to an object
   (a) Open the compass so that the lid is vertical.
   (b) Bring the prism to an upright position and focus it by moving it up its slide.
   (c) Hold the compass as in para. 2 (d) above, look through the prism, and align the hair-line, as seen through the centre of the slit, with the object. Read off the bearing to the nearest 30 minutes.

4. To measure the angle between two objects
   (a) Take a bearing on to each object in turn.
   (b) Subtract the smaller angle from the greater. If the resulting angle is less than 180 degrees it is the angle required. If it is greater than 180 degrees, subtract it from 360 degrees.
LESSON 6.—AMMUNITION

Instructor's Notes

Stores:

- One dummy bomb (H.E.).
- One dummy primary cartridge.
- Six dummy secondary cartridges.
- One drill bomb carrier.

1. Service ammunition

The H.E. service bomb is threaded at the head to receive the fuse and at the base to receive the tail unit. Into the tail unit are fitted the primary and augmenting (or secondary) cartridges.

The bombs are carried in expendable carriers, each containing two bombs. A waterproof cover is fitted over the tail unit to ensure that the cartridges are protected from damp.

2. Markings

(a) The H.E. bomb.—Immediately below the fuze there is a red ring which denotes that the bomb is filled, and below the red ring there is a green band.

(b) The H.E. bomb carrier has a yellow band painted round the middle.

(c) The drill bomb.—A black bomb with the words "Drill" and "Not to be fired" stencilled on the body of the bomb.

3. The charges

(a) Show how the primary cartridge is fitted into the cartridge container, and how the secondary cartridges are held between the arms of the tail unit. Show that the secondary charges may also be ignited by coming in contact with a hot barrel, resulting in very "SICK" rounds.

To avoid this, when a prolonged rate of fire is maintained, it is of particular importance to check that the cartridges are unbroken, and correctly assembled in the tail unit.

(b) Explain the function of the safety cap.

(c) Explain that, on impact with a hard substance, it is the action of the fuze which detonates the bomb.

(d) Explain that until the fuze is "armed" it is "safe" and cannot be detonated.

LESSON 7.—PACKING VEHICLES

1. Explain that there is no fixed drill for packing vehicles since the number of men available for packing may vary. Every man must know where each store is carried. The senior N.C.O. with each vehicle is responsible that the stores are complete.
LESSON 6.—AMMUNITION
Instructor's Notes

Stores
1. dummy bomb (H.E.).
2. dummy primary cartridge.
3. dummy secondary cartridges.
4. drill bomb carrier.

1. Service ammunition

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(b) The H.E. bomb carrier has a yellow band painted round the middle.

(c) The drill bomb.—A black bomb with the words "Drill" and "Not to be fired" stencilled on the body of the bomb.

3. The charges

(a) Show how the primary cartridge is fitted into the cartridge container, and how the secondary cartridges are held between the vanes of the tail unit. Show that the secondary cartridges are easily detachable in order to allow of the mortar being fired with charge I (four secondary cartridges arranged in pairs).

(b) Show how the secondary charges must be inserted with the flush end towards the tail of the bomb.

(c) Explain how the flash passes from the primary to the secondary cartridges.

4. The fuze

(a) Explain the function of the safety cap.

(b) Explain that, on impact with a hard substance, it is the action of the fuze which detonates the bomb.

(c) Explain that until the fuze is "armed" it is "safe" and cannot be detonated.

LESSON 7.—PACKING VEHICLES

1. Explain that there is no fixed drill for packing vehicles since the number of men available for packing may vary. Every man must know where each store is carried. The senior N.C.O. with each vehicle is responsible that the stores are complete.
2. For instructional purposes, packing will be carried out from front to rear of each vehicle.

3. The following table will serve as a guide for packing the stores into the vehicles:

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<th>STORES</th>
<th>Pl. cont'd.</th>
<th>2 L.C.S.</th>
<th>Carrier</th>
<th>No. 1 sec.</th>
<th>No. 2 sec.</th>
<th>No. 2.1 carrier</th>
<th>Each mortar</th>
<th>Each arm.</th>
<th>Each mortar</th>
<th>TOTAL per patrol</th>
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<td>Cleaning rod</td>
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<td>Magazines, (12 in box)</td>
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<tr>
<td>1,000 rds. S.A.A.</td>
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</table>
2. For instructional purposes, packing will be carried out from front to rear of each vehicle.

3. The following table will serve as a guide for packing the stores into the vehicles:

<table>
<thead>
<tr>
<th>Stores</th>
<th>Pl. comd.'s carrier</th>
<th>2 i/c's carrier</th>
<th>No. 1 sec. comd.'s carrier</th>
<th>No. 2 sec. comd.'s carrier</th>
<th>Each mortar carrier</th>
<th>Each ammuntion trailer</th>
<th>Each towards trailer</th>
<th>TOTAL per platoon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
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<td>Blankets</td>
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<td>Vehicle camouflage nets</td>
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<td>Shovels</td>
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<td>Cable drums (880× twisted cable)</td>
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<td>Cable drums (440× single cable)</td>
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<td>Cable drums (220× twisted cable)</td>
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<td>Bombs (cases of 2)</td>
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<td>Magazines (12) in box</td>
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<tr>
<td>1,000 rds. S.A.A. in box</td>
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<td>P.I.A.T. (and 12 bombs)</td>
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Note.—Packs and blankets belonging to the motor cycle personnel are carried as follows:
- Plateau serjeant
- Pl. comd.'s carrier
- Pl. comd.'s orderly
- 2 i/c's carrier
- 3 i/c's orderly
- 2 i/c's carrier

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<table>
<thead>
<tr>
<th>STORES</th>
<th>Pl. cmd.'s carrier</th>
<th>2 l/c's carrier</th>
<th>No. 1 sec. cmd.'s carrier</th>
<th>No. 2 sec. cmd.'s carrier</th>
<th>Each mortar carrier</th>
<th>Each semi-trailer</th>
<th>Each mortar trailer</th>
<th>TOTAL per platoon</th>
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<tr>
<td>P.I.A.T. and 12 bombs</td>
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<td>Grenades No. 36</td>
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<td>12</td>
<td>12</td>
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<td>Pistol, signal in case, 18 rds.</td>
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<td>Pointer staff</td>
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<td>Entrenching tools</td>
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<td>Belts, lineman, with pliers</td>
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<td>2</td>
<td>2</td>
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<td>Wire cutters in frog</td>
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<td>Hacksaw with 3 blades</td>
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<td>Saws, backed tenon</td>
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<tr>
<td>Kit, hand, tools, dvr. mech.</td>
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<td>7</td>
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<td>Bars, crow</td>
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<td>7</td>
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<td>Axes, hand</td>
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<td>Sticks, brook, jointed and strap</td>
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<td>Lamps, hurricane</td>
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<td>7</td>
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<td>Gloves, M.G., pairs</td>
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<td>Spectacles, tinted</td>
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<td>Cable layer No. 3</td>
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<tr>
<td>Bars, carrying drums, cable No. 5 and No. 8</td>
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</tr>
</tbody>
</table>

* In one mortar carrier only.

Note.—Packs and blankets belonging to the motor cycle personnel are carried as follows:

- Platoon serjeant
- Pl. cmd.'s orderly
- 2 l/c's orderly
- No. 1 sec. cmd.'s carrier
- Pl. cmd.'s carrier
- 2 l/c's carrier
LESSON 8.—MAINTENANCE

Instructor’s Notes

Stores :

Mortar complete.
Spare parts bag.
Cleaning rod.

1. The mortar and its stores must always be in a serviceable condition so that, when a task is given, the mortar can be brought into action with the minimum delay.

2. Daily maintenance.—The responsibility of No. 1 will be to ensure that:

(a) The inside of the barrel and the breech piece and the striker stud are clean and dry.

(b) The copper washer is in position, the striker stud screwed tightly into the breech piece, and the breech piece on to the barrel cap so that it will lock into the recess in the

Amend. 2
Jun. 1945

“(d) The working parts of the tripod are lubricated, the clamping screw working correctly, the sight pillar undamaged, and that there is only the minimum play between the cradle bushes and the traversing screw (See Note 2)

(f) The spare parts bag is complete.

(g) The ammunition is sufficient.

3. While the mortar is in action it is the responsibility of No. 1:

(a) To ensure that the breech piece has not worked loose.

(b) When opportunity permits:

(i) To unscrew the breech piece and remove any fouling from the striker stud.

(ii) To clean the barrel and replace the breech piece.

4. When the task is completed:

(a) The barrel should be thoroughly cleaned at the earliest opportunity, using hot water if available. If hot water cannot be obtained, the barrel will be cleaned out with a pad of oiled rags and dried.

If fouling is difficult to remove from the barrel, the brass scrubber will be used.

(b) No. 1 will:

(i) Inspect all parts of the mortar and report any defects.

(ii) Keep an approximate record of the number of rounds fired.
LESSON 8.—MAINTENANCE

Stores:—

Mortar complete.
Spare parts bag.
Cleaning rod.

1. The mortar and its stores must always be in a serviceable condition so that, when a task is given, the mortar can be brought into action with the minimum delay.

2. Daily maintenance.—The responsibility of No. 1 will be to ensure that:

(a) The inside of the barrel and the breech piece and the striker stud are clean and dry.
(b) The copper washer is in position, the striker stud screwed tightly into the breech piece, and the breech piece on to the barrel cap so that it will lock into the recess in the baseplate.
(c) The sight has been inspected and tested as in Lesson 9, and the working parts are lubricated with clean oil.
(d) The working parts of the tripod are lubricated, the clamping screw working correctly, and the sight pillar undamaged.
(e) The socket in the baseplate is clean and works freely.
(f) The spare parts bag is complete.
(g) The ammunition is sufficient.

3. While the mortar is in action it is the responsibility of No. 1:

(a) To ensure that the breech piece has not worked loose.
(b) When opportunity permits:
   (i) To unscrew the breech piece and remove any fouling from the striker stud.
   (ii) To clean the barrel and replace the breech piece.

4. When the task is completed:

(a) The barrel should be thoroughly cleaned at the earliest opportunity, using hot water if available. If hot water cannot be obtained, the barrel will be cleaned out with a pad of oiled rags and dried.
   If fouling is difficult to remove from the barrel, the brass scrubber will be used.

(b) No. 1 will:
   (i) Inspect all parts of the mortar and report any defects.
   (ii) Keep an approximate record of the number of rounds fired.
2. The cradle bushes are adjusted as follows:

Mount the mortar and, using a large screwdriver, remove the locking plate screw and locking plate, and then tighten the adjustable bush clockwise. Test by traversing the full length of the traversing screw. Replace the locking plate and screw. If the play is too much for this adjustment to be made, new bushes must be fitted by the armourer.

3. Use of Implement. Ammunition Key No. 179, Mk. I

When a bomb has failed to pass down the barrel as far as the striker stud the detachment will first perform the drill for misfire. If when the barrel is tilted the bomb will not slide out, return the breech piece to the rebound socket and wait for the barrel to cool.

When cool dismount the mortar carefully, taking care to keep the body clear of both ends of the barrel. Place the barrel on the ground with the muzzle clear of all obstructions and remove the breech piece and barrel cap. Insert the ammunition key into the barrel and, engaging the threads of the fuse, withdraw the bomb.

If the bomb cannot be withdrawn, a piece of wood at least 3½ inches in diameter may be used to force the bomb up from the breech piece end.

4. The Rebound Socket will be removed periodically for inspection and cleaning.

(a) To remove from baseplate

1. Using a large screwdriver, remove the securing screw.

2. Rotate the socket until a large punch hole on the collar inside is seen opposite the hole for securing screw. If any difficulty is found in rotating the collar with the socket, a small screwdriver may be used through the hole for securing screw to rotate it.

3. Withdraw rebound socket.

(b) To assemble

1. Replace socket.

2. Rotate socket and collar until the recess for the securing screw is opposite the hole.

3. Replace securing screw and tighten.

(c) To remove rebound socket spring

With socket removed from baseplate.

1. Take out securing screw.

2. Unscrew nut and remove spring. Reverse the order for assembling, making sure that the steel friction washer is between the spring and collar.
(c) If the mortar is unlikely to be required for some days, the unpainted parts will be oiled.

Note.—The polished external surface of the barrel must not be cleaned with abrasive material. Rust should be loosened with oil, preferably paraffin, before being removed with cotton waste.

LESSON 9.—TESTING AND ADJUSTING THE SIGHT

Instructor's Notes

Stores:
- 2 posts from which to suspend two plumb lines.
- Mortar complete.
- Screwdriver, adjusting, sight.
- Mortar clinometer.

1. The sight should be frequently tested to prove that it is in adjustment both for direction and elevation. Errors in direction may be due to the displacement of the worm wheel bracket, while errors in elevation may be due to the range scale bracket or the range scale slider being bent or damaged.

2. To test and adjust for direction

(a) Choose an aiming point as distant as possible, but at least 4,000 yds., on which the mortar can be laid later. Suspend two plumb lines about 5 yds. apart and align them accurately on to the selected aiming point.

(b) Mount the mortar without the baseplate (i.e. with the breech piece resting on the ground in such a way as to prevent slipping) about 10 yds. in front of the plumb lines with the mortar laid for elevation at extreme range. The breech piece must be moved and the barrel traversed until the plumb lines accurately bisect the barrel throughout its length. The barrel is now laid on the same point as the plumb lines. Now bring the cross level bubble central and check the lay. The sight should be on the selected aiming point.

(c) If the lay is not correct loosen the three cheese-headed screws in the elongated slots in the worm wheel bracket, and move the lensatic sight bracket in the required direction until the sight is laid on the aiming point. Tighten the screws and re-check the aim.

(d) Repeat the procedure described in (b) with the mortar laid at minimum range. If after levelling the cross level bubble an adjustment of more than 2 degrees is necessary to bring the lensatic sight on to the aiming mark this...
shows that the sight pillar has become bent and must be
adjusted by the armourer in accordance with Armament
R. 454, dated 30 Nov. 42.

3. **To test and adjust for range**

(a) Lay the mortar for elevation at an angle of 66°, 10 min.,
which is the elevation corresponding to 3,000 yds. range
with charge II. For this purpose set the clinometer plane
on the barrel and position the barrel by means of the
elevating handle until the clinometer bubble becomes
central.

(b) Bring the elevation bubble of the sight central by operating
the wing nut and the range scale slider. The sight should
now read 3,000 yds. on the charge II scale.

(c) If it does not give this reading, adjustment is necessary.
Slacken the four screws adjusting the range scale reader
and position the reader to read 3,000 yds. on the charge II
scale. Tighten up the adjusting screws and check that
the bubble is still central.

**Note.**—The screws adjusting the range scale reader
are positioned two on each side of the range scale slider
and pass through the elongated slots in the range scale reader.

**SECTION 3.—AIMING AND LAYING**

**LESSON 10.—AIMING**

*Instructor's Notes*

<table>
<thead>
<tr>
<th>Stores:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortar complete.</td>
</tr>
<tr>
<td>1 aiming post.</td>
</tr>
<tr>
<td>Blackboard or diagram.</td>
</tr>
</tbody>
</table>

1. **Aiming with the mortar sight.**—Explain the rules of aiming,
using a blackboard or diagrams:

(a) The eye should be about 3 ins. from the sight and either
eye may be used, but preferably the right.

(b) The tip of the triangle must be laid on the aiming mark.

(c) With the open sight the aim will be taken as for the rifle.

2. Explain the use of the traversing handle and of the lensatic
sight adjusting screw.

3. The squad will view an aim laid by the instructor and will
practise.

**LESSON 11.—LAYING FOR DIRECTION**

*Instructor's Notes*

<table>
<thead>
<tr>
<th>Stores:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortar complete.</td>
</tr>
<tr>
<td>1 aiming post.</td>
</tr>
</tbody>
</table>

*Before starting each lay, the cross level bubble will be central, but
the mortar will not be laid on the aiming mark.*

1. Explain how to lay for direction, introducing the use of the
cross level bubble.

The instructor will act as No. 2 and will detail one of the squad
to act as No. 1.

2. While No. 1 is obtaining direction, as in Lesson 10, demonstrate
and explain that No. 2 must keep the cross level bubble in the centre
of its run.

3. Practise the squad in the duties of No. 2.

4. Explain the use and setting of the deflection dial and drums.

5. Practise squad.

**LESSON 12.—LAYING FOR ELEVATION**

*Instructor's Notes*

<table>
<thead>
<tr>
<th>Stores:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortar complete.</td>
</tr>
</tbody>
</table>

1. Explain that the limits of the range when using charge I are
from 1,050 to 2,800 yds., and when using charge II from 1,500 to
4,100 yds.

2. Explain the graduations on the range scale, and how to set the
slider and charge indicator.

3. Demonstrate how to bring the elevation bubble central by
use of the elevating handle. Emphasize that to increase the range
the muzzle is lowered.

4. Practise the squad in:

(a) Setting the slider and charge indicator.

(b) Levelling the bubble combined with (a) above.

**LESSON 13.—LAYING THE MORTAR**

*Instructor's Notes*

<table>
<thead>
<tr>
<th>Stores:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortar complete.</td>
</tr>
<tr>
<td>1 aiming post.</td>
</tr>
</tbody>
</table>

*Before starting each lay, the cross level bubble will be central, but
the mortar will not be laid on the aiming mark.*
1. Explain that this lesson is a combination of Lessons 11 and 12 and that, in order to reduce the time taken to lay the mortar, the following is the correct procedure:

No. 1 will acknowledge, set the range scale slider, and note his point of aim. He will rapidly turn the traversing handle until his point of aim is midway between his original aim and the aiming mark. No. 2 will now centralize the cross level bubble and No. 1 will at the same time lay the mortar for elevation.

Nos. 1 and 2 will then complete final adjustments as in Lessons 11 and 12.

2. Practise the squad in the duties of Nos. 1 and 2.

LESSON 14.—NIGHT AIMING

Instructor’s Notes

Stores:
- Mortar complete.
- Night aiming box.
- Aiming posts with lamp bracket.
- Pegs.
- Dimmed torch.

1. Posts and pegs will be planted before this lesson begins. See Lesson 41.

2. No value will be obtained from this lesson unless it is conducted in the dark.

3. The instructor must assist the numbers by the use of his torch during the assembling of the mortar and during laying. On the completion of the lay he will check both the sight bubbles and the aim.

1. Explain the working of the night aiming box and how the lamp is secured to the post by means of the bracket.

2. Explain how to position the baseplate between the pegs so that a line drawn from one peg to the other would be parallel to the centre line of the baseplate and 4½ ins. to the left of it.

3. Explain how to get the approximate line of the barrel when assembling the mortar, by one of the following methods:
   (a) Shine a light on the sight pillar. No. 1 aligns the sight pillar on the nearest post and lamp.
   (b) Align the left edge of the barrel on the lamp.

4. (a) No. 1 sets the sight at the charge and range ordered and brings the elevation bubble approximately level. No. 2 then cross levels.

(b) No. 1 notes the point of aim and, if adjustment is required for direction, traverses to a point half way between his original point of aim and the lamp.

No. 2 again cross levels.

This procedure is continued until the correct direction is obtained, the line of sight is through the nearer post on to the lamp, and the cross levelling bubble central. Final adjustment is then made for elevation. Both bubbles and the aim are checked.

It will be noted that Nos. 1 and 2 work as individuals during night aiming and not as a team.

8. After viewing a correct aim the squad will practise.

LESSON 15.—LAYING BY MEANS OF THE CLINOMETER AND USE OF THE RANGETABLE

Instructor’s Notes

Stores:
- Mortar complete.
- Mortar clinometer.
- 1 aiming post.
- Before this lesson is taught the mortar should be brought into action.

1. Explain that if the range scale slider or elevation bubble should become damaged and unserviceable, the mortar can be laid for elevation by means of the clinometer, used in conjunction with the rangetable.

2. Explain that the rangetable shows, opposite each range in yards, the equivalent, in degrees and minutes, for each charge.

3. Nos. 1 and 2 lay the mortar for direction as in Lesson 11.

No. 1 sets the clinometer slider at the elevation ordered and places it on the barrel with the arrow pointing in the direction of the target. He then orders No. 2 to elevate or depress the barrel by means of the elevating screw until the bubble is central in the bubble case. The mortar is now laid at the range corresponding to the elevation ordered.

4. The instructor will practise the squad.

SECTION 4.—ELEMENTARY MORTAR DRILL

Instructor’s Notes

Stores for all lessons in this section:
- Mortar complete.
- 2 cases of drill bombs.
- 2 aiming posts.
A bomb stop is used to prevent the drill bomb falling so far down the barrel that it cannot easily be removed during drill. It consists of a wooden post 4 feet long and 3½ inches in diameter with a hole at one end to accept and protect the striker stud.

1. **Object.**—To teach the soldier to handle the mortar and ammunition so that in war correct action will be instinctive.

2. **Safety precautions.**—At the beginning of each lesson, when drill bombs are used, the instructor will inspect them to ensure that the bombs, primary and secondary cartridges are marked "DRILL" or "DUMMY".

3. The mortar will be brought into action in elementary mortar drill at charge II 3200. This is the best range for "bedding in." (See Lesson 43.)

4. All executive words of command are in heavy type and inverted commas.

**LESSON 16.—ACTION**

*Instructor’s Notes*

1. **Layout of stores**
   - Baseplate and sight 3 yds. in rear of prepared baseplate position.
   - Barrel and spoon past bag 1 yd. to the right of the baseplate.
   - Tripod 1 yd. to the right of the barrel.
   - Ammunition 1 yd. to the right of the baseplate position.

2. This and the following lesson should be carried out in stages. For instance "ACTION" can be taught up to the time that the mortar is assembled, and this be followed by the later stages of "CEASE FIRING". This part of the lesson will be practised until the squad is proficient, before going on to further stages of the drill.

3. "ACTION" should be taught in the following phases:
   1st phase: The actions of Nos. 1 and 2 until No. 1 is behind the baseplate with the sight adjusted to charge II 3200.
   2nd phase: The actions of Nos. 2 and 4 until the breech piece has been locked into the baseplate.
   3rd phase: The actions of No. 3, combined with the further actions of Nos. 1 and 2 until the mortar is assembled and aligned on the aiming post.
   4th phase: The actions of all numbers after the assembly of the mortar.

4. "Fall in": Nos. 1, 2, 3, and 4 fall in in that order from the left, 2 yds. in rear of the stores. The remainder of the squad will be so placed that they can see and hear what takes place.
Sandbags for supporting the baseplate will be required when elementary mortar drill is being taught in places where a hole for the baseplate cannot be dug.

1. **Object.**—To teach the soldier to handle the mortar and ammunition so that in war correct action will be instinctive.

2. **Safety precautions.**—At the beginning of each lesson, when drill bombs are used, the instructor will inspect them to ensure that the bombs, primary and secondary cartridges are marked "DRILL" or "DUMMY".

3. The mortar will be brought into action in elementary mortar drill at charge 11 3200. This is the best range for "bedding in." (See Lesson 43.)

4. All executive words of command are in heavy type and inverted commas.

**LESSON 16.—ACTION**

**Instructor's Notes**

1. **Layout of Stores**
   - Baseplate and sight 3 yds. in rear of prepared baseplate position.
   - Barrel and spare parts bag 1 yd. to the right of the baseplate.
   - Tripod 1 yd. to the right of the barrel.
   - Ammunition 1 yd. to the right of the baseplate position.

2. This and the following lesson should be carried out in stages. For instance "ACTION" can be taught up to the time that the mortar is assembled, and this be followed by the later stages of "CEASE FIRING." This part of the lesson will be practised until the squad is proficient, before going on to further stages of the drill.

3. "ACTION" should be taught in the following phases:
   - **1st phase**: The actions of Nos. 1 and 2 until No. 1 is behind the baseplate with the sight adjusted to charge 11 3200.
   - **2nd phase**: The actions of Nos. 2 and 4 until the breech piece has been locked into the baseplate.
   - **3rd phase**: The actions of No. 3, combined with the further actions of Nos. 1 and 2 until the mortar is assembled and aligned on the aiming post.
   - **4th phase**: The actions of all numbers after the assembly of the mortar.

4. **Fall in**: Nos. 1, 2, 3, and 4 fall in in that order from the left, 2 yds. in rear of the stores. The remainder of the squad will be so placed that they can see and hear what takes place.
8. If at any time the instructor should order "Fall out One", No. 1 becomes No. 4, No. 2 becomes No. 1, and so on, and they renumber at once.

9. The instructor will plant a post as an aiming mark, and will tell No. 1 to order "Action".

**Action.**

All Nos. will come to attention.

No. 1 and 2 double to the baseplate, No. 1 slings the sight case and No. 2 the spare parts bag over their right shoulders, and they carry the baseplate to the prepared position. No. 1 aligns it correctly and they jump on it to bed it in.

No. 1 drops back to the rear, takes out his sight and sets it to charge II 3200, ensuring that the deflection dial and drums are at zero.

No. 4 turns to the left and doubles to the barrel. Having assisted No. 1 with the baseplate No. 2

Line 18.—After "right" insert "No. 4 will hold the locking wedge clear of the socket and ensure it engages when turned".

amo

ammunition.

No. 3 doubles to the tripod. He ensures that the cradle is approximately in the centre of the screw, exposes about 6 ins. of the elevating screw, opens and secures the legs, and takes the tripod to the baseplate position. He places it on the ground with the third leg to the rear and the sight pillar to his right. Assisted by No. 2 he then places the cradle over the barrel. Leaving the tripod to No. 2 he then raises the muzzle with both hands and moves it for direction as ordered by No. 1, taking care to keep the barrel vertically above the elevating screw tube.

No. 2 grips the front and rear legs of the tripod. He moves the tripod for elevation and direction until No. 1 is satisfied that the sight pillar is approximately aligned on to the aiming post. The front legs of the tripod must be approximately parallel to the front edge of the baseplate and the third leg fully to the rear.

No. 1 then orders "Stamp in". No. 3 stamps in the front legs and takes up his position on the left of No. 4. No. 2 stamps in the rear leg, replaces the muzzle cover, and centralizes the cross level bubble.

No. 1 affixes the sight, brings the elevating bubble approximately central and, helped by No. 2, completes laying the mortar as taught in Lesson 13.

No. 4, assisted as soon as possible by No. 3, prepares bombs as follows:

--- Logens de relevage ---

He partly removes them from the case, unties the tail unit covers, sees that all six secondaries are in place, and replaces
5. If at any time the instructor should order "**Fall out One**", No. 1 becomes No. 4, No. 2 becomes No. 1, and so on, and they re-number at once.

6. The instructor will plant a post as an aiming mark, and will tell No. 1 to order "**Action**".

"**Action**."

All Nos. will come to attention.

Nos. 1 and 2 double to the baseplate, No. 1 slings the sight case and No. 2 the spare parts bag over their right shoulders, and they carry the baseplate to the prepared position. No. 1 aligns it correctly and they jump on it to bed it in.

No. 1 drops back to the rear, takes out his sight and sets it to charge II 3200, ensuring that the deflection dial and drums are at zero.

No. 4 turns to the left and doubles to the barrel. Having assisted No. 1 with the baseplate, No. 2 returns, and, with No. 4, brings up the barrel. They insert the breech piece into the socket of the baseplate and give it a half turn to the right. No. 2 supports the barrel, removing the muzzle cover, and No. 4 starts preparing ammunition.

No. 3 doubles to the tripod. He ensures that the cradle is approximately in the centre of the screw, exposes about 6 ins. of the elevating screw, opens and secures the legs, and takes the tripod to the baseplate position. He places it on the ground with the third leg to the rear and the sight pillar to his right. Assisted by No. 2 he then places the cradle over the barrel. Leaving the tripod to No. 2 he then raises the muzzle with both hands and moves it for direction as ordered by No. 1, taking care to keep the barrel vertically above the elevating screw tube.

No. 2 grips the front and rear legs of the tripod. He moves the tripod for elevation and direction until No. 1 is satisfied that the sight pillar is approximately aligned on to the aiming post. The front legs of the tripod must be approximately parallel to the front edge of the baseplate and the third leg fully to the rear.

No. 1 then orders "**Stamp in**". No. 3 stamps in the front legs and takes up his position on the left of No. 4. No. 2 stamps in the rear leg, replaces the muzzle cover, and centralizes the cross level bubble.

No. 1 affixes the sight, brings the elevating bubble approximately central and, helped by No. 2, completes laying the mortar as taught in Lesson 13.

No. 4, assisted as soon as possible by No. 3, prepares bombs as follows:—

- **Loaders**

He partly removes them from the case, unties the tail unit covers, sees that all six secondaries are in place, and replaces...
the bombs in the cases with the tail unit covers on but still untied. No. 3 reports "Ammunition ready" as soon as two bombs have been prepared.

Note.—When charge I is being fired, two secondaries will be removed from each bomb.

When they have completed their duties, as described above, all numbers will kneel at their positions and will keep perfectly still.

Instructor's Notes

1. When the mortar is in action, the instructor will ensure:
   (a) That the baseplate is in correct alignment with the direction given.
   (b) That the breech piece is in and locked.
   (c) That the muzzle cover is on.
   (d) That the sight is locked on the sight pillar, the dial and drums at zero, the range scale slider set at charge II 3200, and the mortar correctly laid.
   (e) That the cradle is approximately in the centre of the traverse.
   (f) That the tripod legs are firm on the ground, approximately parallel to the front edge of the baseplate, and that about 6 ins. of the elevating screw are exposed.
   (g) That the bombs have been prepared correctly.

2. When the mortar numbers are proficient in "Action" and "Cease firing" on level ground, practice will be given on ground necessitating the use of the clamping handle.

LESSON 17.—CEASE FIRING

"Cease firing"

No. 1 acknowledges, centralizes the cradle and removes the sight, closes the range scale slider, zeroes the dial, and returns the sight to the case. Assisted by No. 2, he then lifts out the baseplate and returns it to its original position. He takes off the sight case and lays it beside the baseplate.

No. 2 removes the muzzle cover. No. 3 winds in the elevating screw, and No. 4 unlocks the breech piece. No. 3 then grasps the cradle while Nos. 2 and 4 lift the barrel and withdraw it. No. 2 replaces the muzzle cover and, helped by No. 4, returns the barrel to its original position.

No. 2 then helps No. 1 with the baseplate and lays the spare parts bag beside the barrel. No. 3 lowers the tripod to the ground, closes the legs, fastens the quick-release strap, and replaces it in its original position. No. 4 fastens up the bomb cases.

All numbers fall in in rear of the stores when their duties are completed.

Lesson 18.—Amendment.

Mr. doesn't assist in laying the mortar if there is no correction given (can be already bomb and hand if a correction comes through he will assist the N. 1.

If Mr. 2 doesn't assist by laying mortar (in case of fire) Mr. 1 won't say "Mr. le only says "Fire". Mr. once again because Mr. 1 with have already a bomb in hand passed on by Mr. 3.

The muzzle cover will not be replaced during platoon and mortar fire.

The foot of Mr. 2 is placed on a stay I.

muzzle cover and, helped by No. 2, relays the mortar. Should No. 2 have a bomb when the order "Stop" is received, he passes it back to No. 3 who replaces the safety cap. Bombs will be passed back tail unit foremost. Prepared bombs will not be left in the open, but will be returned to the bomb cases until No. 3 requires them again.

LESSON 19.—ACTION (TWO POSTS)

Instructor's Notes

1. The instructor will plant two aiming posts (the red post will be nearest the mortar) as aiming marks and will tell No. 1 to order "Action".
the bombs in the cases with the tail unit covers on but still untied. No. 3 reports "Ammunition ready" as soon as two bombs have been prepared.

**NOTE.**—When charge I is being fired, No. 4 will remove two secondaries from each bomb.

When they have completed their duties, as described above, all numbers will kneel at their positions and will keep perfectly still.

**Instructor's Notes**

1. **When the mortar is in action, the instructor will ensure:**
   (a) That the baseplate is in correct alignment with the direction given.
   (b) That the breech piece is in and locked.
   (c) That the muzzle cover is on.
   (d) That the sight is locked on the sight pillar, the dial and drums at zero, the range scale slider set at charge 11 3200, and the mortar correctly laid.
   (e) That the cradle is approximately in the centre of the traverse.
   (f) That the tripod legs are firm on the ground, approximately parallel to the front edge of the baseplate, and that about 6 ins. of the elevating screw are exposed.
   (g) That the bombs have been prepared correctly.

2. When the mortar numbers are proficient in "Action" and "Cease firing" on level ground, practice will be given on ground necessitating the use of the clamping handle.

**LESSON 17.—CEASE FIRING**

"Cease firing"

No. 1 acknowledges, centralizes the cradle and removes the sight, closes the range scale slider, zeroes the dial, and returns the sight to the case. Assisted by No. 2, he then lifts out the baseplate and returns it to its original position. He takes off the sight case and lays it beside the baseplate.

No. 2 removes the muzzle cover, No. 3 winds in the elevating screw, and No. 4 unlocks the breech piece. No. 3 then grasps the cradle while Nos. 2 and 4 lift the barrel and withdraw it. No. 2 replaces the muzzle cover and, helped by No. 4, returns the barrel to its original position.

No. 2 then helps No. 1 with the baseplate and lays the spare parts bag beside the barrel. No. 3 lowers the tripod to the ground, closes the legs, fastens the quick release strap, and replaces it in its original position. No. 4 fastens up the bomb cases.

All numbers fall in in rear of the stores when their duties are completed.

**LESSON 18.—TO FIRE AND STOP FIRING**

**Instructor's Notes**

Before beginning this lesson the mortar will be brought into action.

1. **Explain**
   (a) The executive order "Fire" will be given as under:
      (i) For the bedding in round.
      (ii) For the initial round during ranging.
      (iii) When fire "By order" is used.
      (iv) When "Plateau (or Section) fire" is used.
   (b) (i) That during ranging after the first round the correction is the order to fire.
   (ii) That during fire for effect the method of fire is the order to fire.

2. **"Bedding in fire"**.—No. 1 will acknowledge when he is satisfied that the mortar is laid correctly, will report "On" and grasp the muzzle cover.

   Whenever No. 1 reports "On", No. 3 will remove the safety cap and tail unit cover and pass the bomb, tail unit foremost, to No. 2. No. 2 will take the bomb with his left hand on the top near the tail unit and with his right underneath near the fuse. He will ensure that the charge is correct.

   No. 1 will then remove the muzzle cover and order "Fire".

   No. 2 will place the bomb in the barrel, tail unit foremost, and when it is halfway in the barrel, he will force it down. He will at once draw his hand clear of the barrel. As soon as the mortar has fired, No. 1 will replace the muzzle cover and, assisted by No. 2, relay at once.

   During the firing of the bedding in round, Nos. 1 and 2 will ensure that their feet and knees are clear of the baseplate.

3. **... hundred Zero lines fire**.—This represents the firing of the first ranging round. Nos. 1 and 2 lay the mortar and fire as in para. 2 above.

4. **... hundred**.—This represents the firing of subsequent ranging rounds, the correction being the order to fire. The mortar numbers will act as previously described; one bomb being fired for each correction ordered.

   Corrections for line should not be practised at this stage.

5. **... rounds mortar fire**.—When more than one round is ordered No. 1 acknowledges, checks the lay, and, when No. 3 has reported "Ammunition ready", reports "On".

   The first bomb is passed up and fired as in paras. 1 and 2 above. No. 1 orders "On" and "Fire", delaying after each bomb, until the number of rounds ordered has been fired. He removes and replaces the muzzle cover before and after the firing of each bomb.

6. **"Stop"**.—No. 1 acknowledges and orders "Stop". He replaces the muzzle cover and, helped by No. 2, relays the mortar. Should No. 2 have a bomb when the order "Stop" is received, he passes it back to No. 3 who replaces the safety cap. Bombs will be passed back tail unit foremost. Prepared bombs will not be left in the open, but will be returned to the bomb cases until No. 3 requires them again.

**LESSON 19.—ACTION (TWO POSTS)**

**Instructor's Notes**

1. The instructor will plant two aiming posts (the red post will be near the mortar) as an aiming mark and will tell No. 1 to order "Action".
the bombs in the cases with the tail unit covers on but still untied. No. 3 reports 'Ammunition ready' as soon as two bombs have been prepared.

NOTE.—When charge I is being fired, No. 4 will remove two secondaries from each bomb.

When they have completed their duties, as described above, all numbers will kneel at their positions and will keep perfectly still.

Instructor's Notes

1. When the mortar is in action, the instructor will ensure:
   (a) That the baseplate is in correct alignment with the direction given.
   (b) That the breech piece is in and locked.
   (c) That the muzzle cover is on.
   (d) That the sight is locked on the sight pillar, the dial and drums at zero, the range scale slider set at charge II 3200, and the mortar correctly laid.
   (e) That the cradle is approximately in the centre of the traverse.
   (f) That the tripod legs are firm on the ground, approximately parallel to the front edge of the baseplate, and that about 6 ins. of the elevating screw are exposed.
   (g) That the bombs have been prepared correctly.

2. When the mortar numbers are proficient in 'Action' and 'Cease firing' on level ground, practice will be given on ground necessitating the use of the clamping handle.

Lesson 18.—On, Fire, Stop

Instructor's Notes

Before beginning this lesson the mortar will be brought into action.

1. '3200' (NOTE.—This will be the range already on the mortar sight).

   No. 1 acknowledges and, when he is satisfied that the mortar is held correctly, reports 'On', raising his left arm.

   Whenever No. 1 reports 'On', No. 3 removes a bomb from the case, removes the safety cap and passes the bomb, tail unit foremost, to No. 2. No. 2 takes the bomb with his left hand on top near the tail unit and with his right hand underneath the fuze.

2. 'Fire'

   No. 1 lowers his left arm, removes the muzzle cover and orders 'Fire'.

   No. 2 removes the tail unit cover by means of the tape on the bottom, places the bomb into the barrel, tail unit foremost, and, when the guide band is below the muzzle, forces the bomb down. He then draws his hands clear of the barrel.

   As soon as the mortar has fired, No. 1 replaces the muzzle cover and relays at once, assisted by No. 2.

3. 'Cease firing'

   No. 1 acknowledges and centralizes the cradle and removes the sight, closes the range scale slider, zeroes the dial, and returns the sight to the case. Assisted by No. 2, he then lifts out the baseplate and returns it to its original position. He takes off the sight case and lays it beside the baseplate.

   No. 2 removes the muzzle cover, No. 3 winds in the elevating screw, and No. 4 unlocks the breech piece. No. 3 then grasps the cradle while Nos. 2 and 4 lift the barrel and withdraw it. No. 2 replaces the muzzle cover and, helped by No. 4, returns the barrel to its original position.

   No. 2 then helps No. 1 with the baseplate and lays the spare parts bag beside the barrel. No. 3 lowers the tripod to the ground, closes the legs, fastens the quick release strap, and replaces it in its original position. No. 4 fastens up the bomb cases.

All numbers fall in in rear of the stores when their duties are completed.

Lesson 17.—Cease Firing

"Cease firing"

No. 1 acknowledges, centralizes the cradle and removes the sight, closes the range scale slider, zeroes the dial, and returns the sight to the case. Assisted by No. 2, he then lifts out the baseplate and returns it to its original position. He takes off the sight case and lays it beside the baseplate.

No. 2 removes the muzzle cover, No. 3 winds in the elevating screw, and No. 4 unlocks the breech piece. No. 3 then grasps the cradle while Nos. 2 and 4 lift the barrel and withdraw it. No. 2 replaces the muzzle cover and, helped by No. 4, returns the barrel to its original position.

No. 2 then helps No. 1 with the baseplate and lays the spare parts bag beside the barrel. No. 3 lowers the tripod to the ground, closes the legs, fastens the quick release strap, and replaces it in its original position. No. 4 fastens up the bomb cases.

All numbers fall in in rear of the stores when their duties are completed.

Lesson 19.—Action (Two Posts)

Instructor's Notes

1. The instructor will plant two aiming posts (the red post will be nearest the mortar) as an aiming mark and will tell No. 1 to order 'Action'.
2. When the lay is completed, the cradle should be approximately in the centre of the traverse.

1. "Action"

No. 1 obtains direction by placing the baseplate in such a position that the posts are aligned with a point 4½ ins. left of the centre line of the baseplate.

The remaining duties are carried out as already taught.

2. When the mortar has been correctly laid on the two posts, No. 2 will remove the red post. Write: "_On_" from _M_.

No. 1 sets zero opposite the red pointer and, looking along the lensatic sight, orders the post to be moved until it is in line with the apex of the triangle in the sight. He then zeroes his dial and checks his aim. When satisfied that this is correct he reports "_Mortar on zero line_" to the instructor.

**LESSON 20.—CONTROLLED CORRECTIONS**

**Amend. 2**
**Jun. 1915**

1. Corrections for range

Up (or Down) ... hundred.

No. 1 acknowledges, adjusts the range scale slider as ordered, and, assisted by No. 2, relays and reports "_On_" and orders "_Fire_".

(a) Explain that corrections for line may be given:

(i) As a switch right or left of zero, e.g. "3 degrees right of zero". No. 1 will set their deflection dials and drums accordingly, without reference to what may be on the sight already.

(ii) From the last line ordered (e.g. "Right 3 degrees").

Corrections given in this way have a cumulative effect, and must be added to or subtracted from the reading that is already on the sight.

(b) "Right (or Left) ... degrees" or "... degrees right (or left) of zero".

No. 1 acknowledges, adjusts the deflection drum as ordered, and, assisted by No. 2, relays and reports "_On_" and orders "_Fire_".

Note.—When a correction is necessary for both range and line, the correction for line will not be ordered until No. 1 has acknowledged the new range.

3. Corrections involving the movement of the tripod

No. 1 exposes the elevating screw about 6 ins., centralizes the cradle, and orders "_Tripod_". No. 3 goes to the front of the tripod, which is then moved as in Lesson 16.

In addition No. 1 grips the cradle to prevent it from sliding down the barrel and, when satisfied, orders "Stamp in". No. 3 stamps in the front legs and No. 2 stamps in the rear leg. Nos. 1 and 2 then lay the mortar.

Note.—Having moved the tripod the cradle should be approximately in the centre of the traverse.

If at any time during a shoot a correction for line that will give a reading on the dial of greater than left 10 degrees is ordered, the red pointer will be used and the sight will be laid on the red aiming post.

**LESSON 21.—ACTION ON MISFIRE**

No. 1 drops the muzzle cover, shakes the tripod and reports "_On_".

**Amend. 2**
**Jun. 1915**

**LESSON 21A.—ADJUST ZERO LINES**

**Instructor's Notes**

Before beginning the lesson the mortar will be brought into action and given a switch of not more than 10 degrees right (or left).

1. "Adjust zero lines"

No. 1 acknowledges and checks his aim, sets his sights at zero and, without altering the position of the barrel, orders "_Posts_". No. 2, on the order "_Posts_", replants the posts in line with the sight as directed by No. 1.

2. "Adjust zero lines at ... degrees right (or left) of zero"

No. 1 acknowledges and checks his aim, sets his sights at the line ordered and, without altering the position of the barrel, orders "_Posts_" as in para. 1.

3. If a correction for line is given, immediately before the order to adjust zero lines, this will be carried out as a normal controlled correction before adjusting the zero line as in para. 1 or 2.

_e.g._ "Left 5 degrees: adjust zero lines" or "Right 3 degrees: adjust zero lines at 15 degrees left of zero."

Note.—The occasions on which the order to adjust zero lines may be given are found in:

(a) Lesson 23, para. 4.
(b) Lesson 24, para. 3.
(c) Lesson 34, para. 3.
(d) Lesson 38, para. 7.
2. When the lay is completed, the cradle should be approximately in the centre of the traverse.

1. "Action"

No. 1 obtains direction by placing the baseplate in such a position that the posts are aligned with a point 4½ ins. left of the centre line of the baseplate.

The remaining duties are carried out as already taught.

2. When the mortar has been correctly laid on the two posts, No. 2 will remove the red post. No. 1 sets zero opposite the red pointer and, looking along the lensatic sight, orders the post to be moved until it is in line with the apex of the triangle in the sight. He then zeroes his dial and checks his aim. When satisfied that this is correct he reports "Mortar on zero line" to the instructor.

LESSON 20.—CONTROLLED CORRECTIONS

1. Corrections for range

"... hundred", or "Up (or Down) ... hundred".

No. 1 acknowledges, adjusts the range scale slider as ordered, and, assisted by No. 2, relays and reports "On".

2. Corrections for line

(a) Explain that corrections for line may be given:

(i) As a switch right or left of zero, e.g. "3 degrees right of zero". Nos. 1 will set their deflection dials and drums accordingly, without reference to what may be on the sight already.

(ii) From the last line ordered (e.g. "Right 3 degrees"). Corrections given in this way have a cumulative effect, and must be added to or subtracted from the reading that is already on the sight.

(b) "Right (or Left) ... degrees" or "... degrees right (or left) of zero".

No. 1 acknowledges, adjusts the deflection drum as ordered, and, assisted by No. 2, relays and reports "On".

Note.—When a correction is necessary for both range and line, the correction for line will not be ordered until No. 1 has acknowledged the new range.

3. Corrections involving the movement of the tripod

No. 1 exposes the elevating screw about 6 ins., centralizes the cradle, and orders "Tripod". No. 3 goes to the front of the tripod, which is then moved as in Lesson 16.

In addition No. 1 grips the cradle to prevent it from sliding down the barrel and, when satisfied, orders "Stamp in". No. 3 stamps in the front legs and No. 2 stamps in the rear leg. Nos. 1 and 2 then lay the mortar.

Note.—Having moved the tripod the cradle should be approximately in the centre of the traverse.

If at any time during a shoot a correction for line that will give a reading on the dial of greater than left 10 degrees is ordered, the red pointer will be used and the sight will be laid on the red aiming post.

LESSON 21.—ACTION ON MISFIRE

No. 1 drops the muzzle cover, shakes the tripod and reports "On".

LESSON 21A.—ADJUST ZERO LINES

Instructor's Notes

Before beginning the lesson the mortar will be brought into action and given a switch of not more than 10 degrees right (or left).

1. "Adjust zero lines"

No. 1 acknowledges and checks his aim, sets his sights at zero and, without altering the position of the barrel, orders " posts". No. 2, on the order "posts", replants the posts in line with the sight as directed by No. 1.

2. "Adjust zero lines at ... degrees right (or left) of zero"

No. 1 acknowledges and checks his aim, sets his sights at the line ordered and, without altering the position of the barrel, orders "posts" as in para. 1.

3. If a correction for line is given, immediately before the order to adjust zero lines, this will be carried out as a normal controlled correction before adjusting the zero line as in para. 1 or 2.

e.g. "Left 5 degrees : adjust zero lines" or "Right 3 degrees : adjust zero lines at 15 degrees left of zero."

Note.—The occasions on which the order to adjust zero lines may be given are found in:

(a) Lesson 23, para. 4.

(b) Lesson 24, para. 3.

(c) Lesson 34, para. 3.

(d) Lesson 38, para. 7.
2. When the lay is completed, the cradle should be approximately in the centre of the traverse.

1. "Action"

No. 1 obtains direction by placing the baseplate in such a position that the posts are aligned with a point 4½ ins. left of the centre line of the baseplate.

The remaining duties are carried out as already taught.

2. When the mortar has been correctly laid on the two posts, No. 2 will remove the red post.

No. 1 sets zero opposite the red pointer and, looking along the lensatic sight, orders the post to be moved until it is in line with the apex of the triangle in the sight. He then zeros his dial and checks.

No. 1 has acknowledged the new range.

3. Corrections involving the movement of the tripod

No. 1 exposes the elevating screw about 6 ins., centralizes the cradle, and orders "Tripod". No. 3 goes to the front of the tripod, which is then moved as in Lesson 16.

In addition No. 1 grips the cradle to prevent it from sliding down the barrel and, when satisfied, orders "Stamp in". No. 3 stamps in the front legs and No. 2 stamps in the rear leg. Nos. 1 and 2 then lay the mortar.

Note.—Having moved the tripod the cradle should be approximately in the centre of the traverse.

If at any time during a shoot a correction for line that will give a reading on the dial of greater than left 10 degrees is ordered, the red pointer will be used and the sight will be laid on the red aiming post.

LESSON 21.—ACTION ON MISFIRE

No. 1 drops the muzzle cover, shakes the tripod and reports "Misfire".

No. 3 immediately takes up a position behind the baseplate.

No. 1 orders "Unload misfire" and No. 2 and No. 3 push the barrel away from the tripod to steady it.

No. 2 turns the barrel to the unlocked position in the baseplate, then raises the barrel and allows the bomb to slide slowly forward. No. 2 places his hands round the muzzle and catches the bomb as it slides from it.

No. 1 steadies the tripod to prevent the cradle from sliding forward.

No. 2 examines the primary cartridge and watches for fouling to fall out of the barrel. He replaces the safety cap and puts the bomb down, at the same time reporting any defect he has noticed.

If the primary cartridge is undamaged and has not been struck, and no fouling has been seen to fall out of the barrel, No. 3 unscrews the breech piece and examines the striker stud before replacing the barrel.

When the defect has been rectified, No. 3 reassembles the mortar and moves to his place at the ammunition.

No. 1 replaces the muzzle cover and, helped by No. 2, relays, orders "On" and, unless otherwise ordered, "Fire". In platoon (or section) fire No. 1 will not order "Fire" until ordered to do so.

Note: If the cartridge unit from another mortar is used, it is necessary to use Impr. Ammunition Key, No. 179, as in Lesson 8.

ADDITIONAL ELEMENTARY MORTAR DRILL

Note.—The occasions on which the order to adjust zero lines may be given are found in:

(a) Lesson 23, para. 4.
(b) Lesson 24, para. 3.
(c) Lesson 34, para. 3.
(d) Lesson 38, para. 7.

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2. When the lay is completed, the cradle should be approximately in the centre of the traverse.

1. "Action"

No. 1 obtains direction by placing the baseplate in such a position that the posts are aligned with a point 4½ ins. left of the centre line of the baseplate.

The remaining duties are carried out as already taught.

2. When the mortar has been correctly laid on the two posts, No. 2 will remove the red post. On the order "Cost from me!"

No. 1 sets zero opposite the red pointer and, looking along the lensatic sight, orders the post to be moved until it is in line with the apex of the triangle in the sight. He then zeroes his dial and checks.

In addition No. 1 grips the cradle to prevent it from sliding down the barrel and, when satisfied, orders "Stamp in". No. 3 stamps in the front legs and No. 2 stamps in the rear leg. Nos. 1 and 2 then lay the mortar.

Note.—Having moved the tripod the cradle should be approximately in the centre of the traverse.

If at any time during a shoot a correction for line that will give a reading on the dial of greater than left 10 degrees is ordered, the red pointer will be used and the sight will be laid on the red aiming post.

LESSON 21.—ACTION ON MISFIRE

No. 1 drops the muzzle cover, shakes the tripod and reports "Misfire".

No. 3 immediately takes up a position behind the baseplate.

No. 1 orders "Unload misfire", and No. 2 and I put the feet in the tripod to steady it.

No. 3 turns the barrel to the unlocked position in the baseplate, then raises the barrel and allows the bomb to slide slowly forward. No. 2 places his hands round the muzzle and catches the bomb as it slides from it.

No. 1 steadies the tripod to prevent the cradle from sliding forward.

No. 2 examines the primary cartridge and watches for fouling to fall out of the barrel. He replaces the safety cap and puts the bomb down, at the same time reporting any defect he has noticed.

If the primary cartridge is undamaged and has not been struck, and no fouling has been seen to fall out of the barrel, No. 3 unscrews the breech piece and examines the striker stud before replacing the barrel.

When the defect has been rectified, No. 3 reassembles the mortar and moves to his place at the ammunition.

No. 1 replaces the muzzle cover and, helped by No. 2, relays, orders "On" and, unless otherwise ordered, "Fire". In platoon (or section) fire No. 1 will not order "Fire" until ordered to do so.

Note.—A misfire may be caused either by a faulty primary cartridge, by the presence of fouling, or by the remains of the team unit from a previous bomb.

TESTS OF ELEMENTARY MORTAR DRILL

Instructor's Notes

Stores:

Mortar complete.
2 cases of drill bombs.
2 aiming posts.
1 stop watch.
1. The tests have been devised to help the platoon commander in testing the efficiency of his N.C.O.s. and men in elementary mortar drill.

2. In all tests Nos. 1, 2, 3, and 4 are being tested, and each man must pass in the duties of each number.

3. Any action carried out contrary to the lessons taught in elementary mortar drill constitutes a failure in that test. Men who are accurate, but who slightly exceed the standard time, should be tested again before being put back for further instruction.

4. Time will be saved in conducting the tests if men are tested in groups of four and all tests are carried out consecutively. On completion of the third test the order "Fall out one" should be given.

5. The platoon commander will keep a record of the tests.

Test 1.—Action (two posts)
Nos. 1, 2, 3, and 4 fall in as in Lesson 16. The instructor will inspect the stores after "Fall in" has been completed. A baseplate position will previously have been prepared, and two posts will have been planted as in Lesson 19.
The instructor will tell No. 1 to order "Action".
The time is taken from the command "Action" until No. 1 has reported "Mortar on zero line".
Standard time: 70 seconds.

Test 2.—Controlled corrections
This test is divided into three parts.
Before each part the instructor will check that:
the dial and drums of the sight are at zero, the sight set at 3000 or more, and the mortar laid on the aiming post with the cradle approximately central.

(a) Normal correction.—A correction is ordered for elevation and direction that does not exceed 400 yds. or 4 degrees.
"Up...hundred" (or "...hundred") "Right...Degrees" until No. 1 reports "On". No. 1 does not order "Fire". Standard time: 20 seconds.

(b) Large switch to the right.—No. 1 will be warned that this will entail movement of the tripod. A correction of between R. 15 degrees and R. 25 degrees will be ordered.

Right...degrees"
Time taken from the order "Degrees" until No. 1 reports "On".
Standard time: 25 seconds.
(c) Large switch to the left.—No. 1 will be warned that this will entail movement of the tripod and use of the red pointer.
A correction of between L. 15 degrees and L. 25 degrees will be ordered.

Left...degrees"
Time taken from the order "Degrees" until No. 1 reports "On".
Standard time: 25 seconds.

Test 3.—Cease firing
All bombs will be secured in cases before the test begins. The dial and drums of the sight will be set at zero.

"Cease firing"
The numbers act as in Lesson 17.
The time is taken from the order "Firing" until all numbers are still.
Standard time: 25 seconds.

SECTION 5.—LINES OF FIRE
Instructor's Notes
The lessons in this section should take the form of lectures followed by practical periods.

LESSON 22.—INTRODUCTORY
1. The underlying principle of 4-2-in. mortar fire is that the "lines of fire" of the mortars are made parallel in the first place, and remain parallel throughout, unless orders to concentrate are given by the fire controller.
The original parallel lines are known as "zero lines", so called because all sights are at zero when the mortars are laid on their zero lines.
Lines which are parallel, when swung through the same angle, remain parallel to each other. If paralleled mortars, therefore, are each given the same switch, their lines of fire can be directed on to any area within the arc, and will remain parallel.
2. The zero lines will normally be approximately at right angles to the mortar line. The interval between mortars will vary according to the ground and available cover, but it should never be
2 aiming posts.
1 stop watch.

1. The tests have been devised to help the platoon commander in testing the efficiency of his N.C.O.s. and men in elementary mortar drill.

2. In all tests Nos. 1, 2, 3, and 4 are being tested, and each man must pass in the duties of each number.

3. Any action carried out contrary to the lessons taught in elementary mortar drill constitutes a failure in that test.

   Men who are accurate, but who slightly exceed the standard time, should be tested again before being put back for further instruction.

4. Time will be saved in conducting the tests if men are tested in groups of four and all tests are carried out consecutively. On completion of the third test the order "Fall out one" should be given.

5. The platoon commander will keep a record of the tests.

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Test 1.—Action (two posts)

Nos. 1, 2, 3, and 4 fall in as in Lesson 16. The instructor will inspect the stores after "Fall in" has been completed. A baseplate position will previously have been prepared, and two posts will have been planted as in Lesson 19.

The instructor will tell No. 1 to order "Action". The time is taken from the command "Action" until No. 1 has reported "Mortar on zero line".

Standard time: 70 seconds.

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Test 2.—Controlled corrections

This test is divided into three parts.

Before each part the instructor will check that —

- the dial and drums of the sight are at zero, the sight set at 3000 or more, and the mortar laid on the aiming post with the cradle approximately central.

(a) Normal correction.—A correction is ordered for elevation and direction that does not exceed 400 yds. or 4 degrees.

   "Up . . . hundred" (or . . . "hundred") "Right (or left) . . . degrees". Time is taken from the order "Hundred" until No. 1 reports "On". Standard time: 20 seconds.

(b) Large switch to the right.—No. 1 will be warned that this will entail movement of the tripod. A correction of between R. 15 degrees and R. 25 degrees will be ordered.

"Right . . . degrees"

Time taken from the order "Degrees" until No. 1 reports "On".

Standard time: 25 seconds.

(c) Large switch to the left.—No. 1 will be warned that this will entail movement of the tripod and use of the red pointer. A correction of between L. 15 degrees and L. 25 degrees will be ordered.

"Left . . . degrees"

Time taken from the order "Degrees" until No. 1 reports "On".

Standard time: 25 seconds.

Test 3.—Cease firing

All bombs will be secured in cases before the test begins. The dial and drums of the sight will be set at zero.

"Cease firing"

The numbers act as in Lesson 17. The time is taken from the order "Firing" until all numbers are still.

Standard time: 25 seconds.

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SECTION 5.—LINES OF FIRE

Instructor’s Notes

The lessons in this section should take the form of lectures followed by practical periods.

LESSON 22.—INTRODUCTORY

1. The underlying principle of 4-2-in. mortar fire is that the lines of fire of the mortars are made parallel in the first place, and remain parallel throughout, unless orders to concentrate are given by the fire controller.

The original parallel lines are known as "zero lines" so called because all sights are at zero when the mortars are laid on their zero lines.

Lines which are parallel, when swung through the same angle, remain parallel to each other. If paralleled mortars, therefore, are given the same switch, their lines of fire can be directed on to any area within the arc, and will remain parallel.

2. The zero lines will normally be approximately at right angles to the mortar line. The interval between mortars will vary according to the ground and available cover, but it should never be
less than 20 yds. and, whenever possible, should not be greater than 40 yds. If the mortars are normally spaced and parallel, the M.P.Is. at the target end will fall approximately 30 yds. apart. This distance ensures that the 50 per cent. beaten zones will overlap at all ranges and that an effective belt of fire will result, having an approximate width of 150 yds. for a platoon. This belt of fire can be quickly switched over an area or on to a new target.

3. Each mortar position is marked by a different coloured flag. The arrangement, from right to left, is as follows:
   No. 1 mortar ... ... red flag { Right section.
   No. 2 mortar ... ... white flag
   No. 3 mortar ... ... blue flag { Left section.
   No. 4 mortar ... ... yellow flag

Note.—This numbering of mortars and sections bears no relation to the administrative organization within the platoon.

4. The procedure for placing mortars on their zero lines is carried out in two stages:
   (a) Initial line is first established.
   (b) The mortars are paralleled on this line.

**LESSON 23.---INITIAL LINE**

**Instructor's Notes**

Stores:
- Liquid prismatic compasses.
- Aiming posts.
- 1 in. maps.
- Protractors.

1. The zero line may be directed on to a target, or, if no particular target has been allotted, on to a convenient point within an area.

2. In either case one of the following methods may be employed to establish the zero line:
   (a) **Grid bearing taken from a map.**—If the map co-ordinates of the target, or of a point within an arc, can be determined, the O.P. officer can measure the grid bearing mortar-target by protractor and send it over the 22 set to the M.P.O. The O.P. officer's ability to do this will depend on his knowing the approximate area of the mortar position.

3. **As soon as the M.P.O. knows the grid bearing of the zero line,**

4. If at any subsequent time the zero line requires to be directed on to a new point in the arc an ordinary switch may be given followed by an adjustment of zero line.

Stores:
- 4 flags.
- 8 aiming posts.
- 1 liquid prismatic compass.

1. There are two methods of paralleling by compass:
   (a) Compass "A" for use before the mortars arrive.
   (b) Compass "B" for paralleling mortars whose baseplates are already in position.

2. **Compass "A"**
   (a) This is the simplest method of paralleling and has the advantage that, if time permits, line can be established for each mortar before the platoon arrives. The platoon, however, will never be held back from coming into action because all posts have not yet been planted. Therefore, if the platoon should arrive while the M.P.O. is laying out line by this method, the remaining mortars must be paralleled by one of the other methods. The most urgent consideration is to get one mortar ready for ranging, and all mortars in action without delay.

   (b) **Method.**—The M.P.O. lies down well behind each baseplate position in turn and orders his assistant to plant two posts accurately in line with the hair-line of his compass, set at the correct magnetic bearing. If the flag is already
less than 20 yds. and, whenever possible, should not be greater than 40 yds. If the mortars are normally spaced and parallel, the M.P.Is. at the target end will fall approximately 30 yds. apart. This distance ensures that the 50 per cent. beaten zones will overlap at all ranges and that an effective belt of fire will result, having an approximate width of 150 yds. for a platoon. This belt of fire can be quickly switched over an area or on to a new target.

3. Each mortar position is marked by a different coloured flag. The arrangement, from right to left, is as follows:

- No. 1 mortar ... red flag
- No. 2 mortar ... white flag
- No. 3 mortar ... blue flag
- No. 4 mortar ... yellow flag

Note: Alignment of mortars and sections bears no relation to the

4. True out in

(a) Aim...

(b) The mortars are paralleled on this line.

LESSON 23.—INITIAL LINE

Instructor’s Notes

Stores:

Liquid prismatic compasses.
Aiming posts.
1 in. maps.
Protractors.

1. The zero line may be directed on to a target, or, if no particular target has been allotted, on to a convenient point within an arc.

2. In either case one of the following methods may be employed to establish the zero line:

(a) Grid bearing taken from a map.—If the map co-ordinates of the target, or of a point within an arc, can be determined, the O.P. officer can measure the grid bearing mortar-target by protractor and send it over the 22 set to the M.P.O. The O.P. officer’s ability to do this will depend on his knowing the approximate area of the mortar position.

If he is unable to do this he will send the map co-ordinates of the target, or of any convenient point within the arc, over the 22 set. The M.P.O., having located his mortar position on the map, will work out the correct bearing.

(b) Compass bearing.—A compass bearing may be taken by the O.P. officer from a position on, or only slightly displaced from, the line mortar-target. This will be sent back as a grid bearing to the M.P.O. This method is quick and reasonably accurate, but is dependent on a view of the target from a point near the line mortar-target and on knowing the approximate area of the mortar position. Displacement should be avoided if at all possible, but if present it must be allowed for.

(c) Aiming posts.—It may sometimes be possible to plant two aiming posts in line with the target in such a way that they can both be seen from the mortar position. When the O.P. is near the mortar position the O.P. officer will often save time by doing this himself.

3. As soon as the M.P.O. knows the grid bearing of the zero line, he will correct it to a magnetic bearing, allowing for compass error, and will parallel the mortars by one of the methods described in the subsequent lessons.

4.

LESSON 24.—PARALLELING—COMPASS METHODS

Instructor’s Notes

Stores:

4 flags.
8 aiming posts.
1 liquid prismatic compass.

1. There are two methods of paralleling by compass:

(a) Compass “A” for use before the mortars arrive.

(b) Compass “B” for paralleling mortars whose baseplates are already in position.

2. Compass “A”

(a) This is the simplest method of paralleling and has the advantage that, if time permits, line can be established for each mortar before the platoon arrives. The platoon, however, will never be held back from coming into action because all posts have not yet been planted. Therefore, if the platoon should arrive while the M.P.O. is laying out line by this method, the remaining mortars must be paralleled by one of the other methods. The most urgent consideration is to get one mortar ready for ranging, and all mortars in action without delay.

(b) Method.—The M.P.O. lies down well behind each baseplate position in turn and orders his assistant to plant two posts accurately in line with the hairline of his compass, set at the correct magnetic bearing. If the flag is already
3. Compass "B"

(a) This procedure can be started before the mortars arrive but is completed after the mortars are assembled.

(b) Method.—The M.P.O. or No. 1 section commander orders a post to be planted in front of the flag or baseplate in the approximate direction of the zero line, standing slightly in rear and using a compass.

The mortar is then mounted, if this has not already been done, and laid on the post, with the sights at zero. Then No. 1 section commander, standing at least 10 yards in rear or in front of the mortar or post respectively, checks the bearing through the sight and post. He orders any correction necessary to bring the mortar on to the correct zero line and then orders the zero line to be adjusted.

In order to eliminate compass errors, the same compass must be used to lay out line for each mortar. With good training these methods are both quick and accurate.

LESSON 25.—PARALLELING—D.A.P. METHOD

Instructor’s Notes

Stores:

- 4 mortars complete.
- 1 liquid prismatic compass.
- 4 flags.

1. Provided that a satisfactory D.A.P. is available this is the quickest method of paralleling.

2. Theory.—This method is based on the fact that if two or more mortars are laid upon the same distant object (called a distant aiming point), they will be sufficiently parallel for practical purposes. It will be seen from Fig. 1 that, the further distant the D.A.P., the more nearly parallel will the lines of fire be on the target TT. It will also be seen that, for two equally distant D.A.P.s, A and B, the lines converge most (i.e. are least parallel) on A, which is at an angle of 90 degrees to the mortar line M1M4, and that they converge least (i.e. are most nearly parallel) on B, which is in prolongation of the mortar line, A D.A.P., therefore, which is roughly in prolongation of the mortar line need not be so far away as one which is at right angles to it.

The minimum distances required to avoid undue inaccuracy are:

(a) When the D.A.P. is in prolongation of a line joining the mortars to be paralleled ………… 1,000 yds.

(b) When the D.A.P. makes an angle of less than 45 degrees with the mortar line ………… 4,000 yds.

(c) When the D.A.P. makes an angle of more than 45 degrees with the mortar line ………… 7,000 yds.

Note.—If only two mortars are being paralleled by this method only half these distances need apply.

(d) If the mortars can be made parallel by laying them on a D.A.P., it is a simple matter to switch them all through the same angle on to their zero lines. The necessary switch is the angle between the zero line and the D.A.P. This angle can be measured by compass (see Lesson 5, para. 4) before the mortars arrive.

3. Method

(a) Selection of a D.A.P.—The minimum distance for a satisfactory D.A.P. has already been considered. In addition:

(i) It must be visible from each baseplate position and each mortar must be able to lay on it. In order to
in position it should be removed while the posts are being planted and then repositioned in line with the posts.

3. Compass "B"

(a) This procedure will be used for laying out line when the baseplates are in position.

(b) Method.—No. 1 section commander stands or kneels at least 10 yds. behind the baseplate, in such a position that, with the compass set at the correct bearing, the hair-line cuts a point on the near edge of the baseplate, 44 ins. left of the centre line. He then orders one post to be planted in line with the bearing.

4. In order to eliminate compass errors the same compass must be used to lay out line for each mortar. With good training these methods are both quick and accurate.

LESSON 26.—PARALLELING—D.A.P. METHOD

Instructor's Notes

Stores:

4 mortars complete.

1 liquid prismatic compass.

4 flags.

1. Provided that a satisfactory D.A.P. is available this is the quickest method of paralleling.

2. Theory.—This method is based on the fact that if two or more mortars are laid upon the same distant object (called a distant aiming point), they will be sufficiently parallel for practical purposes. It will be seen from Fig. 1 that, the further distant the D.A.P., the more nearly parallel will the lines of fire be on the target TT. It will also be seen that, for two equally distant D.A.P.s, A and B, the lines converge most (i.e. are least parallel) on A, which is at an angle of 90 degrees to the mortar line M1M4, and that they converge least (i.e. are most nearly parallel) on B, which is in prolongation of the mortar line, A D.A.P., therefore, which is roughly in prolongation of the mortar line need not be so far away as one which is at right angles to it.

The minimum distances required to avoid undue inaccuracy are:

(a) When the D.A.P. is in prolongation of a line joining the mortars to be paralleled .... .... 1,000 yds.

(b) When the D.A.P. makes an angle of less than 45 degrees with the mortar line .... .... .... 4,000 yds.

(c) When the D.A.P. makes an angle of more than 45 degrees with the mortar line .... .... .... 7,000 yds.

Note.—If only two mortars are being paralleled by this method only half these distances need apply.

(d) If the mortars can be made parallel by laying them on a D.A.P., it is a simple matter to switch them all through the same angle on to their zero lines. The necessary switch is the angle between the zero line and the D.A.P. This angle can be measured by compass (see Lesson 5, para. 4) before the mortars arrive.

3. Method

(a) Selection of a D.A.P.—The minimum distance for a satisfactory D.A.P. has already been considered. In addition:

(i) It must be visible from each baseplate position and each mortar must be able to lay on it. In order to
avoid barrel obstruction, D.A.P.s. should not be chosen to the right front or to the left rear of the mortar position.

If, however, the only good D.A.P. is in either of these sectors, barrel obstruction can often be avoided by paralleling at extreme or minimum range. A D.A.P. cannot be used only if it is between 26 degrees and 36 degrees right of the zero line, or between 141 degrees and 161 degrees left of it.

(ii) It must be prominent and unmistakable, and must have a clearly defined edge on which the mortars can be laid with accuracy.

(b) The M.P.O. flags each baseplate position, while his assistant lays the posts on the ground to indicate the approximate direction of the zero line. The baseplate positions must be staggered sufficiently to avoid obstruction when the mortars are being laid on the D.A.P.

(c) On the arrival of the platoon, the angle D.A.P.-zero line is measured as already described.

(d) Each mortar is brought into action in the approximate direction of the zero line, the angle of switch is given, and the D.A.P. clearly indicated, to each No. 1. The Nos. 1 put the angle on their sights and lay their mortars on the D.A.P.

(e) Sights are zeroed, posts are planted and each mortar is now on its zero line.

LESSON 28.—PARALLELING—MORTAR ANGLE METHOD

Instructor's Notes

Stores:
4 mortars complete.
2 aiming posts.
4 flags.

In teaching this lesson, flags may be used to represent two of the mortars.

1. Mortar angle is the slowest method of paralleling. It should not normally be employed when it is possible to use any of the other methods, but should be regarded as a reserve.

2. Method

(a) Before the mortars arrive, two posts are planted on the zero line for the pivot mortar, and flags are planted for each mortar, staggered forward from right to left so as to avoid barrel obstruction.

In Fig. 2 P represents one mortar (the pivot mortar) which has been laid on its zero line, PZ, by one of the methods described in Lesson 23. It is desired to place the mortar M on a line MX, parallel to PZ.

As the mortar P is laid on two posts on the line PZ, with its sight at zero, the angle ZPM can be found by laying the lensatic sight on the sight of the mortar M, and reading off the angle.

If the angle is read off from the front pointer of the sight instead of the usual back pointer, it will read (180 degrees—ZPM).

Now, if the angle XPM can be made equal to (180 degrees—ZPM), then MX will be parallel to PZ, since the angles XMP and ZPM are supplementary angles.

This can be done by placing the angle (180 degrees—ZPM), as read off from the front pointer of the mortar P, on the sight of the mortar M and laying the mortar on the sight of P.

MX is now parallel to PZ, and the same procedure can be repeated for the remaining mortars.
(e) On the arrival of the platoon, the pivot mortar comes into action on the two posts, and the remainder in the approximate direction of the zero line.

(e) No. 1 of the pivot mortar, having laid the mortar correctly, lays his lensatic sight on the sight of each mortar in turn, beginning with the furthest mortar, and calls out the angle as read from the front pointer (e.g. "No. 4. Left nine seven degrees . . . ", etc.). Having called out all the angles, he zeroes his sight and checks his aim.

(d) Nos. 1 of the remaining mortars, having brought their mortars into action, place on their sights the angles called out to them. They lay their mortars on the sight of the pivot mortar, zero their sights, and put out their posts.

SECTION 6.—COMMUNICATIONS

LESSON 27.—INTRODUCTORY

1. The wireless set No. 22 will normally be used for control of fire. The O.P.A. will pass fire orders through a D V remote control unit, the operator at the O.P. carrier switching to "Send" as ordered.

2. No. 22 sets are carried as follows:

  Platoon commander's carrier [to enable communication to be maintained during the advance and in action.

  Second in command's carrier

No. 1 section commander's carrier— as the platoon rear link to heavy mortar company H.Q.

3. In addition each platoon commander is provided with a No. 18 set to enable him to keep in touch with any infantry commander whom he may be supporting. This set may also be used to enable an infantry commander to indicate targets to the platoon commander by directing the fire of the platoon, provided that previous arrangements have been made.

4. Code signs (see diagram in para. 5).

  (a) The brigade support group will be allotted a three letter code sign which will change every 24 hours (e.g. LMN).

  (b) Heavy mortar company H.Q. becomes LMN 1 (or L 1), and Nos. 1 and 2 platoons will be LMN 1A (or L 1A) and LMN 1B (or L 1B) respectively.

(e) In each platoon the O.P. set will be control set for the group, and the layout will be as follows:

No. 1 platoon

  Platoon commander's set (control) ... LMN 1A2
  Second in command's set ... LMN 1A1
  Link sign within the platoon ... 1A1 (or A1)

No. 2 platoon

  Platoon commander's set (control) ... LMN 1B2
  Second in command's set ... LMN 1B1
  Link sign within the platoon ... 1B1 (or B1)

(d) When a message is passed from heavy mortar company H.Q. to the rear link set of either platoon, it is possible for the operator of the latter, using the flick mechanism of the 22 set, to report the message straight through to the platoon commander's set. Thus, on the company commander's net, No. 1 platoon rear link set is LMN 1A, and on the platoon commander's net it becomes LMN 1A3 (1A3 or A3).

  It is essential that the operator on this set should listen in permanently on the company commander's net, using his flick mechanism only to report messages to the platoon commander as they arrive. Messages from platoon to company will be passed in the normal way.
5. The layout of communications within the heavy mortar company is, therefore, as follows:

![Diagram of communication layout]

**LESSON 28.—CONTROL OF FIRE**

**Instructor’s Notes**

Stores:

- 2 No. 22 sets (1 with R.C. unit).
- 1 D.V telephone and cable.

The procedure specified in this lesson is to be used only for the control of fire. All other RT communications must conform to the procedure laid down in Signal Training (All Arms) Pamphlet No. 5, Part 1.

1. The O.P.A. uses the D.V remote control unit. Before transmitting any message or fire order the O.P.A. must tell the operator at the set to switch to “Send.”
   The operator at the O.P. carrier will listen to the passing of orders and will switch to “Receive” each time he hears “over,” “out” or “wait out.”

2. The O.P.A. writes down the order, passing it over the D.V remote control to the mortar position operator.

3. The mortar position operator writes down and repeats it back.

4. After each order has been repeated back correctly the O.P.A. says “Through, six” to the observing officer and puts a tick against the order on his pad.

5. If the order is repeated back incorrectly the O.P.A. sends “Wrong” and gives the order again. He does not use the phrase “I say again” in this connection.

6. The M.P.O.A. hears the orders through a second pair of headphones and gives them over the loudspeaker to the mortars.

7. In the following examples:
   - Column 1 shows the O.P. officer’s orders as given to the O.P.A.
   - Column 2 shows the orders as transmitted by the O.P.A. (No. 22 set).
   - Column 3 shows the orders as repeated back by the mortar position operator (No. 22 set).
   - Column 4 shows the orders given by the M.P.O.A. to the mortars (loudspeaker).

<table>
<thead>
<tr>
<th>O.P. officer</th>
<th>O.P.A. sends</th>
<th>M.P. operator sends</th>
<th>M.P.O.A.’s orders</th>
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<tbody>
<tr>
<td>Column 1</td>
<td>Column 2</td>
<td>Column 3</td>
<td>Column 4</td>
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- O.P. officer
- O.P.A. sends
- M.P. operator sends
- M.P.O.A.’s orders

“Send—
No. 2 on zero lines—over”
1. When platoon (or section) fire is being fired the M.P. operator will remain at SEND until he has reported "Shot 4". The O.P.A. reports the shots to the

2. If the remote control unit No. 2 is used instead of the D. Mk. V telephone, procedure is the same, omitting the use of the word "Send".

**LESSON 29.—LIAISON WITH INFANTRY**

(No. 18 set)

1. The ideal method of securing mortar support where and when it is vitally necessary is for the commander of the attacking troops to have a mortar officer with him, but this will often not be possible because the location of infantry headquarters will not necessarily be suitable as an O.P. If, however, the supporting mortar O.P. is linked to the infantry No. 18 set frequency, the co-operation can be very close. This frequency is the property of the infantry, and the O.P. officer listens in order that he may be called upon to give supporting fire. Except to test his communications when the net is quiet, the O.P. officer will speak on this frequency only when he is spoken to.

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<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
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<tbody>
<tr>
<td><strong>O.P. officer</strong></td>
<td><strong>O.P.A. sends</strong></td>
<td><strong>M.P. operator sends</strong></td>
<td><strong>M.P.O.A.'s orders</strong></td>
</tr>
<tr>
<td>&quot;No. 2 bedding in&quot;</td>
<td>&quot;Send—No. 2 bedding in—over&quot;</td>
<td>&quot;No. 2 bedding in—over&quot;</td>
<td>(Through, sir)</td>
</tr>
<tr>
<td>(Through, sir)</td>
<td>&quot;No. 2 bedding in—over&quot;</td>
<td>&quot;Shot—over&quot;</td>
<td>&quot;2400&quot;</td>
</tr>
<tr>
<td>&quot;Send—shot 2—over&quot;</td>
<td>(Shot 2)</td>
<td>&quot;2400&quot;</td>
<td>(Through, sir)</td>
</tr>
<tr>
<td><strong>Platoon target, charge No. 2 ranging</strong></td>
<td>&quot;Send—Platoon target, charge No. 2 ranging—over&quot;</td>
<td>&quot;Platoon target, charge No. 2 ranging—over&quot;</td>
<td>(Through, sir)</td>
</tr>
<tr>
<td>(Through, sir)</td>
<td>&quot;2000, zero lines, fire&quot;</td>
<td>&quot;Send—&quot;</td>
<td>&quot;Fire&quot; (Shot 2)</td>
</tr>
<tr>
<td>&quot;Shot—over&quot;</td>
<td>&quot;Send—shot 2—over&quot;</td>
<td>(All on zero lines)</td>
<td>&quot;All on zero lines—over&quot;</td>
</tr>
<tr>
<td>&quot;Bedding in&quot;</td>
<td>&quot;Send—bedding in—over&quot;</td>
<td>&quot;Bedding in—over&quot;</td>
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**Notes**

1. When platoon (or section) fire is being fired the M.P. operator will remain at SEND until he has reported "Shot 4." The O.P.A. reports the shots to the O.P. officer without sending until "Shot 4" has been reported.

2. In the above example words in brackets are not transmitted.

3. The procedure for control of fire by telephone is the same as that laid down for R/T, except that "Send" and "over" are omitted.

**Lesson 29.—Liaison with Infantry**

(No. 18 set)

1. The ideal method of securing mortar support where and when it is vitally necessary is for the commander of the attacking troops to have a mortar officer with him, but this will often not be possible because the location of infantry headquarters will not necessarily be suitable as an O.P. If, however, the supporting mortar O.P. is linked to the infantry No. 18 set frequency, the co-operation can be very close. This frequency is the property of the infantry, and the O.P. officer listens in in order that he may be called upon to give supporting fire. Except to test his communications when the net is quiet, the O.P. officer will speak on this frequency only when he is spoken to.
2. Target indications.—The following methods, which are simple and acceptable to infantry and artillery, will be used by 4.2-in. mortar observing officers:

(a) Map reference.—When the target is easy to describe and can be located on the map, the infantry will pass its map reference.

Example:

"Farm buildings, map reference 436598, active mortars, neutralize for three minutes."

This is the simplest method and the one least open to error. It will be used whenever possible.

(b) Compass point and distance from a reference object.—The infantry ensures that the O.P. officer has identified some unmistakable object as a reference point and will then fix the target by giving its direction and distance (in yards) from the reference object, using one of the eight cardinal points of the compass, i.e., North, South, East, West, N.E., N.W., S.E., S.W.

Example:

"Reference red house in cornfield, N.E. 300, mortars in re-entrant, neutralize 5 minutes."

(c) Compass point and distance from shot.—In country which is unmapped or particularly featureless, the infantry officer may begin by calling for a shot. He will then use this shot as a reference point, and will proceed as in 2 (b). The O.P. officer must ensure that the shot falls in a safe place on ground which is easily visible both for the infantry and himself.

Example:

Infantry ... "Fire shot as reference object."
O.P. officer ... "Shot."
Infantry ... "Reference shot, target is N.W. 200. Mortars behind wood, neutralize 3 minutes."
O.P. officer ... "Target identified."

(d) Prominent features obvious to both observers.—If the eye can be carried easily from a reference object to the target, following an obvious feature of the ground, this may be used in place of a compass direction as in 2 (b).

Example:

"Reference lone haystack (considered unmistakable), right along track 300, machine guns in dark field."

3. Engagement of targets

(a) If these methods of target indication are used, the O.P. officer should be able to identify the target whenever it is visible from his O.P. As soon as he is certain of the target he will report "Target Identified" to the infantry and will engage the target by normal methods.

If he is unable to identify the target, it may be clear from the indication that it is in ground that is dead from his present O.P., and it may be clear in which direction the O.P. should be moved in order to obtain command of the target. If so, it will generally be best to move the O.P. at once, in order that the target may be identified and the shoot then conducted in the normal way.

(b) In featureless or very enclosed country the O.P. officer may be unable to identify the target and may be uncertain whether this inability is due to the target being hidden or merely to the identification. In this case he will report to the infantry. "Target not identified, send corrections." He will fire shot at what he considers to be:

(i) A safe place.
(ii) On visible ground.
(iii) As near as possible to the target.

He will report "Shot" to the infantry, who will then report the position of the target with reference to this shot by the method in 2 (c).

The observing officer will give the necessary orders as a result of this correction and, if he is still unable to identify the target, will continue to fire single bombs. The infantry will continue to send corrections until the O.P. officer reports "Target Identified."

SECTION 7.—PLATOON DRILL

Instructor's Notes

Stores required for all periods of platoon drill (except Lesson 30):—

5 Loyd carriers and trailers.
4 mortars complete.
16 sandbags.
8 aiming posts.
4 flags (red, white, blue, yellow).
1 case drill bombs per mortar.
9 dummy cases per mortar.
1 megaphone.
1 telephone loudspeaker No. 2 complete.
1. **Object.**—To teach and exercise the mortar numbers, M.P.O.A., and batman in their drill duties in the occupation of a position, in fire discipline, and in "Cease firing".

2. Lesson 30 will be taught first, and preliminary instruction in the use and setting up of the loudspeaker equipment will also be given at this stage. Lessons 31 and 35 will be practised by squads until proficient, before working as a platoon. The following notes refer to Lessons 31-35.

3. Before the drill begins the instructor will mark each baseplate position with its flag as follows:

   - No. 1 mortar: red flag
   - No. 2 mortar: white flag
   - No. 3 mortar: blue flag
   - No. 4 mortar: yellow flag

   These flags will be staggered.

4. The instructor will call in the platoon, detail the personnel and order "Take post." Call it.

   Mortar numbers will take up their positions in front of their respective vehicles as follows:

   1
   432
   Dvr

5. Before the drill begins the instructor will indicate to the drivers a vehicle position in sight of the mortar line, and the mortar numbers will remove the trailer cover.

   Vehicles will approach the position from a flank. Drivers will be given practice in the observance of track discipline.

6. For drill purposes, ten cases will be removed from the carrier.

**LESSON 30.**—**PREPARATION OF THE BASEPLATE POSITION**

- **Instructor's Notes**

**Stores:**

- 1 pick
- 1 shovel
- 1 baseplate
- 4 sandbags
- 1 baseplate flag
- 1 aiming posts

---

The following lesson should take the form of a demonstration by the instructor, followed by plenty of practice by the class in the rapid preparation of baseplate positions on different types of ground.

1. The design of the baseplate is such that it will always be necessary to dig a hole for it and to weight it down with filled sandbags.

2. **Preparation of the position on normal ground**
   
   (a) A circular hole is dug, about 9 ins. in diameter and about 9 ins. deep.
   
   (b) The baseplate is placed flat, with its base in the hole, and Nos. 1 and 2 jump on it to bed it in. Sandbags are then placed on it to weight it down.

3. **Preparation of the position on very dry ground**
   
   (a) A pit is dug, about 2 ft. square and 1 ft. deep, with the rear side vertical.
   
   (b) The baseplate is placed in the pit at an angle of about 45 degrees, so that the front edge rests in the front of the pit, the front ribs of the base lying flat on the bottom of the pit, and the rear edge level with the surface of the ground. Fig. 3 is a sectional view of the baseplate in position.
   
   (c) Nos. 1 and 2 jump on the front half of the baseplate to bed it in, and sandbags are placed in position.

4. When the mortar is being brought into action on two posts, it is important that the centre of the hole should be 4½ inches to the right of the flag. This allows for the sight being offset from the centre of the barrel.
1. **Object.**—To teach and exercise the mortar numbers, M.P.O.A., and batman in their drill duties in the occupation of a position, in fire discipline, and in "Cease firing".

2. Lesson 30 will be taught first, and preliminary instruction in the use and setting up of the loudspeaker equipment will also be given at this stage. Lessons 31 and 35 will be practised by squads until proficient, before working as a platoon. The following notes refer to Lessons 31-35.

3. Before the drill begins the instructor will mark each baseplate position with its flag as follows:
   - No. 1 mortar
   - No. 2 mortar
   - No. 3 mortar
   - No. 4 mortar

   ... red flag
   ... white flag
   ... blue flag
   ... yellow flag

   These flags will be staggered.

4. The instructor will call in the platoon, detail the personnel and order "Take post!" Each No.

   Mortar numbers will take up their positions in front of their respective vehicles as follows:
   
   1
   432
   Dvr

5. Before the drill begins the instructor will a vehicle position in sight of the mortar line, and the will remove the trailer cover.

   Vehicles will approach the position from a flank. Drivers will be given practice in the observance of track discipline.

6. For drill purposes, ten cases will be removed from the carrier.

**LESSON 30.—PREPARATION OF THE BASEPLATE POSITION**

**Instructor’s Notes**

**Stores:**
- 1 pick.
- 1 shovel.
- 1 baseplate.
- 4 sandbags.
- 1 baseplate flag
- 1 aiming post

---

The following lesson should take the form of a demonstration by the instructor, followed by plenty of practice by the class in the rapid preparation of baseplate positions on different types of ground.

1. The design of the baseplate is such that it will always be necessary to dig a hole for it and to weight it down with filled sandbags.

2. **Preparation of the position on normal ground**
   - A circular hole is dug, about 9 ins. in diameter and about 9 ins. deep.
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3. **Preparation of the position on very dry ground**
   - A pit is dug, about 2 ft. square and 1 ft. deep, with the rear side vertical.
   - The baseplate is placed in the pit at an angle of about 45 degrees, so that the front edge rests in the front of the pit, the front ribs of the base lying flat on the bottom of the pit, and the rear edge level with the surface of the ground. Fig. 3 is a sectional view of the baseplate in position.
   - Nos. 1 and 2 jump on the front half of the baseplate to bed it in, and sandbags are placed in position.
LESSON 31.—ACTION—COMPASS

Instructor's Notes

Before the drill starts the instructor will lay out lines of fire, planting two posts for each mortar.

1. "Mount"

Nos. 1 and 4 will turn to their left, Nos. 2, 3 and the drivers to their right, and all will take up their positions in the carriers as follows:

```
1 Dvr 2

4 3
```

Drivers will move off when signalled for and will halt as follows:

No. 1 section commander's carrier at the control post.
Mortar carriers on the track, opposite their flags.

2. As soon as the carriers halt each No. 1 will order "10-cases, Action".

3. "Action"

No. 1 takes a pick and shovel and prepares the baseplate position.

Nos. 3 and 4 unhook the trailer and, assisted by No. 2, manhandle it to the baseplate position.

No. 2 lowers the headboard, unfastens the trailer quick-release straps and the baseplate retaining clamp, and takes the cable drum to the baseplate position.

Nos. 3 and 4 and the driver remove 10-cases of bombs, the mortar camouflage nets and four sandbags, from the carrier to the ground. As soon as these stores have been removed, the driver will take the carrier off the position. He will dispose the carrier as ordered, and will camouflage it.

No. 2 carries the sandbags, and No. 4 two cases of bombs, to the baseplate position.

When the baseplate position is prepared, all numbers double to the trailer.

No. 3 hands the sight case to No. 1, and No. 4 the spare parts bag to No. 2.

The mortar is then brought into action on the two posts as in Lesson 19.

LESSON 32.—ACTION—D.A.P.

Instructor's Notes

Before the drill starts, the instructor will lay two aiming posts on the ground in front of each flag, indicating the direction of the zero line.

He will decide on a D.A.P., will measure the angle between it and the zero line, and will pass this information on to the M.P.O.A.

1. "Mount"

Actions will be carried out as in Lesson 31, paras. 1 and 2.

The M.P.O.A. will position himself in the centre and a few yards in front of the mortar line.

2. "Action"

Actions will be carried out as in Lesson 31, paras. 3 and 4, with the following exceptions:

(a) The M.P.O.A. will visit each No. 1 in turn and will indicate the D.A.P., ensuring that it is correctly recognized. He will give each No. 1 the switch D.A.P.—zero line, e.g. "Right 35 degrees".

(b) Each No. 1 will bring the mortar into action in the approximate direction of the zero line, will set his sight correctly, and will then lay the mortar on the D.A.P. When the mortar is laid, the sight will be zeroed and a post planted (by No. 2) in line with the lenticular sight. The second (red) post will then be planted opposite the red pointer, and the sight reset at zero. The mortar will then be reported on zero lines to the control post.
LESSON 33.—ACTION—MORTAR ANGLE

Instructor's Notes

Before the drill starts, the instructor will plant two posts for the pivot mortar and will place two posts on the ground in front of each remaining flag, indicating the approximate direction of the zero line. The flags will be staggered so as to avoid barrel obstruction. The instructor will tell the M.P.O.A. the number of the pivot mortar.

1. **"Mount"**

Actions will be carried out as in Lesson 31, paras. 1 and 2, the M.P.O.A. acting as in Lesson 32, para. 1.

2. **"Action"**

Actions will be carried out as in Lesson 31, para. 3, with the following exceptions:—

(a) The M.P.O.A. will order "Mortar angle from No. . . .".

(b) No. 1 of the pivot mortar will bring his mortar into action on two posts. The remaining Nos. 1 will mount their mortars in the approximate direction as indicated.

No. 1 of the pivot mortar, having laid on two posts, will lay his lensatic sight (using the quick-release and the deflection drums) on the sight of each mortar in turn, starting with the furthest mortar, reading the angle off the front pointer, and calling it out to the No. 1 concerned (e.g. "No. 4, left nine five degrees").

Each remaining No. 1, having acknowledged his switch, will set his sight accordingly and lay his mortar on the sight of the pivot mortar. He will then zero his sight and plant his posts as in Lesson 32, para. 2 (b).

LESSON 34.—FIRE DISCIPLINE

Instructor's Notes

Before teaching this lesson, the platoon will be brought into action by one of the methods already taught.

Fire orders may be given to Nos. 1 by the instructor, representing the M.P.O.A., but both the M.P.O.A. and O.P.A. should be exercised in the passing of orders through the 22 set and in the giving of orders to Nos. 1 during platoon drill, when the appropriate stage of training is reached.

1. Acknowledgment of orders

(a) Nos. 1 will acknowledge each order.

(b) If a No. 1 is in doubt as to any order, he will keep his hand raised and will shout "Again", If only part of the order has been missed he will shout "Check switch," "Check range", "Check method of fire", or "Check No. of rounds" as the case may be. "Again" will not be called unless the whole order is to be repeated.

(c) If any No. 1 cannot be heard at the control post, or if he cannot be seen by the M.P.O.A., he will use the loudspeaker to call for an order to be repeated. He will press the button on his loudspeaker, wait for the acknowledgment "O.K., No. . . .", and will then speak with his mouth close to the loudspeaker.

2. **"Bedding in"**

(a) Bedding in rounds will normally be fired at charge II, 3200' on the zero line unless orders to the contrary are given.

The M.P.O.A. will, on receiving the order "Bedding in", order "Bedding in, 3200, zero lines, one round mortar fire ". Bedding in, Fire.

(b) The number of the first mortar on its zero lines will be reported to the O.P. This will enable one mortar to be bed in and start ranging without reference to the others. The other mortars will be reported on zero lines as soon as they are all ready. The M.P.O.A. will bed them in on orders from the O.P. The firing of these bedding in rounds must not interfere with the firing or observation of ranging rounds. The M.P.O.A. will, therefore, order these bombs to be fired some 20 seconds after a ranging bomb has been fired.

(c) The M.P.O.A. is responsible for ensuring that mortars which have bedded in later than the ranging mortar are laid at the correct range and line before mortar fire is fired.

3. **Adjust zero lines.**—If at any time the fire controller orders an individual line correction to a mortar the M.P.O.A. will adjust the zero line of this mortar at the first opportunity without further orders.

4. **"Platoon Target, charge . . . No. . . Ranging"**

This indicates that the ranging mortar alone will fire until the order for mortar fire is given. The remaining Nos. 1 will apply all corrections ordered, but will not report "On", This is known as "following up".

5. **"Right (or Left) section target, charge . . . No. . . Ranging"**

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LESSON 33.—ACTION—MORTAR ANGLE

Instructor’s Notes

Before the drill starts, the instructor will plant two posts for the pivot mortar and will place two posts on the ground in front of each remaining flag, indicating the approximate direction of the zero line. The flags will be staggered so as to avoid barrel obstruction. The instructor will tell the M.P.O.A. the number of the pivot mortar.

1. “Mount”
Actions will be carried out as in Lesson 31, paras. 1 and 2, the M.P.O.A. acting as in Lesson 32, para. 1.

2. “Action”
Actions will be carried out as in Lesson 31, para. 3, with the following exceptions:
(a) The M.P.O.A. will order “Mortar angle from No. . . .”.
(b) No. 1 of the pivot mortar will bring his mortar into action on two posts. The remaining Nos. 1 will mount their mortars in the approximate direction as indicated.

No. 1 of the pivot mortar, having laid on two posts, will lay his lensatic sight (using the quick-release and the deflection drums) on the sight of each mortar in turn, starting with the furthest mortar, reading the angle off the front pointer, and calling it out to the No. 1 concerned (e.g. “No. 4, left nine five degrees”).

Each remaining No. 1, having acknowledged his switch, will set his sight accordingly and lay his mortar on the sight of the pivot mortar. He will then zero his sight and plant his posts as in Lesson 32, para. 2 (b).

3. “Adjust zero lines”
Nos. 1 will check their aim, zero their sights and replant posts as necessary, without altering the position of the barrel.

If observation of bombs shows that a mortar is obviously off parallelism, it may be ordered to “Adjust zero lines at . . . degrees right (or left) of zero” after the necessary correction has been given. No. 1 will then set his sight at the line ordered without moving his barrel and will replant posts.

4. “Platoon Target, charge . . ., No. . . . Ranging”
This indicates that the ranging mortar alone will fire until the order for mortar fire is given. The remaining Nos. 1 will apply all corrections ordered, but will not report “On”. This is known as “following up”.

5. “Right (or Left) section target, charge . . ., No. . . . Ranging”

has been missed he will shout “Check switch.” “Check range”, “Check method of fire”, or “Check No. of rounds” as the case may be. “Again” will not be called unless the whole order is to be repeated.

(c) If any No. 1 cannot be heard at the control post, or if he cannot be seen by the M.P.O.A., he will use the loudspeaker to call for an order to be repeated. He will press the button on his loudspeaker, wait for the acknowledgment “O.K., No. . . .”, and will then speak with his mouth close to the loudspeaker.
Para. 4 above now applies only to the section named. The M.P.O.A. will order the other section to "Rest", and, if he considers it desirable, to "Stand easy."

6. "Registration, No... Ranging"

This order is used when the O.P. officer is registering an arc. The other three mortars will not follow up but will be ordered to "Rest" by the M.P.O.A.

7. "Rest"

The mortar nos. will remain at the mortar but will not act on any order until "Position" has been ordered.

8. "Stand easy"

No. 1 will carry out any maintenance that he considers necessary, and will then order "Stand clear". He will march the detachment to a position not far from the mortar and under cover if possible, and will order "Fall out", keeping the detachment under his control. On the order "Take post" the detachment will double to the mortar and take up their positions.

9. "... Rounds mortar fire"

This order indicates that each mortar will fire the number of rounds ordered (as in elementary mortar drill, Lesson 18) as soon as it is laid, provided that the order "Fire" has been given, irrespective of the others. The M.P.O.A. will order "Fire" as soon as the first No. 1 to be ready reports "On". The batman will, when possible, note the order in which mortars fire.

10. "One round platoon fire (or section fire)"

The M.P.O.A. will order "Fire" to each mortar in turn from the right, at an interval of 5 seconds (unless some other interval has been ordered).

\[\text{e.g.} \quad \text{"No. 1, fire"} \quad \text{"No. 2, fire"} \quad \text{"No. 3, fire"} \quad \text{"No. 4, fire"} \]

11. Nos. 1 report "On" to the control post and grasp the muzzle cover.

12. If two or more rounds platoon (or section) fire is ordered, each mortar will fire the number of rounds specified before the next mortar is ordered to fire.

13. Order:

\[\text{"No. 1, left one degree,} \quad \text{No. 4, right one degree."} \]

14. This order is passed to the Nos. 1 in the normal way and indicates that mortars will not be fired until ordered to do so by the O.P. Nos. 1 will, therefore, report "OK", but will not order "Fire".

15. As soon as all mortars are ready, the M.P.O.A. will report "READY" to the O.P.

16. The O.P. will then order "Fire" or "Rest".

A correction that is not preceded by a number will be applied by all mortars, whether they are actually firing or only "following up". Mortars will always be relaid at the last range and line ordered.

17. "Wrong"

This order indicates that the last order is wrong and is to be ignored. No action will be taken by Nos. 1 until the mistake has been corrected.

18. "Cancel..."

This will follow "Wrong" only when the order to be ignored is a cumulative correction, e.g. "2500" automatically cancels "2300"; but if "Up 100" or "Right 5 degrees" is wrong, the order "Cancel up 100" or "Cancel right 5 degrees" must be given before the correct order.

19. "Repeat"

This order from the O.P. indicates to the M.P.O.A. that the last method of fire and number of rounds is to be fired again. The M.P.O.A. will pass the order to the mortars in the normal way (e.g. as "3 rounds mortar fire"), or whatever the last order may have been. During ranging the M.P.O.A. will give the last range entered to the mortar.

20. "Record as target A 1"

On receiving this order, the M.P.O.A. will order "Record as target", then calling out the number of each mortar in turn. Each No. 1, as soon as the number of his mortar is called, will report direct, or through his loudspeaker, the reading on his sight, both for range and for line.
Para. 4 above in this lesson the M.P.O.A. will consider it desirable to:

6. "Register"
This order is given when the gunner has no other three rounds in the battery and has no orders other than "Rest" by the C.O.

7. "Rest"
The mortar will remain in this position and will not be moved until further orders are received.

8. "Stand by"
No. 1 will cease fire and will then cease to fire and is not competent to a position where it is possible, and will only fire under his control. The battalion will double the mortar and take up their positions.

9. "... Rounds mortar fire"
This order indicates that each mortar will fire the number of rounds ordered (as in elementary mortar drill, Lesson 18) as soon as it is laid, provided that the order "Fire" has been given, irrespective of the others. The M.P.O.A. will order "Fire" as soon as the first No. 1 to be ready reports "On". The battalion will, when possible, note the order in which mortars fire.

10. "One round platoon fire (or section fire)"
The M.P.O.A. will order "Fire" to each mortar in turn from the right, at an interval of 5 seconds (unless some other interval has been ordered).

   e.g. "No. 1, fire"
   "No. 2, fire"
   "No. 3, fire"
   "No. 4, fire"

Notes.—1. Before ordering "No. 1, fire", the M.P.O.A. will wait until all Nos. 1 have reported "On".

2. On the order "No. 1, fire", each other No. 1 will drop his hand, raising it again when the number of his own mortar is called.

11. "Concentrate"
The M.P.O.A., on receiving the order "Concentrate" will order:

   "No. 1, left one degree,
   No. 4, right one degree."

On the order "Concentration off", the M.P.O.A. will order:

   "No. 1, right one degree,
   No. 4, left one degree."

12. "Fire by order"
This order indicates that the M.P.O.A. will await the fire controller's order "Fire". The order "Fire by order" will be passed to Nos. 1.

13. Report of shot
(a) During mortar fire, the M.P.O.A. will report "Shot" when the first bomb is fired.

(b) During ranging and platoon fire, the M.P.O.A. will report "Shot (2, 3, or 4)" as each round is fired, the number referring to the mortar that has fired.

14. Controlled corrections.—A correction for range or line that is preceded by the number of a mortar will be applied by that mortar only. A correction that is not preceded by a number will be applied by all mortars, whether they are actually firing or only "followed up". Mortars will always be relayed at the last range and line ordered.

15. "Wrong"
This order indicates that the last order is wrong and is to be ignored. No action will be taken by Nos. 1 until the mistake has been corrected.

This will follow "Wrong" only when the order to be ignored is a cumulative correction, e.g. "2500" automatically cancels "2300": but if "Up 100" or "Right 5 degrees" is wrong, the order "Cancel up 100" or "Cancel right 5 degrees" must be given before the correct order.

17. "Repeat"
This order from the O.P. indicates to the M.P.O.A. that the last method of fire and number of rounds is to be fired again. The M.P.O.A. will pass the order to the mortars in the normal way (e.g. as "3 rounds mortar fire"), or whatever the last order may have been. During ranging the M.P.O.A. will give the last range of the mortar.

18. "Record as target A 1"
On receiving this order, the M.P.O.A. will order "Record as target", then calling out the number of each mortar in turn. Each No. 1, as soon as the number of his mortar is called, will report direct, or through his loudspeaker, the reading on his sight, both for range and for line.
The M.P.O.A. will record this information on a pro forma as follows:

<table>
<thead>
<tr>
<th>Target No.</th>
<th>Bearing of Z.L.</th>
<th>No. 1</th>
<th>No. 2</th>
<th>No. 3</th>
<th>No. 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>335°</td>
<td>Ch. I, 1700, 1° L. of Z.</td>
<td>1800, Z.L.</td>
<td>1800, Z.L.</td>
<td>1800</td>
</tr>
<tr>
<td>A3</td>
<td>335°</td>
<td>Ch. II, 2500, 30° R. of Z.</td>
<td>2500, 29° R. of Z.</td>
<td>2600, 29° R. of Z.</td>
<td>2600, 30° R. of Z.</td>
</tr>
</tbody>
</table>

"Target A2" indicates that this was the second target engaged by No. 1 platoon.

On "Cease firing" the target record will be destroyed.

19. "Platoon (or Section) target B2"

This order indicates that the second target which has been recorded by No. 2 platoon is to be re-engaged. The M.P.O.A. will call out from the record the range and line for each mortar.

LESSON 35.—CEASE FIRING

13. No. 1 will remove the sandbags, No. 2 will repack unexpanded ammunition, and Nos. 3 & 4 will fold and secure camouflage nets.

No. 3 will then disconnect the loudspeaker and reel in the cable, and No. 4 will replace the loudspeaker in the trailer. The batman will disconnect the junction box and batteries.

No. 1 returns the sight to its case, and collects the posts.

Nos. 2 and 3 begin to fasten up bomb cases.

No. 4 disconnects the loudspeaker and replaces it in the trailer.

All numbers then act as taught in elementary mortar drill, Lesson 17, except that the mortar, sight and spare parts bag are returned to the trailer, and the baseplate retaining clamp and quick-release straps secured.

No. 1 replaces the posts, flag, pick and shovel in the carrier.

No. 2 raises and fastens the headboard, and returns the sandbags to the carrier.

No. 3 winds in the cable and replaces the drum in the trailer.

No. 4 fastens up bomb cases and returns any live ammunition to the carrier.

The trailer is hooked on to the carrier.

All numbers mount.

SECTION 8.—BATTLE DRILL—ATTACK

LESSON 36.—INTRODUCTORY

1. Deployment drill—heavy mortar company

(a) Grouping

(i) "R" group

Company commander ... 1 car 5 cwt. FWD.

M.C. orderly ... 1 motor cycle.

M.C. orderly ... 1 motor cycle

(ii) "O" group

Each platoon:

Platoon commander ... 1 universal carrier.

M.C. orderly ... 1 motor cycle.

(iii) "F" group

Company

Company H.Q. 1 wireless truck.

Each platoon:

Second in command ... 1 universal carrier.

Platoon serjeant ... 1 motor cycle.

M.C. orderly ... 1 motor cycle.

2 sections ... 6 Loyd carriers.

(b) The company commander will receive particulars of his tasks and, possibly, areas of deployment.

(c) Meanwhile the "O" group arrives at a prearranged rendezvous and receives orders which will include:

(i) Platoon tasks.

(ii) Approximate platoon areas.

(iii) Ammunition supply and reservation for special tasks.

(iv) Details of communications, including position of company H.Q., allotment of frequencies for No. 18 sets, and policy regarding line communications.

(f) At the same time, F groups are moving to their respective deployment areas.

2. (a) The platoon commander will normally move as near as possible to the commander from whom he will receive orders. He must try to make a continuous reconnaissance, with reference to the ground and his map, so that he can make a quick appreciation of areas suitable for an O.P. and a mortar position.

(b) The second in command moves at the head of the platoon. The reconnaissance for, and the occupation of, the mortar position is his responsibility.
The M.P.O.A. will record this information on a pro forma as follows:

<table>
<thead>
<tr>
<th>Target No.</th>
<th>Bearing of Z.L.</th>
<th>No. 1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>335°</td>
<td>Ch. II, 2500, 2500, 2600, 2500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>335°</td>
<td>Ch. I, 1700, 1800, 1800, 1800</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>335°</td>
<td>Z.L.</td>
<td>Z.L.</td>
<td>1° R. of Z.</td>
<td>1° R. of Z.</td>
</tr>
</tbody>
</table>

"Target A2" indicates that this was the second target engaged by No. 1 platoon.

On "Cease firing" the target record will be destroyed.

19. "Platoon (or Section) target B 2"
This order indicates that the second target which has been recorded by No. 2 platoon is to be re-engaged. The M.P.O.A. will call from the record the range and line for each mortar.

LESSON 35.—CEASE FIRING

1. The M.P.O.A. orders "Nets off" and signals for the carriers.

2. The drivers drive straight to their own baseplate positions. Rack discipline is of no importance at this stage.

3. Nos. 3 and 4 fold and secure the trailer camouflage net.

4. The M.P.O.A. orders "Cease firing". The batman disconnects the junction box and batteries, and returns them to No. 1 section commander's carrier. No. 1 returns the sight to its case, and collects the posts. Nos. 2 and 3 begin to fasten up bomb cases. No. 4 disconnects the loudspeaker and replaces it in the trailer. All numbers then act as taught in elementary mortar drill, lesson 17, except that the mortar, sight and spare parts bag are returned to the trailer, and the baseplate retaining clamp and quick-release straps secured.

No. 1 replaces the posts, flag, pick and shovel in the carrier. No. 2 raises and fastens the headboard, and returns the sandbags to the carrier. No. 3 winds in the cable and replaces the drum in the trailer. No. 4 fastens up bomb cases and returns any live ammunition to the carrier. The trailer is hooked on to the carrier. All numbers mount.

SECTION 8.—BATTLE DRILL—ATTACK

LESSON 36.—INTRODUCTORY

1. Deployment drill—heavy mortar company

(a) Grouping

(i) "R" group
- Company commander ... 1 car 5 cwt. FWD.
- M.C. orderly ... 1 motor cycle.

(ii) "O" group
- Each platoon:
  - Platoon commander ... 1 universal carrier.
  - M.C. orderly ... 1 motor cycle.

(iii) "F" group
- Company:
  - Company H.Q. ... 1 wireless truck.
- Each platoon:
  - Second in command ... 1 universal carrier.
  - Platoon sergeant ... 1 motor cycle.
  - M.C. orderly ... 1 motor cycle.
  - 2 sections ... 6 Loyd carriers.

(b) The company commander will receive particulars of his tasks and, possibly, areas of deployment.

(c) Meanwhile the "O" group arrives at a prearranged rendezvous and receives orders which will include:

(i) Platoon tasks.

(ii) Approximate platoon areas.

(iii) Ammunition supply and reservation for special tasks.

(iv) Details of communications, including position of company H.Q., allotment of frequencies for No. 18 sets, and policy regarding line communications.

(d) At the same time "F" groups are moving to their respective deployment areas.

2. (a) The platoon commander will normally move as near as possible to the commander from whom he will receive orders. He must try to make a continuous reconnaissance, with reference to the ground and his map, so that he can make a quick appreciation of areas suitable for an O.P. and a mortar position.

(b) The second in command moves at the head of the platoon. The reconnaissance for, and the occupation of, the mortar position is his responsibility.
(c) The platoon serjeant moves immediately behind the second in command’s carrier, ready to accompany him and assist him on his reconnaissance.

(d) No. 1 section commander moves at the head of the leading section in his carrier. Communication between company H.Q. and the platoon is maintained through the 22 set carried in his carrier.

(e) No. 2 section commander should move in his carrier at the rear of the platoon.

3. (a) The platoon commander should always ask the commander from whom he receives orders to pin-point the target on the map. He will send orders to his second in command over the 22 set. These should be kept to a minimum and usually need only consist of the following:

(i) "Action—QRSFDY"
Map reference, in code, of an approximate platoon area.

(b) In order to give the 2 I.C. some indication of the time available to get the platoon into action, the platoon commander may use the figures 1, 2, 3, or 4, after the order "Action", e.g., "Action 2 AFMDZY".

Action 1 indicates that the quick action drill is to be used, and the platoon must get into action with all possible speed.

Action 2 indicates that the normal drill is to be used, but the platoon must get into action quickly.

Action 3 indicates that there is no immediate hurry, and that care must be taken to select the best position in the vicinity.

Action 4 indicates that there is ample time. The position must be reconnoitred in detail and a temporary position occupied during the preparation of the permanent position.

4. The first consideration of a platoon commander must always be to move his platoon into action as early as possible. Orders must, therefore, be passed to the second in command immediately the platoon commander has received them.

To this end the O.P. assistant will move, with the remote control of the 22 set, towards the place where the platoon commander is receiving orders. This action will result in orders getting back to the second in command more quickly than if the platoon commander had to return to the carrier.

In taking this action the O.P. assistant must keep well under cover.

5. The platoon commander will write down orders and give them to the O.P. assistant, or to the operator, to be transmitted. He should not transmit them verbally.

6. The duties of the platoon commander in the reconnaissance and occupation of an O.P. are described in Lesson 37.

The duties of the second in command in the reconnaissance and occupation of the mortar position are described in Lesson 38.

LESSON 37.—O.P. RECONNAISSANCE AND OCCUPATION

1. Introduction.—The selection of a good O.P. is of the utmost importance to the successful employment of the weapon.

By far the most important consideration is that the O.P. must provide the best possible command of the arc in which targets are likely to be engaged. All other requirements must be subsidiary to this.

It will usually happen that the farther forward the O.P., the better will be the observation of the arc and of our own troops. The O.P. officer, therefore, should normally reconnoitre forward.

2. Selection of an O.P.

(a) The requirements of an O.P. are:

(i) It must command a view of the whole arc for which the platoon is responsible, and, whenever possible, of the positions and line of advance of our foremost troops.

(ii) It must give cover from view. It should, if possible, give cover from fire.

(iii) It should have a covered line of approach, so that the O.P. will be disclosed neither by movement during its occupation nor by any necessary comings and goings during daylight.

(b) It may, however, sometimes be necessary to establish an O.P. on an exposed crest, or on a forward slope, where cover is scanty. In any case the intelligent use of camouflage and concealment is of the utmost importance.

3. Occupation of an O.P.

(a) During reconnaissance full use must be made of the carrier. There must be the minimum of exposure, movement on the skyline must be avoided, and vehicles must be kept under cover.
(c) The platoon serjeant moves immediately behind the second in command's carrier, ready to accompany him and assist him on his reconnaissance.

(d) No. 1 section commander moves at the head of the leading section in his carrier. Communication between company H.Q. and the platoon is maintained through the 22 set carried in his carrier.

(e) No. 2 section commander should move in his carrier at the rear of the platoon.

3. (a) The platoon commander should always ask the commander from whom he receives orders to pin-point the target on the map. He will send orders to his second in command over the 22 set. These should be kept to a minimum and usually need only consist of the following:

(i) "Action—QRSFDY"

Map reference, in code, of an approximate platoon area.

Alternatively, the map reference, in code, of a line forward of which the platoon must not come may be given, e.g. "Action—not forward of QRSFDY."

While the map reference for the platoon is being transmitted, the platoon commander can work out the bearing to the target. He will then order the O.P.A. to send:

(ii) "Bearing—160"

If the platoon commander knows the area, he will give a grid bearing... a special code for this should be arranged by the platoon commander.

(iii) "Target—568675"

If the mortar area is not known, the second in command will have to work out the bearing himself.

The reference of the target will always be given, in case the platoon is unable to occupy at the position ordered.

4. The first consideration of a platoon commander must always be to move his platoon into action as early as possible. Orders must, therefore, be passed to the second in command immediately the platoon commander has received them.

To this end the O.P. assistant will move, with the remote control of the 22 set, towards the place where the platoon commander is receiving orders. This action will result in orders getting back to the second in command more quickly than if the platoon commander had to return to the carrier.

In taking this action the O.P. assistant must keep well under cover.

5. The platoon commander will write down orders and give them to the O.P. assistant, or to the operator, to be transmitted. He should not transmit them verbally.

6. The duties of the platoon commander in the reconnaissance and occupation of an O.P. are described in Lesson 37.

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LESSON 37.—O.P. RECONNAISSANCE AND OCCUPATION

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It will usually happen that the farther forward the O.P., the better will be the observation of the arc and of our own troops. The O.P. officer, therefore, should normally reconnoitre forward.

2. Selection of an O.P.

(a) The requirements of an O.P. are:

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(ii) It must give cover from view. It should, if possible, give cover from fire.

(iii) It should have a covered line of approach, so that the O.P. will be disclosed neither by movement during its occupation nor by any necessary comings and goings during daylight.

(b) It may, however, sometimes be necessary to establish an O.P. on an exposed crest, or on a forward slope, where cover is scanty. In any case the intelligent use of camouflage and concealment is of the utmost importance.

3. Occupation of an O.P.

(a) During reconnaissance full use must be made of the carrier. There must be the minimum of exposure, movement on the skyline must be avoided, and vehicles must be kept under cover.
(b) The O.P. carrier will be established behind cover as close to the O.P. as is consistent with concealment.

Normally the O.P. officer and the O.P.A. will occupy the O.P., while the driver operators and the motor cycle orderly remain at the carrier.

The O.P. officer must give clear information and orders to the personnel at the carrier. These will include:

(i) Position of the O.P.
(ii) Route to the O.P.
(iii) Whether or not any person is to come up to the O.P.

No person, whoever he may be, will approach the O.P. without first reporting to the carrier.

(c) The O.P. officer may often be responsible for maintaining constant communication with infantry. If it is necessary to take the No. 18 set into the O.P., the O.P. officer must decide whether or not there is room and cover for an operator. If there is insufficient cover the O.P. officer may himself have to work either the 18 set or the 22 set remote control.

(d) Nothing is more likely to attract attention than movement. The O.P. officer will, therefore, ensure that the personnel in the O.P. can work in comfort with the minimum of movement.

(e) The O.P. assistant will remove the D.V. remote control unit from the carrier and will take it to the O.P. He will take up a position in the O.P. so that the O.P. officer can easily pass orders to him and also see what is written on his message pad.

4. Duties at the O.P.

(a) O.P. officer

(i) He is responsible for the observation and control of fire.

(ii) It is essential that he should make arrangements for a continuous watch to be kept on the movements of the O.P. and the enemy.

(iv) He will report the position of the O.P. carrier in code to the second in command.

(b) O.P. assistant

(i) He is responsible for the transmission and recording of the O.P. officer’s fire control orders.

(ii) He is available to assist the O.P. officer in observing from the O.P. and can be left, if necessary, in charge of the O.P. should the O.P. officer have to leave it temporarily.

(iii) He must be prepared temporarily to take over the fire control duties of the O.P. officer should he become a casualty.

5. Silent registration

(a) As soon as the O.P. is occupied the O.P. officer should begin the silent registration of his arc.

The object of silent registration is to enable an O.P. officer to obtain as much information about his arc as possible without shooting. This information will assist him in ranging and in the quick engagement of new targets.

With this object in mind he should:

(i) Locate his O.P. and mortar position on the map and plot in the direction of the zero line.

(ii) Note to which side his O.P. will be displaced when engaging not only the first target but also other targets in different sectors of the arc.

(iii) Make a careful study of contours to determine the position of false crests and dead ground.

(iv) Locate likely targets in the arc and identify them on the map. A compass bearing will often be of assistance.

(v) By use of the map estimate the range to each point, and the approximate switch from the zero line, and record this information.

(vi) Do everything possible to locate the positions both of the enemy and of our own troops.

(b) Although the value of silent registration cannot be overestimated, information gained by shooting will be much more reliable. The practical information gained by shooting at a target, therefore, will always supersede the theoretical deductions of silent registration.

6. Panorama.—The most convenient method of recording the information gained, either from shooting or silent registration, is by drawing a simple panorama of the arc.

This should be diagrammatic, clear, and easily understood. The following example (Fig. 4) will serve as a guide to indicate the type of panorama that is necessary at the O.P. and the method of recording targets.
The O.P. carrier will be established behind cover as close to the O.P. as is consistent with concealment.

Normally the O.P. officer and the O.P.A. will occupy the O.P., while the driver operators and the motor cycle orderly remain at the carrier.

The O.P. officer must give clear information and orders to the personnel at the carrier. These will include:

(i) Position of the O.P.
(ii) Route to the O.P.
(iii) Whether or not any person is to come up to the O.P.

No person, however he may be, will approach the O.P. without first reporting to the carrier.

c. The O.P. officer may often be responsible for maintaining constant communication with infantry. If it is necessary to take the No. 18 set into the O.P., the O.P. officer must decide whether or not there is room and cover for an operator. If there is insufficient cover the O.P. officer may himself have to work either the 18 set or the 22 set remote control.

d. Nothing is more likely to attract attention than movement. The O.P. officer will, therefore, ensure that the personnel in the O.P. can work in comfort with the minimum of movement.

e. The O.P. assistant will remove the B.V. remote control unit from the carrier and will take it to the O.P. He will take up a position in the O.P. so that the O.P. officer can easily pass orders to him and also see what is written on his message pad.

4. Duties at the O.P.

(a) O.P. officer

(i) He is responsible for the observation and control of fire.

(ii) It is essential that he should make arrangements for a continuous watch to be kept on the movements of the enemy and of our own troops.

(iii) He must pass on all information to the O.P. assistant at the earliest opportunity.

(b) O.P. assistant

(i) He is responsible for the transmission and recording of the O.P. officer’s fire control orders.

(ii) He is available to assist the O.P. officer in observing from the O.P. and can be left, if necessary, in charge of the O.P. should the O.P. officer have to leave it temporarily.

(iii) He must be prepared temporarily to take over the fire control duties of the O.P. officer should he become a casualty.

5. Silent registration

(a) As soon as the O.P. is occupied the O.P. officer should begin the silent registration of his arc.

The object of silent registration is to enable an O.P. officer to obtain as much information about his arc as possible without shooting. This information will assist him in ranging and in the quick engagement of new targets.

With this object in mind he should:

(i) Locate his O.P. and mortar position on the map and plot the direction of the zero line.

(ii) Note to which side his O.P. will be displaced when engaging not only the first target but also other targets in different sectors of the arc.

(iii) Make a careful study of contours to determine the position of false crests and dead ground.

(iv) Locate likely targets in the arc and identify them on the map. A compass bearing will often be of assistance.

(v) By use of the map estimate the range to each point, and the approximate switch from the zero line, and record this information.

(vi) Do everything possible to locate the positions both of the enemy and of our own troops.

(b) Although the value of silent registration cannot be over-estimated, information gained by shooting will be much more reliable. The practical information gained by shooting at a target, therefore, will always supersede the theoretical deductions of silent registration.

6. Panorama.—The most convenient method of recording the information gained, either from shooting or silent registration, is by drawing a simple panorama of the arc.

This should be diagrammatic, clear, and easily understood. The following example (Fig. 4) will serve as a guide to indicate the type of panorama that is necessary at the O.P. and the method of recording targets.
The panorama represents a view of the arc as seen from the O.P. The vertical lines, equally spaced, represent any convenient number of degrees. The horizontal lines will be drawn to approximately the same scale. Neither the vertical nor horizontal lines represent any range or switch measured from the mortar position but only serve to keep the panorama in a reasonable perspective.

Prominent features, e.g. woods, valleys, hills, etc., should be drawn in their correct relation to each other.

On the pro forma below the panorama should be recorded information gained by silent registration of possible targets and useful points in the arc. These should be numbered on the panorama and on the table for easy reference.

Information obtained by shooting must immediately take the place of information deduced by silent registration, e.g. target No. 3 (Fig. 4).

LESSON 38.—MORTAR POSITION RECONNAISSANCE AND OCCUPATION

1. As soon as the second in command has received the order “Action” he will make his reconnaissance and occupation plans. He must decide upon the area, or areas, to be reconnoitred, a forward R V for the platoon, and a route to it. The forward R V should be chosen as near as possible to the area, or areas, to be reconnoitred.

2. Having made his plan, he will issue orders to the platoon sergeant and section commanders as follows:
   - Platoon area.
   - Forward R V and route to it.
   - Direction in which he is going to reconnoitre.

If at all possible these must be pointed out on the ground before referring to a map.

3. The second in command will then go off on his reconnaissance, accompanied by the platoon sergeant and his M.C. orderly.

4. Selection of the mortar position.—It is essential that full use should be made of the range of the mortar. The mortar position should, therefore, be as far forward as is consistent with safety and the maximum use of cover.

   (a) The following are the requirements of a good mortar position:

   (i) It must have sufficient space and cover to accommodate four mortars at an interval of 20–40 yds.

   (ii) The position selected should allow the carriers and trailers to come up close to the baseplate positions.

   (iii) There should, if possible, be cover for the vehicles in the vicinity.

   (b) Each baseplate position should have:

   (i) Cover from enemy fire.

   (ii) The clearance necessary for the engagement of the arc.

   (iii) Suitable ground for the baseplate.

   (iv) As much cover from air as clearance will allow.

   (v) If D.A.P. or mortar angle method is being employed, each position must allow of the laying of the mortar on a D.A.P. or on the pivot mortar.

   (c) A control post will be selected by the M.P.O, so as to afford the best facilities for the passing of orders and for the exercise of command.

   (d) A position for vehicles should be chosen (by the platoon sergeant) which:

   (i) Has cover from ground observation and from air.

   (ii) Allows as wide a dispersion of vehicles as is practicable.

   (Note.—It is better to camouflage vehicles dispersed in the open than to congregate them in isolated cover.)

   (iii) Is, if possible, in view of the mortar position.

5. As soon as the second in command has decided upon the approximate area for the mortar position, he proceeds as follows:

   (a) He sends his orderly to bring up or direct the platoon to the mortar position, indicating the route of approach. This must be known by the platoon sergeant.
(b) He moves clear of the carrier and, with his compass, notes the approximate direction of the zero line.

(c) He decides roughly on the mortar line, and selects the position for the control post.

(d) He orders: "Control post—vehicle (or ground)", indicating whether the 22 set is to be a vehicle or a ground station, according to the cover available; at the same time he points to the position selected.

(b) "Rear link—vehicle (or ground)".

These orders are given so that the platoon sergeant and the personnel of the carrier can hear.

(f) He then selects a D.A.P. if one is available.

(g) He takes the flags and, accompanied by his assistant with the aiming posts, selects and flags each baseplate position, while the M.P.O.A. has the position on the ground to indicate the approximate direction of the zero line.

In flagging the baseplate positions, he starts with the one nearest the direction of approach of the platoon.

(h) If the platoon has not arrived when he reaches the fourth position, he lays out line for this mortar by compass "A", assisted by the M.P.O.A. He will continue laying out line by this method until the leading vehicle arrives on the position.

(i) If a D.A.P. has been selected, on arrival of the leading vehicle he measures the angle D.A.P.—zero line, and indicates the D.A.P. to his assistant, telling him the angle.

(j) He hands over his compass to No. 1 section commander, telling him the magnetic bearing of the zero line.

(k) He returns to the control post and gives orders to No. 2 section commander for the siting of the L.M.G.s and P.I.A.T.

(l) As soon as the platoon is in action and all mortars are bedded in, the second in command will indicate to the platoon sergeant an area to reconnoitre as a cease firing rendezvous, ensuring that all personnel are shown the route to it. This should be at least 400 yds. from the mortar position, must be easily accessible, and must provide good cover.

(n) He will notify the platoon commander of the cease firing R.V.

(o) He will report the location of the O.P. carrier and mortar position to company headquarters.

(a) On arrival on the position with the second in command he listens to the instructions to the orderly, and to the orders relating to the control post and rear link.

(b) He decides on the vehicle position.

(c) He notes the positions of the flags, and makes his plan for the occupation.

(d) He positions himself so as to meet the leading carrier, and gives brief instructions to the N.C.O. in charge of each vehicle as it arrives. He sends No. 1 section commander's carrier to the control post with instructions as to the rear link 22 set, and the mortar carriers to their baseplate positions. He gives clear instructions for track discipline and directs the drivers to the vehicle position or to an assembly position where he will collect them.

(e) He disposes the vehicles at the vehicle position and organizes the supply of ammunition.

(f) He reconnoitres a cease firing rendezvous when ordered to do so.

7. No. 1 section commander is responsible for the parallelism of the mortars. He immediately reports to the second in command.

If at any time he should find a mortar off parallelism he will correct it by the Compass B method, unless it has already been given an adjustment of zero line by the M.P.O.A.

8. No. 2 section commander is responsible for the local protection of the mortar position. On arrival at the position he will take his L.M.G. to the control post, where he will collect the second L.M.G. and the P.I.A.T. and will receive orders from the second in command. L.M.Gs. will be left either at the control post or at one or more of the baseplate positions, where they will be handed over to the Nos. 1 concerned. No. 2 section commander will site the P.I.A.T. covering the most likely tank approach, and will be himself responsible for handling it.

9. The M.P.O.A. is responsible for fire discipline and for the passing of orders to Nos. 1. As soon as he has completed his duties as in platoon drill, Lessons 32 and 33, he will go to the control post, check the transmission of the loudspeaker to each mortar detachment, and take up his duties in the control of fire.
(m) He remains at or near the control post, and commands at the mortar position.

6. The platoon serjeant is responsible for the efficient handling of vehicles during the occupation, for track discipline, for the vehicle position, and for maintaining the supply of ammunition.

(a) On arrival on the position with the second in command he listens to the instructions to the orderly, and to the orders relating to the control post and rear link.

(b) He decides on the vehicle position.

(c) He notes the positions of the flags, and makes his plan for the occupation.

(d) He positions himself so as to meet the leading carrier, and gives brief instructions to the N.C.O. in charge of each vehicle as it arrives. He sends No. 1 section commander's carrier to the control post with instructions as to the rear link 22 set, and the mortar carriers to their baseplate positions. He gives clear instructions for track discipline and directs the drivers to the vehicle position or to an assembly position where he will collect them.

(e) He disposes the vehicles at the vehicle position and organizes the supply of ammunition.

(f) He reconnoitres a cease firing rendezvous when ordered to do so.

7. No. 1 section commander is responsible for the parallelism of the mortars. He immediately reports to the second in command, takes over his compass, and is told the magnetic bearing of the zero line. If no D.A.P. is available he will parallel by compass "B" the mortars which have not yet been paralleled.

Whichever method has been used, he will check parallelism after bedding in, and at intervals during the shoot.

8. No. 2 section commander is responsible for the local protection of the mortar position. On arrival at the position he will take his L.M.G. to the control post, where he will collect the second L.M.G. and the P.I.A.T. and will receive orders from the second in command. L.M.G.s. will be left either at the control post or at one or more of the baseplate positions, where they will be handed over to the Nos. 1 concerned. No. 2 section commander will site the P.I.A.T. covering the most likely tank approach, and will be himself responsible for handling it.

9. The M.P.O.A. is responsible for fire discipline and for the passing of orders to Nos. 1. As soon as he has completed his duties as in platoon drill, Lessons 32 and 33, he will go to the control post, check the transmission of the loudspeaker to each mortar detachment, and take up his duties in the control of fire.
10. Mortar numbers and drivers will act as taught in platoon drill. Each No. 1 will command his detachment and will be

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11. No. 1 batman connects up the loudspeaker junction box, No. 2 batman will man the P.I.A.T. after it has been sited by the No. 2 section commander.

2. Wireless operators will stand in vehicle or ground stations as ordered, and will remove from their carriers the L.M.G. or P.I.A.T., as the case may be, together with enough ammunition.

13. On the command “Cease firing”, N.C.O.s. in charge of vehicles will move independently to the cease firing rendezvous as soon as their stores have been loaded. The platoon will reorganize at this rendezvous.

Speed in the evacuation of the mortar position is of the greatest importance if casualties from enemy artillery and air attack are to be minimized.

SECTION 9.—SPECIAL BATTLE DRILLS

LESSON 39.—DEFENCE

1. When a defensive position is to be occupied, the mortar platoon commander will receive orders which will include:

(a) Full information regarding the enemy and our own troops.
(b) The approximate platoon area.
(c) The tasks, including:
   (i) The area to be covered, together with alternative area or areas.
   (ii) Defensive fire tasks, including probable S.O.S. tasks.
   (iii) Probable counter-attack tasks.
(d) Ammunition to be reserved for special tasks and details regarding ammunition replenishment.
(e) Orders regarding digging and concealment.
(f) Orders regarding the disposal of vehicles.
(g) Details of communications, including position of company H.Q., allotment of frequencies, line communications.
(h) Signal for S.O.S. fire.

2. On completion of orders, the platoon commander will give orders to the second in command and the platoon serjeant. These will include:

(a) The approximate platoon area.
(b) The bearing of the zero line (on to the S.O.S. task).
(c) The route for the platoon.

3. The platoon commander will then proceed to reconnoitre for his own O.P., and for any alternative or subsidiary O.P.s. He will give orders to his assistant for the occupation and digging of his own O.P. as soon as he has selected it.

4. The second in command will reconnoitre the mortar position, selecting first a temporary position. With the assistance of the M.P.O.A. he will lay out lines of fire. In the selection of both permanent and temporary positions, full use must be made of natural cover and facilities for concealment.

5. The platoon serjeant will lead the platoon to the position. Track discipline is of the utmost importance and will be his responsibility.

6. On arrival at the position, the mortars will be brought into action in the temporary position.

7. Having laid out lines of fire at the temporary position, the permanent position will be selected. Trenches will be dug for the protection of each mortar detachment and for the control post. Mortar pits will be dug in accordance with the digging policy laid down.

(Note.—The smallest pit that can effectively hold a mortar and three mortar numbers measures approximately 9 ft. long by 6 ft. wide by 4½ ft. deep. This size may later be altered, as time allows, to suit particular requirements.)

8. As soon as digging is under way, the platoon commander will show the second in command the positions reconnoitred for the permanent and alternative O.P.s. The second in command will then order the preparation of his first O.P.

9. At the O.P.s., panoramas will be prepared. Line communication will be established from each O.P. to the switchboard on the mortar position. To the switchboard will also be connected:

(a) Line from each of two control posts, sited for the control of independent sections.
(b) Line from the remote control unit of the rear link 22 set, which is thus in direct communication with either O.P.

10. As soon as line has been laid, and all stores removed from the vehicles, these will be disposed according to orders by the platoon serjeant.

11. At the earliest opportunity the platoon commander will arrange:

(a) To reconnoitre alternative mortar positions.
(b) To visit the H.Q. of adjacent units.
(c) To give full information to the whole platoon.
10. Mortar numbers and drivers will act as taught in platoon drill. Each No. 1 will command his detachment, and will be responsible for as much digging for its protection as time permits.

11. The batman, having connected up the loudspeaker junction box, is responsible for noting the order in which the mortars fire.

12. The driver operators will establish vehicle or ground stations as ordered, and will remove from their carriers the L.M.G. or P.I.A.T., as the case may be, together with enough ammunition.

13. On the command "Cease firing," N.C.O.s. in charge of vehicles will move independently to the cease firing rendezvous as soon as their stores have been loaded. The platoon will reorganize at this rendezvous. Speed in the evacuation of the mortar position is of the greatest importance if casualties from enemy artillery and air attack are to be minimized.

SECTION 9.—SPECIAL BATTLE DRILLS

LESSON 39.—DEFENCE

1. When a defensive position is to be occupied, the mortar platoon commander will receive orders which will include:

(a) Full information regarding the enemy and our own troops.
(b) The approximate platoon area.
(c) The tasks, including:
   (i) The arc to be covered, together with alternative arc or arcs.
   (ii) Defensive fire tasks, including probable S.O.S. tasks.
   (iii) Probable counter-attack tasks.
(d) Ammunition to be reserved for special tasks and details regarding ammunition replenishment.
(e) Orders regarding digging and concealment.
(f) Orders regarding the disposal of vehicles.
(g) Details of communications, including position of company H.Q., allotment of frequencies, line communications.
(h) Signal for S.O.S. fire.

2. On completion of orders, the platoon commander will give orders to the second in command and the platoon sergeant. These will include:

(a) The approximate platoon area.
(b) The bearing of the zero line (on to the S.O.S. task).
(c) The route for the platoon.

3. The platoon commander will then proceed to reconnoitre for his own O.P., and for any alternative or subsidiary O.P.s, he considers necessary. He will give orders to his assistant for the occupation and digging of his own O.P. as soon as he has selected it.

4. The second in command will reconnoitre the mortar position, selecting first a temporary position. With the assistance of the M.P.O.A. he will lay out lines of fire. In the selection of both permanent and temporary positions, full use must be made of natural cover and facilities for concealment.

5. The platoon sergeant will lead the platoon to the position. Track discipline is of the utmost importance and will be his responsibility.

6. On arrival at the position, the mortars will be brought into action in the temporary position.

7. Having laid out lines of fire at the temporary position, the permanent position will be selected. Slit trenches will be dug for the protection of each mortar detachment and for the control post. Mortar pits will be dug in accordance with the digging policy laid down.

(Note.—The smallest pit that can effectively hold a mortar and three mortar numbers measures approximately 9 ft. long by 6 ft. wide by 4½ ft. deep. This size may later be altered, as time allows, to suit particular requirements.)

8. As soon as digging is under way, the platoon commander will show the second in command the positions reconnoitred for the permanent and alternative O.P.s. The second in command will then order the preparation of his first O.P.

9. At the O.P.s., panoramas will be prepared. Line communication will be established from each O.P. to the switchboard on the mortar position. To the switchboard will also be connected:

   (a) Line from each of two control posts, sited for the control of independent sections.
   (b) Line from the remote control unit of the rear link 22 set, which is thus in direct communication with either O.P.

10. As soon as line has been laid, and all stores removed from the vehicles, these will be disposed according to orders by the platoon sergeant.

11. At the earliest opportunity the platoon commander will arrange:

   (a) To reconnoitre alternative mortar positions.
   (b) To visit the H.Q. of adjacent units.
   (c) To give full information to the whole platoon.
12. At the time ordered the platoon commander will arrange for the arc to be registered and the S.O.S. task to be ranged on and recorded.

LESSON 40.—WITHDRAWAL

1. Occupation of the position

(a) When a rear guard position is to be occupied the heavy mortar platoon commander will receive the same orders as in defence, with the following additions:

(i) Under whose command the platoon will come during the action and for the withdrawal; and from whom he will receive withdrawal orders.

(ii) When and where any platoons placed under command of battalions will revert to company control.

(b) The remainder of the platoon, under the second in command, will have been sent to a platoon rendezvous as near as possible to the area in which it will operate.

(c) The platoon commander will then proceed to reconnoitre for his O.P. and for alternative or subsidiary O.P.s as he considers necessary. The O.P. should be sited so as to afford the maximum liaison with infantry as is consistent with good observation.

(d) The second in command will reconnoitre the mortar position, which must possess a covered line of withdrawal.

(e) The platoon serjeant will lead the platoon to the position and will be responsible for reconnoitring a position for vehicles, which should be as close to the mortar position as is practicable.

2. Reconnaissance for the withdrawal

When orders have been received for rear parties to be sent back to reconnoitre another position in rear the platoon commander will:

(a) Send the platoon serjeant and one M.C. orderly to report to the company commander's representative who has been detailed to reconnoitre the rear position.

(b) As opportunity permits, pass on all information to the section commanders.

3. Reconnaissance of the rear position

(a) The platoon serjeant, on arrival at the rear position, will be given orders. He will select an approximate platoon area and will arrange a rendezvous at which he will meet the platoon on its arrival.

(b) He will send the M.C. orderly back to the platoon commander with a message giving him any essential information about the new position, together with details of the route and of the rendezvous at which the platoon will be met.

(c) He will then carry out the necessary reconnaissance for O.P. and mortar position. He will locate them on the map, decide on the bearing of the zero line, and the most suitable method of paralling mortars.

(d) He will await the arrival of the platoon at the rendezvous.

NOTE.—If time permits, the platoon serjeant may decide to leave the orderly at the rendezvous, and to return himself to the platoon commander. This will enable him to assist with the control of vehicles during the withdrawal.

4. The withdrawal

(a) The orders for the withdrawal will usually be given in two phases:

(i) The warning order.

(ii) The order for the move.

(b) These orders will include:

(i) The time before which no troops will be withdrawn.

(ii) The time at which the position will be vacated.

(iii) The means by which the final order to withdraw will be given.

(iv) The time by which the platoon will be clear of a certain line in rear.

(c) The final order for the move must be given by some clear means, either by RT, by written message, or by some distinct signal. The platoon commander must clearly understand who will give the order to withdraw.

The platoon commander is responsible for deciding whether the final move is to be by sections or as a platoon. He must ensure that all personnel have a full knowledge of the arrangements made, and especially of the route back to the rendezvous.

LESSON 41.—NIGHT

1. Introductory

(a) The mortar is unable to engage targets at night with any great accuracy, since there can be no ranging and fire cannot be corrected by observation. If, however, lines of fire can be laid out in daylight, areas can be engaged satisfactorily, if it is considered that the importance of the
task justifies the comparatively large expenditure of ammunition.

(b) The flash from the mortar at night is considerable. The fullest use must therefore be made of high cover to screen this flash from enemy ground observation. Concealment from air, or staggering of the mortars, is of little importance, except when the platoon is likely to remain in action until after daylight.

(c) In certain circumstances (for example, in bright moonlight or during the later stages of a dawn attack), conditions may be suitable for the observation of fire. When they are so, an O.P. should be reconnoitred as close to the mortar position as possible, whenever the nature of the target warrants it.

(d) Night shoots must necessarily be predicted shots. Line and range will therefore be calculated as in Lesson 51.

(e) The second in command of the platoon will normally reconnoitred for both O.P. and mortar position.

(f) The reconnaissance should be made in the greatest detail, on the assumption that the approach and occupation will take place in complete darkness.

(g) During the approach and occupation of the position the strictest precautions will be observed with regard to silence and the exposure of lights.

2. Daylight reconnaissance

(a) The second in command.

On receipt of orders as to the map reference and extent of the target, the approximate mortar position, and the forward rendezvous for the platoon, the second in command (or the platoon commander if he is available) will:

(i) Proceed to the forward rendezvous, accompanied by his assistant, the batman, the platoon serjeant, and one M.C. orderly. He will take with him the following stores:

- 8 aiming posts (4 fitted with a bracket to hold the aiming lamp),
- 8 pegs,
- 2 picks,
- 2 shovels,
- 16 sandbags.

(ii) Helped by the platoon serjeant, reconnoitre the route to the mortar position, ensuring that he will be able to find his way in darkness.

(iii) On arrival at the mortar position, determine the approximate direction of the zero line.

(iv) Decide the positions for the baseplates and the control post, and give orders for the filling of sandbags.

(v) Put in the flags for the baseplates.

(vi) Pinpoint on the map the position of one of the flank mortars as accurately as possible, measure the grid bearing from it to the corresponding flank of the target, and convert this to magnetic, allowing for compass error.

(vii) With his assistant, plant posts for this mortar by compass "A," the further post having the bracket for the aiming lamp.

(viii) Mark the baseplate position for the mortar by positioning, by eye, two pegs accurately in line with the posts, spaced so that the baseplate will fit easily between them.

(ix) Order the hole for the baseplate to be dug between the pegs, and possible aiming lamp to be fitted.

(x) Repeat the procedure described in sub-paras. (vii) to (ix) for each of the remaining mortars.

(xi) Ensure that four filled sandbags are placed by each baseplate position.

(xii) Inform the platoon serjeant which detachments he will lead to their baseplate positions, on their arrival at the mortar position.

(xiii) With the platoon serjeant, reconnoitre an O.P. and the route to it from the mortar position, and also

(xiv) Post a sentry at the mortar position to guard the flags and posts, and to assist the platoon on arrival by lighting the aiming lamps if they are in position.

(b) The platoon serjeant will:

(i) Accompany the second in command on his reconnaissance.

(ii) On arrival at the mortar position, decide on a position for the vehicles during the shoot, and reconnoitre the route to it.

(iii) Note carefully the positions of the baseplates and of the control post.
task justifies the comparatively large expenditure of ammunition.

(b) The flash from the mortar at night is considerable. The fullest use must therefore be made of high cover to screen this flash from enemy ground observation. Concealment from air, or staggering of the mortars, is of little importance, except when the platoon is likely to remain in action until after daylight.

(c) In certain circumstances (for example, in bright moonlight or during the later stages of a dawn attack), conditions may be suitable for the observation of fire. When they are so, an O.P. should be reconnoitred as close to the mortar position as possible, whenever the nature of the target warrants it.

(d) Night shots must necessarily be predicted shots. Line and range will therefore be calculated as in Lesson 51.

(e) The second in command of the platoon will normally reconnoitre for both O.P. and mortar position.

(f) The reconnaissance should be made in the greatest detail, on the assumption that the approach and occupation will take place in complete darkness.

(g) During the approach and occupation of the position the strictest precautions will be observed with regard to silence and the exposure of lights.

2. Daylight reconnaissance

(a) The second in command.

On receipt of orders as to the map reference and extent of the target, the approximate mortar position, and the forward rendezvous for the platoon, the second in command (or the platoon commander if he is available) will:

(i) Proceed to the forward rendezvous with the following:
- 8 pegs
- 2 pickets
- 2 shovels
- 16 sandbags

(ii) Helped by the platoon sergeant, reconnoitre the route to the mortar position, ensuring that he will be able to find his way in darkness.

(iii) On arrival at the mortar position, determine the approximate direction of the zero line.

(iv) Decide the positions for the baseplates and the control post, and give orders for the filling of sandbags.

(v) Put in the flags for the baseplates.

(vi) Pinpoint on the map the position of one of the flank mortars as accurately as possible, measure the grid bearing from it to the corresponding flank of the target, and convert this to magnetic, allowing for compass error.

(vii) With his assistant, plant posts for this mortar by compass "A," the further post having the bracket for the aiming lamp.

(viii) Mark the baseplate position for the mortar by positioning, by eye, two pegs accurately in line with the posts, spaced so that the baseplate will fit easily between them.

(ix) Order the hole for the baseplate to be dug between the pegs.

(x) Repeat the procedure described in sub-paras. (vii) to (ix) for each of the remaining mortars.

(xi) Ensure that four filled sandbags are placed by each baseplate position.

(xii) Inform the platoon sergeant which detachments he will lead to their baseplate positions, on their arrival at the mortar position.

(xiii) With the platoon sergeant, reconnoitre an O.P. and the route to it from the mortar position, and also the route from the mortar position to a cease firing rendezvous.

(xiv) Report to the platoon commander the exact mortar position and the zero line bearing.

(b) The platoon sergeant will:

(i) Accompany the second in command on his reconnaissance.

(ii) On arrival at the mortar position, decide on a position for the vehicles during the shoot, and reconnoitre the route to it.

(iii) Note carefully the positions of the baseplates and of the control post.
3. Night occupation

(a) The platoon commander will:—

(i) When given the exact mortar position and zero line bearing by the second in command, prepare a fire control chart for each mortar (see Lesson 51).

(ii) Give full information and orders to the platoon before moving to the forward rendezvous.

(iii) Command on the mortar position, prepared to hand over to the second in command and occupy the O.P. as soon as he considers that observation of fire is likely to become possible.

(iv) Order the platoon sergeant, shortly before giving "Cease firing", to lead the vehicles to the mortar position.

(b) The second in command will:—

(i) Lead the platoon from the forward rendezvous to the mortar position.

(ii) Assisted by the platoon sergeant, lead the mortar carriers to their respective baseplate positions, and take Nos. 1 to their pegs.

(iii) Lead his own carrier to the control post, and position the platoon commander's carrier ready to move, if required, towards the O.P.

(iv) Assist the platoon commander on the mortar position.

(v) On cease firing, remain on the mortar position till the last.

(c) The platoon sergeant will:—

(i) Assist in moving the platoon from the forward rendezvous to the mortar position.

(ii) Lead the mortar carriers to their respective baseplate positions, as previously ordered by the second in command, and take Nos. 1 to their pegs.

(iii) Lead the vehicles to the vehicle position, and ensure that they are turned to face back along the route to the mortar position.

(iv) If necessary, lead the platoon commander to the O.P.

(v) Just before "Cease firing" is ordered, lead the vehicles to the baseplate positions.

(vi) Lead the platoon to the cease firing rendezvous.

LESSON 41A.—QUICK ACTION

1. Object.—The object of this drill is to enable the platoon to come into action in the shortest possible time.

2. This drill may be used:—

(a) In the encounter battle when the platoon is supporting an advance guard.

(b) When the platoon is going to occupy a position for a quick harassing shoot.

(c) For a quick move to an alternative position.

3. The primary consideration is the speed with which fire for effect is produced, and the following modifications to the normal battle drill are therefore necessary:—

(a) The only essentials for the mortar position are cover from ground observation and space for four mortars, if necessary at less than 20 yards apart.

(b) The 2 I.C., whenever possible, moves in bounds ahead of the platoon and the platoon is ordered into action by signal.

(c) An arbitrary zero line, prearranged to suit the axis of advance, will be used whenever possible.

(d) Mortars are paralleled by compass B, and more than one compass may be used for paralleling.

(e) During the occupation track discipline is not observed, and concealment from air is only undertaken if the position has to be occupied for a long time.

(f) The drivers are responsible for dispersing their own vehicles in the nearest available cover, not more than about 200 yards away, and preferably in rear of the mortar line.

(g) Bedding in and initial ranging rounds will be fired without orders from the O.P. (See para. 3 (a).)

(h) The Tapnoy will not be connected unless ordered by the M.P.O.A. and the junction box will be carried on the 2 I.C's. carrier.

(i) On "Cease firing" baseplates will be cleaned at the mortar position and a cease-firing R.V. will only be used if the platoon is under fire. To assist in the cleaning of the baseplate it is suggested that old sandbags should be placed under the baseplate before it is positioned.

4. The platoon commander will, having decided whether the platoon is far enough forward to carry out the task within the time required, immediately send back the order "Action 1. Target..."
"Action I" indicates that the platoon must get into action instantly, and the map reference of the target, in clear, enables the M.P.O.A. to fire the first ranging rounds without further orders. After these rounds have been fired the platoon commander takes over control of fire.

If the target is close to our own troops, the platoon commander must send back the map reference of a point at which it will be safe for the M.P.O.A. to fire (this must not be less than 900 yards from O.T.).

5. The duties at the mortar position are divided into two parts, the first to be carried out before, and the second after, the receipt of "Action I" from the platoon commander.

6. Before the receipt of "Action I":

(a) The 2 I.C. will:

(i) Accompanied by his orderly and the platoon serjeant move by bounds in front of the platoon from one mortar position to another.

(ii) On arrival at a likely mortar position, station the orderly at the place where he moves off the axis of advance, so that he can signal when the platoon approaches.

(iii) When the platoon serjeant indicates the mortar line, order the carrier to the control post in front or rear of the position and up wind if necessary.

(iv) Pin point the position on the map, encode it and send it to the platoon commander.

(b) The platoon serjeant will:

(i) When the 2 I.C. stations the orderly at a likely mortar position to signal the approach of the platoon, find the approximate direction of the arbitrary zero line, decide on the mortar line and indicate it to the 2 I.C. and M.P.O.A.

(ii) Take the flags from the M.P.O.A. and plant them at the baseplate positions. The first one planted being the one nearest the direction of arrival of the platoon, indicating to the M.P.O.A. where to plant the posts in the approximate direction of the arbitrary zero line.

(c) The M.P.O.A. will:

(i) Take the flags and posts from the 2 I.C.'s. carrier, and give the flags to the platoon serjeant when he has decided upon the mortar line.
3. Night occupation

(a) The platoon commander will:—

(i) When given the exact mortar position and zero line bearing by the second in command, prepare a fire control chart for each mortar (see Lesson 51).

(ii) Give full information and orders to the platoon before moving to the forward rendezvous.

(iii) Command on the mortar position, prepared to hand over to the second in command and occupy the O.P. as soon as he considers that observation of fire is likely to become possible.

(iv) Order the platoon serjeant, shortly before giving "Cease firing", to lead the vehicles to the mortar position.

(b) The second in command will:—

(i) Lead the platoon from the forward rendezvous to the mortar position.

(ii) Assisted by the platoon serjeant, lead the mortar carriers to their respective baseplate positions, and take Nos. 1 to their pegs.

(iii) Lead his own carrier to the control post, and position the platoon commander's carrier ready to move, if required, towards the O.P.

(iv) Assist the platoon commander on the mortar position.

(v) On cease firing, remain on the mortar position till the last.

(c) The platoon serjeant will:—

(i) Assist in moving the platoon from the forward rendezvous to the mortar position.

(ii) Lead the mortar carriers to their respective baseplate positions, as previously ordered by the second in command, and take Nos. 1 to their pegs.

(iii) Lead the vehicles to the vehicle position, and ensure that they are turned to face back along the route to the mortar position.

(iv) If necessary, lead the platoon commander to the O.P.

(v) Just before "Cease firing" is ordered, lead the vehicles to the baseplate positions.

(vi) Lead the platoon to the cease firing rendezvous.

7. When the order "Action I" is received before the platoon has reached the mortar position:—

(a) The 2 I.C. will:—

(i) Check to see if the mortar position is within range of the target.

(ii) Send the orderly to guide up the platoon and give the quick action signal.

(iii) Measure the grid bearing of the target.

(iv) Shout the magnetic bearing of the target to the platoon serjeant.

(v) Measure the range to the target.

(vi) Inform the M.P.O.A. of the range to the target.

(vii) Go to the flag furthest from the platoon serjeant and help the mortar into action and parallel it by compass B.

(b) The platoon serjeant will:—

(i) Go to the pivot mortar flag, help the mortar into action and parallel it by compass B to the magnetic bearing shouted to him by the 2 I.C.

(ii) When the section commanders come to him, give them the magnetic bearing of the zero line.

(c) The M.P.O.A. will:—

(i) Obtain the range to the target from the 2 I.C.

(ii) As soon as the first mortar reports on zero line, bed it in.

(iii) As soon as the mortar has bedded in, order it to fire one bomb at the target range plus 200, at the target...
range, and at the target minus 200, reporting each shot to the O.P., e.g.:

"Shot 1 2700"  "Shot 1 2500"
"Shot 1 2300"

(iv) Bed in the other three mortars as soon as the No 1 batman informs him that they are on zero lines, and report "Shot" to the O.P.

(v) Give the correct range and line to these three mortars so that they can follow up.

(vi) Order the tannoy to be connected up if required.

(d) The No. 1 section commander will:

(i) On receipt of the quick action signal from the orderly pass it on to the platoon and lead them to the mortar position.

(ii) Take his carrier to the control post and then report to the platoon serjeant and receive the magnetic bearing of the zero line.

(iii) Parallel the mortar next to the pivot mortar, by compass B.

(iv) As soon as the first mortar has bedded in, if it is in his section, check its bearing and parallel the other mortar to it, reporting the bearing to the No. 2 section commander. If it is in the other section he will obtain the bearing from the No. 2 section commander and parallel his two mortars to it.

(v) Keep a check on the range and line of the mortars.

(e) The No. 2 section commander will:

(i) Send his vehicle clear of the position.

(ii) Report to the platoon serjeant and receive the magnetic bearing of the zero line.

(iii) Parallel the mortar next to the 2 I.C. by compass B.

(iv) As soon as the first mortar has bedded in, if it is in his section, check its bearing and parallel his other mortar to it, reporting the bearing to the No. 1 section commander. If the first mortar to bed in is in the other section, he will obtain the bearing from the No. 1 section commander and parallel his two mortars to it.

(v) Keep a check on the range and line of the mortars.

(f) No. 1 batman will:

Note which mortars have reported on zero line, and when all have reported inform the M.P.O.A.
3. Night occupation

(a) The platoon commander will:

(i) When given the exact mortar position and zero line bearing by the second in command, prepare a fire control chart for each mortar (see Lesson 51).

(ii) Give full information and orders to the platoon before moving to the forward rendezvous.

(iii) Command on the mortar position, prepared to hand over to the second in command and occupy the O.P. as soon as he considers that observation of fire is likely to become possible.

(iv) Order the platoon sergeant, shortly before giving "Cease firing", to lead the vehicles to the mortar position.

(b) The second in command will:

(i) Lead the platoon from the forward rendezvous to the mortar position.

(ii) Assisted by the platoon sergeant, lead the mortar carriers to their respective baseplate positions, and take Nos. 1 to their pegs.

(iii) Lead his own carrier to the control post, and position the platoon commander's carrier ready to move, if required, towards the O.P.

(iv) Assist the platoon commander on the mortar position.

(v) On cease firing, remain on the mortar position till the last.

(c) The platoon sergeant will:

(i) Assist in moving the platoon from the forward rendezvous to the mortar position.

(ii) Lead the mortar carriers to their respective baseplate positions, as previously ordered by the second in command, and take Nos. 1 to their pegs.

(iii) Lead the vehicles to the vehicle position, and ensure that they are turned to face back along the route to the mortar position.

(iv) If necessary, lead the platoon commander to the O.P.

(v) Just before "Cease firing" is ordered, lead the vehicles to the baseplate positions.

(vi) Lead the platoon to the cease firing rendezvous.

(g) 2 I.C.'s driver will:

Collect the baseplate flags of all mortars as soon as they have bedded in.

(h) 2 I.C.'s orderly will:

(i) On receipt of the quick action signal from the 2 I.C. go to meet the platoon and pass on the signal.

(ii) Guide the platoon to the mortar position and ensure that all vehicles turn off the axis of advance at the right place.

(i) No. 1 will, on receipt of the quick action signal, pass it on to the vehicle behind and close the vehicle interval.

(j) The leading detachment will go to the nearest flag, by the platoon sergeant, and become the pivot mortar, the second will go to the furthest flag and the third and fourth will go to the other flags, the fourth being next to the pivot mortar.

(k) The detachment will report on zero lines as soon as the black post has been planted. They will plant the red post at the first available opportunity.

8. When the 2 I.C. is moving close to the platoon, it will be necessary to modify the above procedure. In order to give the 2 I.C. and platoon sergeant time to prepare the position, the "Quick action" signal will not immediately be given. On receipt of "Action I", the 2 I.C. will give the "Action imminent" signal. Vehicles will close up and move to the mortar position as usual, but the mortar carriers will fan out and halt at least 30 yards in rear of their flags. As soon as the 2 I.C. and platoon sergeant are ready, the "Quick action" signal will be given and the occupation will continue.

9. On "Cease firing" the aiming posts will be collected. The 2 I.C. collecting those from No. 1 mortar, the M.P.O.A. those from No. 2, No. 1 section commander those from No. 3 and No. 2 section commander those from No. 4.

The 2 I.C.'s reconnaissance party will move off immediately to reconnoitre further mortar positions.

The platoon will form up behind the No. 1 section commander and continue to advance.

The No. 2 section commander will be the last to leave the position and will ensure that no stores are left behind.

10. For tactical driving the normal carrier signals are used, but the following special signals are necessary:

(a) "Quick action" ... Yellow flown.

(b) "Action imminent" ... Green up and down.
3. Night occupation

(a) The platoon commander will:

(i) When given the exact mortar position and zero line bearing by the second in command, prepare a fire control chart for each mortar (see Lesson 51).

(ii) Give full information and orders to the platoon before moving to the forward rendezvous.

(iii) Command on the mortar position, prepared to hand over to the second in command and occupy the O.P. as soon as he considers that observation of fire is likely to become possible.

(iv) Order the platoon serjeant, shortly before giving "Cease firing", to lead the vehicles to the mortar position.

(b) The second in command will:

(i) Lead the platoon from the forward rendezvous to the mortar position.

(ii) Assisted by the platoon serjeant, lead the mortar carriers to their respective baseplate positions, and take Nos. 1 to their pegs.

(iii) Lead his own carrier to the control post, and position the platoon commander's carrier ready to move, if required, towards the O.P.

(iv) Assist the platoon commander on the mortar position.

(v) On cease firing, remain on the mortar position till the last.

(c) The platoon serjeant will:

(i) Assist in moving the platoon from the forward rendezvous to the mortar position.

(ii) Lead the mortar carriers to their respective baseplate positions, as previously ordered by the second in command, and take Nos. 1 to their pegs.

(iii) Lead the vehicles to the vehicle position, and ensure that they are turned to face back along the route to the mortar position.

(iv) If necessary, lead the platoon commander to the O.P.

(v) Just before "Cease firing" is ordered, lead the vehicles to the baseplate positions.

(vi) Lead the platoon to the cease firing rendezvous.

SECTION 10.—FIRE CONTROL

Instructor's Notes

Each lesson in this section, except where expressly stated to the contrary, should take the form of a lecture followed by practical periods. Full use should be made of blackboards, sand tables, and of natural targets in the open.

LESSON 42.—INTRODUCTORY

1. The object of mortar fire is to assist the movement of our own troops by neutralizing enemy fire.

2. The fire unit may be the platoon or the section, but the tactical unit will always be the platoon. 4.2-in. mortars will never be employed singly.

3. The fire of the platoon will be controlled by the platoon commander. If sections are being employed as independent fire units, as sometimes in defence, the platoon commander will control the right section and the second in command the left section.

4. The range and line to a target will normally be taken from a map, and J.D. will never be employed when a map is available.

Except in a predicted shoot extreme accuracy in initial range and line is not essential. It is enough if the first ranging bomb is observed in the neighbourhood of the target.

5. Wind causes considerable errors both in elevation and in direction. It is not generally practicable to make allowances for these errors in deciding the opening elevation, but they are automatically corrected when fire is directed on to the target by observation.

6. Beaten zone.—If a succession of bombs is fired from a mortar laid each time at the same elevation and line, they will not all fall on the same spot.
There are limits both to the longitudinal and lateral dispersion, however many rounds are fired. These are represented in Fig. 5 by the sides of the rectangle ABCD, which is called the 100 per cent. beaten zone. It can be said to be made up from the combination of a 100 per cent. length zone (the distance A—D) and a 100 per cent. width zone (the distance A—B).

The mean position of the points of impact of a large number of bombs, fired under the same conditions, is known as the mean point of impact (M.P.I.).

For practical purposes it is convenient to consider the length and width independently.

For length alone, half the total number of bombs fired will fall in the 50 per cent. length zone, which is one quarter of the 100 per cent. length zone, i.e. one quarter of A—D in length.

Similarly for width, half the total number of bombs fired will fall in the 50 per cent. width zone, i.e. one quarter of the distance A—B in width.

7. The approximate dimensions of the 100 per cent. zones at all ranges are:

<table>
<thead>
<tr>
<th></th>
<th>Charge I</th>
<th>Charge II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length zone</td>
<td>60 yds.</td>
<td>120 yds.</td>
</tr>
<tr>
<td>Width zone</td>
<td>100 yds.</td>
<td>140 yds.</td>
</tr>
</tbody>
</table>

8. The mortars are spaced so as to ensure that the 50 per cent. width zones overlap at all ranges (see Lesson 22).

**LESSON 43.—FIRE ORDERS**

**Instructor’s Notes**

This lesson should be split up and introduced at the appropriate stages of Lessons 44 and 48. Reference should be made, where applicable, to Lesson 34.

Students will be given practice in giving fire orders during fire control periods and in all later stages of training.

1. In order to quicken drill, to minimize delay in the transmission of orders, and to ensure that mistakes or omissions are readily detected, all fire orders are given to the mortars in a particular sequence. Although certain conventions (e.g. “Repeat”) may be used from the O.P. to shorten fire orders, the M.P.O.A. will always give out the complete sequence to the mortars.

2. Owing to the instability of the baseplate before it has settled in, one round must always be fired from each mortar as soon as a new position is occupied. Information from this bomb is unreliable both for range and for line, but use can be made of it to correct gross errors.

The order “No... bedding in” (when the first mortar is reported on zero lines) or “Bedding in” (when all mortars are reported on zero lines) will be given from the O.P.

Mortars will normally be bedded in at 3200 on the zero line. If the safety of our own troops demands that a greater range be used the O.P. officer will always specify the range in his order, e.g. “Bedding in, 3400”.

3. Initial fire orders

   (a) The sequence is as follows:

   (i) Platoon (or section) target.
   (ii) Charge.
   (iii) Ranging section (or mortar).
   (iv) Range.
   (v) Line.
   (vi) Order to fire.
(b) Platoon (or section) target.—"Platoon target" indicates that the fire of four mortars is to be employed. If one section only is to fire, the order will be "Right (or left) section target".

(c) Ranging section or mortar.—The order will be "Right (or left) ranging" or "No... (mortar) ranging".

(d) Ranges will be ordered as follows:

<table>
<thead>
<tr>
<th>Range</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600</td>
<td>One six hundred</td>
</tr>
<tr>
<td>1850</td>
<td>One eight fifty</td>
</tr>
<tr>
<td>2000</td>
<td>Two thousand</td>
</tr>
</tbody>
</table>

(e) Line

Line is given in the form of a switch either from the zero line (e.g. "Five degrees right (or left) of zero") or from the last target (e.g. "Right (or left) five degrees").

Switches will be ordered as follows:

<table>
<thead>
<tr>
<th>Switch</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>7°</td>
<td>Seven degrees</td>
</tr>
<tr>
<td>13°</td>
<td>One three degrees</td>
</tr>
<tr>
<td>20°</td>
<td>Two o any degrees</td>
</tr>
</tbody>
</table>

(f) Order to fire

The order "Fire" will be given by the O.P. officer at the end of an initial fire order.

Example of an initial order:

"Platoon target, charge II, right ranging"

"Two five hundred, one five degrees left of zero, fire".

4. Orders during a shoot.—The sequence is as follows:

(a) Corrections for range

(i) During ranging these will be given as actual ranges (e.g. "Two thousand", "Two four hundred").

(ii) During fire for effect they will be given as "Up (or down)... hundred".

Note.—Except in the order for the rounds of mortar fire immediately following the completion of bracketing, no reference will be made to the range unless a correction is necessary.

(b) Corrections for line.—All switches will be given as "Right (or left)... degrees".

(c) Number of rounds.—During bracketing, this part of the order is omitted when only one round is required.

(d) Method of fire (e.g. "Mortar fire", "Platoon (or section) fire")

If for any reason the O.P. officer does not want the rounds ordered to be fired immediately, he will give "Fire by order". The M.P.O.A. will then await the order "Fire".

If at any time the same number of rounds and method of fire is required again, the order "Repeat" will be given by the O.P. officer.

Corrections for individual mortars are always preceded by the number of the mortar concerned (e.g. "No. 1, up two hundred, No. 1, right three degrees"; "Last mortar down one hundred").

5. "Concentrate"

It may be desirable to concentrate the fire of mortars in the following circumstances:

(a) When the area to be engaged is smaller than that which will be covered by the fire of the mortars on parallel lines.

(b) When enemy positions within an area have been located.

The decision to concentrate mortars must always rest with the O.P. officer.

The order to concentrate will immediately precede the number of rounds and method of fire.

A concentration will be cancelled by the order "Concentration off" or by any switch given from the zero line.

6. Examples of orders during a shoot

"Three four hundred, right two degrees, two rounds mortar fire".

"Up three hundred, concentrate, three rounds mortar fire".

"Left five degrees, repeat".

"One round mortar fire, fire by order"...

"Fire".

7. If registering an arc the order "Registration, no... ranging" will precede the range and method of fire.

If engaging a rapid engagement target the order "Rapid engagement" will precede the initial fire order.

8. For the correction of mistakes in fire orders see Lesson 34.
LESSON 44.—RANGING

1. The purpose of ranging.—The sole purpose of ranging is to ensure that the necessary volume of fire is brought down with sufficient accuracy in the required place at the required time.

The extent of ranging to be carried out, therefore, will depend on whether accuracy or speed is of greater importance for the task.

2. Types of tasks.—Tasks may be classified as:

(a) Normal targets.
(b) Rapid engagement targets.
(c) Predicted shoots.

3. Normal targets.—These will be the most common form of mortar target, and will include any form of opposition that is holding up our advance. Speed is important, but sufficient ranging must be carried out to ensure a reasonable degree of accuracy.

4. Rapid engagement targets.—These targets involve a high degree of urgency. They will normally consist of hitherto unlocated enemy positions which have surprised our own troops and are inflicting casualties. Speed in the production of fire is, therefore, of vital importance and must take precedence over accuracy. Mortar fire must be produced after the minimum amount of ranging.

5. Predicted shoots.—As no ranging is involved this type of shoot is dealt with in Lesson 51.

6. Choice of the ranging mortar.—Unless the fire controller indicates which mortar he desires to use in ranging, this will be left to the discretion of the M.P.O. The use of a different mortar for each target has the advantage of equalizing the expenditure of ammunition. The M.P.O. will employ the same mortar for bracketing unless circumstances force him to change, when the fire controller will be informed.

7. Methods of ranging.—The object of ranging is to find, by trial and error, a range at which the M.P.I. from each mortar will fall in the target area.

(a) Normal targets.

(i) Bracketing.—The first object of the fire controller is to bracket some definite point (the ranging point) in the target area.

To do this the first bomb is fired at a range which the fire controller judges will bring it close to the target, at the same time ensuring that it will be observed.

Another bomb is then fired with a difference of 400 yds. on the mortar sight so that one bomb falls plus, i.e. beyond the ranging point, and the other minus, i.e. short of it. These two bombs are known as the Long Bracket.

A bomb is now fired at the intermediate range of the long bracket. The ranging point now lies between two bombs fired with a difference of 200 yds. on the mortar sight. These are termed the Short Bracket and bracketing is now complete (see Fig. 8).
LESSON 44.—RANGING

1. The purpose of ranging.—The sole purpose of ranging is to ensure that the necessary volume of fire is brought down with sufficient accuracy in the required place at the required time. The extent of ranging to be carried out, therefore, will depend on whether accuracy or speed is of greater importance for the task.

2. Types of tasks.—Tasks may be classified as:
   (a) Normal targets.
   (b) Rapid engagement targets.
   (c) Predicted shoots.

3. Normal targets.—These will be the most common form of mortar target, and will include any form of opposition that is holding up our advance. Speed is important, but sufficient ranging must be carried out to ensure accuracy.

4. Rapid engagement targets are used when the enemy positions without time to inflict casualties. Mortar fire must be quick.

5. Predicted shots are divided into two types: (i) normal ranging unless circumstances change and (ii) predictive ranging.

6. Choice of the target area is dependent on the task at hand. The target indicates which mortar will be used to the discretion of the officer in charge. Each target has the size of an ammunition. The mortar will be used unless circumstances change, when the target will be changed.

7. Methods of ranging are done by trial and error, a range is then used in the target area.

   (a) Normal target

      (i) Bracketing targets.

      (ii) Mortar fire.—Sufficient information is now available to determine upon the range at which to fire mortar fire. This range will normally be the intermediate range of the short bracket, and two or three rounds of mortar fire will be fired. Provided these bombs fall in or close to the target area, mortar fire will be continued, corrections being made according to the principles of fire for effect. The range should always be stated before the first rounds of mortar fire are ordered.

(iii) Platoon (or section) fire.—If the first two or three rounds of mortar fire show that some rounds are consistently incorrect for range or line, the officer will note the order in which the bombs fell. He will then order, for example, "Second mortar (meaning the second mortar to fire) up 200". If the M.P.O.A reports, for example, "Second mortar not known," the officer will order "One round platoon (or section) fire", which will show him which mortar to correct.
When it is necessary to ensure that fire will be effective at a certain time (e.g. at zero hour) the fire controller must continue to range until he is satisfied that, at the time given, all bombs will fall in the target area.

Rapid engagement targets.—The procedure of bracketing will be applied until a bomb falls in the target area, or until a long bracket is obtained. The fire controller will then apply the necessary correction to bring fire on to the area, will order "Three rounds mortar fire", and will proceed to fire for effect.

If, however, the target is within a few degrees of another target which has already been engaged and recorded, it may be possible to dispense with bracketing altogether and order "One round mortar fire" straight away.

LESSON 45.—OBSERVATION OF FIRE (1)—O.P. UNDISPLACED

Instructor's Notes

Lessons 45 and 46 should each consist of a lecture followed by practical periods on the blackboard and sand table. Every opportunity must be taken to practise personnel in observation of fire with live ammunition.

1. The fundamental principle of all observation of fire is to make use only of those rounds which give certain and definite information. To make deductions from rounds that are in any way doubtful is a gamble that, in the majority of cases, is certain to lead to a waste of time and ammunition.

2. Bombs that are off for line are frequently misleading for range, particularly when observing at long ranges. The only certain plus or minus is a bomb that falls directly behind or in front of the ranging point. Therefore the first object of the fire controller, during ranging, must be to establish correct line. Until he has done this he should not normally accept information for range.

3. In some cases, however, rounds that are slightly off for line may give a certain indication for range and can therefore be accepted. For example:

(a) A wind at right angles to the line of observation may blow the smoke from the bomb in front of or behind the ranging point. It should be borne in mind, however, that an oblique wind may give misleading information, particularly when the bomb falls some distance from the ranging point.

(b) It will often be possible, as a result of silent registration, when bombs fall near objects which are known from the map to be short of or beyond the ranging point, to accept this information as definite. Information gained from silent registration is therefore of great assistance in ranging.

(c) When the command from the O.P. is good, bombs that are obviously far short of or beyond the ranging point can often be accepted as plus or minus without risk.

4. There may often be areas of low lying ground which are invisible from the O.P. Rounds falling in dead ground or amongst woods or buildings will be unobserved and may give no indication of line or range.

If the first bomb fired is unobserved it will give no indication. Once line is established, however, an unobserved round may clearly have fallen in a certain dead area and may often give as valuable information as an observed round.

The first round, therefore, should always be fired at a line and range that will ensure its observation, even if this is not calculated to bring it particularly close to the target.

A careful study of map and ground will facilitate observation and will show the area in which bombs are liable to be unobserved.

5. The first rounds of mortar fire should always be fired at a range that will ensure observation of each bomb, since their main object is to provide information regarding line and range. This, therefore, should have primary consideration, because the observation of these bombs is of the greatest importance.

6. If the O.P. is close to the mortars any switch measured from the O.P. will be approximately the same as that required at the mortars.

If, however, the O.P. is on or close to the line mortar-target but some distance away from the mortar position, the switch measured at the O.P. will not be the same as that required at the mortars (see Fig. 9).

A factor will have to be applied to all switches measured at the O.P. This is called the line factor and is $OT \div MT$. 

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8. Field glasses should be used for observation both of the arc and of the fall of bombs. They should be graticuled horizontally and the value of the divisions known. The graticules should be used whenever possible for small measurements in preference to hand angles. Owing to the limited field of vision, however, glasses should not be used until the burst of the bomb is observed by the naked eye. This obviates the risk of the limited vision of glasses resulting in the bomb being unobserved. When the burst of the bomb is observed the glasses should then be used to determine more exactly its position in relation to the target.

LESSON 46.—OBSERVATION (2)—O.P. DISPLACED

1. Observation from a displaced O.P. presents certain difficulties owing to the oblique view the observer has of the line mortar-target. This makes it difficult to judge whether errors are in line, or in range, or in both.

In the following example, Fig. 10 represents the view of a target as it appears from an O.P. with poor command. Fig. 11 shows the relative positions of O.P., mortar position, ranging point, and bombs seen in plan, i.e., as if from the air.

Fig. 9

In Fig. 9, T is the ranging point, O the O.P., and M the mortar position. The distance OT is 2,000 yds. and O is 1,000 yds. in front of M. A bomb falls at B, and the switch from B to T as measured from O is 18 degrees.

\[
\frac{OT}{MT} = \frac{2000}{3000} = \frac{2}{3}
\]

Therefore the switch for the mortars will be \( \frac{2}{3} \times 18^\circ \), or "Left 12°".

If the position of the target and the mortar can be plotted on a map, any switch from the zero line required at the mortar position can be measured by the fire controller directly off the map without reference to the position of the O.P.

7. If at any time during bracketing a bomb should fall in the target area, provided that command is good and the information is beyond doubt, mortar fire may be ordered at once.
Certain aids must, therefore, be employed to assist the observing officer to make a correct judgment.

2. The rules of ranging (see Lesson 44) apply equally whether the O.P. is displaced or not, but, because of the difficulties described in para. 1, it is necessary to bracket for line as well as for range when the O.P. is displaced.

3. O.T. rounds.—In whatever position the O.P. may be, and however bad the command, a round falling on the line O-T (O.P.—Target) will always give definite information as regards both line and range. Thus, in Fig. 11 a round falling between O and R.P. at X (an "O.T. minus") must be left and minus, while a round falling beyond R.P. at Y (an "O.T. plus") must be right and plus.

4. Information from rounds which do not fall on the line O-T is less certain, but, for all normal degrees of command, the "vertical clock" aid may be taken as reliable.

5. The vertical clock method.

(a) This method involves the use of one of two alternative keys. One (Fig. 12) is used when bombs are coming over the left shoulder (i.e., when the O.P. is displaced to the right of the line M-T); the other (Fig. 14) is used when bombs are coming over the right shoulder (i.e., when the O.P. is displaced to the left of the line M-T). The explanation which follows will be based on the key shown in Fig. 12.

(b) The key represents an imaginary vertical clock, identical with that used in the indication of targets, its centre coinciding with the ranging point.

(Note.—This vertical clock is in no way distorted or fore-shortened. It is as though the observer were looking at his target area through a vertical pane of glass with the clock rays marked upon it. With very little practice, observers can determine the clock ray, on which a bomb appears to fall, with ease and accuracy.)

(c) When a ranging bomb bursts, the observer decides upon which clock ray the bomb has fallen, refers to the appropriate key, and reads off the information which it gives.

It will be noted that the clock rays within the shaded sectors give information both for line and range, while those within the unshaded sectors give information for line or range, but not for both.

(d) But the fire controller will often be unable to say with certainty that a bomb has fallen on a definite clock ray. Many will fall in between rays.

From Fig. 12 it is clear that bombs between 11 and 12, and between 12 and 1, are left and plus; similarly, bombs between 5 and 6, and between 6 and 7, are right and minus.

Bombs falling between the other rays give single information only. For example, if a bomb has fallen not quite at 9, but rather towards 8, only information which is common to both these rays can be accepted, i.e., only minus information. A simple rule is as follows:—

If a bomb falls between two rays, information must only be taken from the ray that gives least information.

Particular care is necessary in dealing with the 9 and 3 rays, where there is little margin for error, and where double information should only be accepted from bombs which have fallen with reasonable certainty on these rays.

(e) The vertical clock method should be combined with information from silent registration, and applied with common sense. Bombs which fall beyond crests and of which the smoke, but not the actual burst, can be seen, will give information as shown, for example, in Fig. 13.

Only the smoke of the bomb has been seen. The bomb is clearly to the left of the 12 ray. It cannot be at 9 or 10 or its burst would have been observed, and it must be somewhere between 10 and 12. If between 10 and 11 it
6. Bracketing for line and range should be carried out simultaneously according to the information obtained.

The size of the initial bracket for line will depend on the fire controller's estimate of the line error, but, for convenience in halving, brackets should be of 2 degrees, 4 degrees, 8 degrees, or 16 degrees.

The size of bracket which will justify going to mortar fire will depend upon the size of the target and the degree of command, but it should not normally be greater than 4 degrees.

7. If command of the target area is good, bombs fired on the same line and at different ranges will give an imaginary visualized line on the ground. In the absence of information for line from the vertical clock, a visualized line from three or more bombs may be accepted as giving information for line.

8. If at any time during bracketing a bomb should fall in the target area, provided that command is good and the information is beyond doubt, mortar fire may be ordered at once.

9. If, from the map, the line of fire M—T is seen to be at right angles to the line O—T, the vertical clock method will not be used. Bracketing under these conditions is simple, because undisplaced methods may be employed by substituting range for line and vice versa.

10. Example

Bombs over the left shoulder, therefore the key in Fig. 12 must be used.

1st bomb, at 2900, falls at A. It is exactly at 9 o'clock, and is, therefore, minus and left. The fire controller proceeds to bracket simultaneously for range and line.

"3300 right 8 degrees." This bomb falls at B. It is between 2 and 3 o'clock, and is, therefore, plus only, giving a long bracket but no further information for line.
“3100.” This bomb falls at C. It is at 4 o'clock, and is, therefore, right only, giving an 8 degrees bracket for line, which must now be halved.

“Left 4 degrees.” This falls at D. It is at 1 o'clock, and is, therefore, plus and left. A short bracket (2900—3100) and a 4 degrees bracket for line have now been obtained. The size of the target (not shown in Fig. 15) will determine whether sufficient information for line has been obtained.

LESSON 47.—RANGING INSTRUCTION

Instructor’s Notes

Stores:

Blackboard,
or cloth (or sand) model,
or rifles and rests.

1. The first stage of ranging instruction will be carried out on the blackboard. Its objects are:

(a) To ensure that the rules and principles of ranging are thoroughly understood.

(b) To practise the squad in the correct application of these rules and principles.

(c) To practise the squad in the giving of clear, quick, and correct fire orders.

2. The instructor should always draw on the blackboard, in addition to any representation of the target area, a diagram, in plan, showing the relative positions of target, O.P., and mortar position. This is particularly important when dealing with displaced O.P.s.

3. When the squad is proficient in blackboard ranging, the sand or cloth model should be introduced. The objects of this stage are the same as (c) above with special emphasis on quick reactions from the fall of bombs. Observation of fire, as such, cannot be taught on a model since a realistic view of the ground and normal command of an arc are impossible to reproduce. The false picture thus obtained can be minimized by giving the squad an opportunity of observing the effect of live ammunition before the model is introduced.

4. When correct and quick fire orders have become instinctive, ranging instruction should be carried out on the ground, first using rifles and rests to indicate the imaginary fall of bombs and, later, with live ammunition on the range. It is at this stage that the fire controller should be practised in making reasonable deductions from the fall of bombs, according to varying command and facilities for observation.

5. The sequence outlined above should be followed for each lesson in ranging or observation, e.g. O.P. near the mortar position; O.P. on the line mortar-target, but introducing the OT factor; and O.P. displaced.

LESSON 48.—FI XE FOR EFFECT

1. There are no hard and fast rules governing fire for effect. The method adopted will depend on the urgency of the task, the nature of the target, and the type of effect required.

2. Although in practice there is no clear-cut difference between ranging and firing for effect, in theory ranging is said to be completed when mortar fire has been adjusted to fall in the target area. During ranging, the primary consideration is to gain information and to correct from the fall of bombs. As soon as ranging is complete, the object of the fire controller is to secure the effect desired, making full use of the searching power of the weapon.

3. In firing for effect, the first groups of mortar fire should cover an area that is somewhat wider than the frontage of the mortars—wider because the beaten zones of the flank mortars form an overlap at each end. If the width of the target is narrower than the belt of fire, mortars will be concentrated.

Since the lines of fire are parallel, the effective zone of fire so produced can quickly be switched from one part of the area to another. Changes in elevation will be ordered as "Up (or down) . . . Hundred". This is necessary because individual adjustments in range may have been ordered. Switches will be ordered as "Right (or left) . . . Degrees", without reference to the zero line.

4. In switching fire over an area during fire for effect, the following should be borne in mind:

(a) If the area is more or less equal in value regarding available cover and likely enemy positions, fire should be switched boldly from one side to the other and from front to rear. "Creeping" over the target should be avoided.

(b) If parts of the area appear more likely than others to contain enemy weapons, fire should be applied to those parts, concentrating if necessary, and dealing with them in the order of the danger which they represent to our own troops. The fire controller and his assistant must try before and during the shoot to locate, by means of enemy movement and of the smoke or flash from weapons, the exact positions of the enemy within the area. A large area can thus be narrowed down and, as a result, ammunition can be employed more economically and to greater effect.
(c) Owing to its steep angle of descent mortar fire can reach enemy positions which cannot be engaged by other weapons. Enemy behind crests, etc., rather than those within reach of small arms fire and that of other fire weapons, are being engaged.

(d) When observing from a displaced O.P. the "OT round" and "Vertical clock" aids can be used.

5. When fire is required to be spread over a period of time, mortar fire should be employed at irregular intervals. If, however, moral effect is likely to result from simultaneous fire from all mortars, "Fire by order" should be given.

6. If it is found that, during fire for effect, one or more mortars are consistently firing outside the area, the procedure described in Lesson 44, para. 7 (a) (iii) should be employed, but at the same time the production of effective fire on the target should be interrupted as little as possible.

LESSON 49.—SAFETY

1. It is essential when giving supporting fire that the fire controller should have as good observation as possible of the ground over which our troops are advancing. He will ensure that fire is stopped when the attacking troops enter the danger area of the supporting fire. When observation of our own troops is impossible, arrangements must be made to stop mortar fire by signal, wireless message, or according to a timed programme.

2. No target can be engaged which is less than 400 yds. from our own troops.

3. Ranging

(a) The fire controller will ensure that the bedding-in rounds, and the first ranging round, are fired at a range and line which will ensure their falling at least 600 yds. from our own troops.

(b) As soon as a ranging round has been observed, ranging can be continued, provided that no round is fired that is likely to fall nearer to our troops than 400 yds. This restriction means that it will sometimes be impossible to employ the normal ranging procedure. The fire controller must then apply his knowledge of the principles of bracketing to obtain the necessary information without infringing safety.

4. When our own troops are approaching the target area, fire must stop when they reach a point 400 yds. from the M.P.I. of the nearest mortar.

5. In predicted shooting, no target can be engaged that is nearer to our own troops than 600 yds.

LESSON 49.—SAFETY

1. It is essential when giving supporting fire that the fire controller should have as good observation as possible of the ground over which our troops are advancing. When our own troops are approaching the target area fire must stop when they reach the safety limit, allowance being made for the time of flight of the bomb.

When observation of our own troops is impossible, arrangements must be made to stop mortar fire either in accordance with a timed programme, or by signal, or by wireless.

2. Safety limit

The safety limit is a point on the ground measured from the mortars of the unit.

For practice conditions, it is recommended that the above distances should be doubled and no overhead fire fired during training.

3. The minimum safety range (M.S.R.)

This is the range on the mortar sight below which no bomb will be fired until bedding-in is completed and an M.P.I. has been established.

Before firing the first round the fire controller will find the M.S.R. in the following way:

(a) Determine the range from the mortar position to own troops.
(b) Add 700 yards to this range.
(c) Add any allowance for head wind.

4. Flanking fire

When our own troops are to the flank of the target, to ensure their safety during bedding-in and until an M.P.I. is established, no mortar will be laid within 500 yards of own troops; mortars will therefore be laid off by the angle subtended by 400 yards at the range mortar position-target, allowance being made for wind if necessary.

When an M.P.I. has been established fire may be brought to the safety limit (see para. 2).

5. Ranging, overhead fire

(a) If the range to the target is greater than the M.S.R. ranging can proceed normally provided no round is fired below the M.S.R.
LESSON 49.—SAFETY

1. It is essential when giving supporting fire that the fire controller should have as good observation as possible of the ground over which our own troops are advancing. When our own troops are approaching the target area, fire must stop when they reach the safety limit, allowance being made for the time of flight of the bomb. When observation of our own troops is impossible, arrangements must be made to stop mortar fire either in accordance with a timed programme, or by signal, or by wireless.

2. Safety limit

The safety limit is a point on the ground more than 300 yards from the target. For practice conditions the 4.2" mortar should not be fired over the heads of troops during training. For flanking fire the safety distance is 500 yards.

For practice conditions it is recommended that the above distances should be doubled.

3. The minimum safety range (M.S.R.)

This is the range on the mortar sight below which no bomb will be fired until bedding-in is completed and an M.P.I. has been established.

Before firing the first round the fire controller will find the M.S.R. in the following way:

(a) Determine the range from the mortar position to own troops.
(b) Add 500 yards to this range.
(c) Add any allowance for head wind.

4. Flanking fire

When our own troops are to the flank of the target, to ensure their safety during bedding-in and until an M.P.I. is established, no mortar will be laid within 400 yards of own troops. Mortars will therefore be laid off by the angle subtended by 400 yards at the range mortar position-target, allowance being made for wind if necessary.

When an M.P.I. has been established, fire may be brought to the safety limit (see para. 2).

5. Ranging, overhead fire

(a) If the range to the target is greater than the M.S.R. ranging can proceed normally provided no round is fired below the M.S.R.
(b) If the range to the target is less than the M.S.R. one round should be fired at the M.S.R.

(i) If this round falls minus of the target ranging can proceed normally provided no round is fired below the M.S.R.

(ii) If this round falls plus of the target normal ranging cannot be carried out. Two rounds platoon (or section) fire will be fired at the M.S.R. to ascertain the M.P.I. of each mortar. If the M.P.I. of each mortar falls plus of the target the range can be decreased, provided no rounds are fired at a range which will bring the M.P.I. of any mortar within the safety limit.

Two rounds mortar fire should normally be fired at each new range.

6. Predicted shooting.—No bombs will be fired at less than the M.S.R. When our own troops are to the flank of the target mortars will not be laid for direction within 400 yards of their positions.

7. Practice conditions.—If the safety limit has been doubled (see para. 2) it is necessary to modify the rules as follows:

(a) For overhead fire no round will be fired at less than the M.S.R. If therefore the first round falls minus, normal ranging can be carried out; but if the first round falls plus, the target cannot be engaged.

(b) For flanking fire no mortar will be laid within 400 yards of our own troops.

Note.—A useful table for converting distances to angles, and vice versa, is as follows:

<table>
<thead>
<tr>
<th>100 yards at 1,000 yards subtends 6 degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 .. 2,000 .. 3 ..</td>
</tr>
<tr>
<td>100 .. 3,000 .. 2 ..</td>
</tr>
<tr>
<td>100 .. 4,000 .. 1½ ..</td>
</tr>
<tr>
<td>100 .. 6,000 .. 1 ..</td>
</tr>
</tbody>
</table>
(c) Owing to its steep angle of descent mortar fire can reach enemy positions which cannot be engaged by other weapons. Enemy behind crests, etc., rather than those within reach of small arms fire and that of other fire arms. 

(d) When observing from a displaced O.P. the "OT round" and "Vertical clock" aids can be used.

5. When fire is required to be spread over a period of time, mortar fire should be employed at irregular intervals. If, however, moral effect is likely to result from simultaneous fire from all mortars, "Fire by order" should be given.

6. If it is found that, during fire for effect, one or more mortars are consistently firing outside the area, the procedure described in Lesson 44, para. 7 (a) (iii) should be employed, but at the same time the production of effective fire on the target should be interrupted as little as possible.

LESSON 49.—SAFETY

1. It is essential, when giving supporting fire, that the fire controller should have as good observation as possible of the ground over which our troops are advancing. He will ensure that fire is stopped when the attacking troops enter the danger area of the supporting fire. When observation of our own troops is impossible, arrangements must be made to stop mortar fire by signal, wireless message, or according to a timed programme.

2. No target can be engaged which is less than 400 yds. from our own troops.

3. Ranging

(a) The fire controller will ensure that the bedding-in rounds, and the first ranging round, are fired at a range and line which will ensure their falling at least 600 yds. from our own troops.

(b) As soon as a ranging round has been observed, ranging can be continued, provided that no round is fired that is likely to fall nearer to our troops than 400 yds. This restriction means that it will sometimes be impossible to employ the normal ranging procedure. The fire controller must then apply his knowledge of the principles of bracketing to obtain the necessary information without infringing safety.

4. When our own troops are approaching the target area, fire must stop when they reach a point 400 yds. from the M.P.I. of the nearest mortar.

5. In predicted shooting, no target can be engaged that is nearer to our own troops than 600 yds.

Note.—A useful guide for converting angles to distances at known ranges is as follows:

- 100 yds. at 1000 yds. subtends 6 degrees.
- 100 yds. at 2000 yds. subtends 3 degrees.
- 100 yds. at 3000 yds. subtends 2 degrees.
- 100 yds. at 4000 yds. subtends 1½ degrees.
- 100 yds. at 6000 yds. subtends 1 degree.

LESSON 50.—SMOKE

1. The present smoke producing chemical is white phosphorus. It burns with great heat on coming into contact with the air and this results in "pillaring" and a consequent loss of screening effect.

2. The factors which otherwise affect the behaviour of the smoke are:

(a) Weather conditions.
(b) Ground.

3. Weather conditions

(a) Wind.—The direction of the wind determines the course of the smoke screen, and the speed of the wind determines the rate of fire necessary. A very strong wind demands a high rate of fire, very light wind allows the smoke to rise and increases the inherent "pillaring" of the chemical. A wind of 7–15 m.p.h. is the most favourable throughout the year.

(b) Temperature.—On hot sunny days, especially towards midday, the rising air-currents tend to increase the pillaring effect of the chemical.

(c) Humidity.—Damp air is favourable and causes a heavy sluggish screen.

(d) In general, therefore, a damp and cloudy day with a wind of 7–15 m.p.h. is most suitable for the production of a smoke screen.

4. Ground.—Smoke tends to cling to valleys and the sides of hills. These are, therefore, favourable for the production of screens. Trees, buildings, etc., tend to scatter the smoke cloud and increase the pillaring effect. The up-draughts at the top of hills also increase pillaring.

5. Selection of points of origin.—The O.P. officer, before producing a smoke screen, must consider the direction of the wind in relation to the area to be screened, and the direction from which the screening is required (Figs. a18 and a19). He then selects his point of origin, i.e., the point on the ground around which he intends to burst his bombs in order to screen the area from the direction required. Since the screen does not become effective until it has
travelled about 30 yds., no bomb should be less than 30 yds. to the windward of the area to be screened.

If the wind is blowing across the area to be screened one point of origin only will normally be required. This point should be selected so that the smoke will be as near the enemy position as possible.

With head or rear winds, or sometimes with oblique winds, two or more points of origin may be necessary. It is not practicable to give more than one point of origin to one mortar.

**Are to Be Screened**

![Diagram of smoke screening](image)

**Point of Origin**

**Wind**

**Area to Be Screened**

**Points of Origin**

**Wind**

The main consideration in the production of a smoke screen is to have the screen effective as early as possible. Owing to the size of the beaten zone it may often be advantageous to start the screen with two points of origin, reverting to one when observation shows that the fire from one mortar is sufficient to maintain the screen at the required density.

Again, when the weather is unfavourable for smoke, it may often be necessary to concentrate two mortars on to the same point of origin to facilitate the maintenance of the high rate of fire necessary.

6. Ranging.—Ranging should be reduced to a minimum and carried out with H.E. in order not to lose surprise effect. The extent to which ranging will be carried out will depend on the distance the O.P. is displaced and on the degree of command it affords. It will be normal to obtain a long bracket about the area chosen for the point of origin with one mortar. When line is correct and sufficient information has been obtained regarding range, one round platoon or section fire will be ordered from each mortar to be employed in the production of the screen. The O.P. officer will, if necessary, correct from this round of platoon or section fire to bring the fire from each mortar into its correct position for the laying of the smoke screen.

As the tangent elevations for smoke bombs are different from those of H.E., it is necessary to obtain the adjusted ranges from the range tables before changing to smoke.

Orders will be given as for a platoon target, one mortar being ordered to "Rest" before platoon fire is ordered.

7. Production of the smoke screen.—As soon as the O.P. officer is satisfied that he has sufficient information to ensure that the smoke bombs will fall in the area (or areas) he has chosen for his points of origin, he will order:

"Smoke, ... rounds mortar fire".

The O.P. officer, on observing the fall of the last rounds of platoon or section fire, may desire to correct the range and line of one or more mortars, while considering that it is unnecessary to fire any further H.E. bombs. In this event these corrections will follow the order "Smoke" and must be given as "Up (or down) ... hundred", or "Right (or left) ... degrees", e.g.:

"Smoke, No. 1 up 200, No. 2 right 2 degrees, ... rounds mortar fire".

The screen should always be started at a rate slightly faster than is considered necessary and gradually slowed down to the rate required. For this reason it should always be started with two or three rounds mortar fire. When the first smoke bombs burst the
travelled about 30 yds., no bomb should be less than 30 yds. to the windward of the area to be screened.

If the wind is blowing across the area to be screened one point of origin only will normally be required. This point should be selected so that the smoke will be as near the enemy position as possible.

With head or rear winds, or sometimes with oblique winds, two or more points of origin may be necessary. It is not practicable to give more than one point of origin to one mortar.

The main consideration in the production of a smoke screen is to have the screen effective as early as possible. Owing to the size of the beaten zone it may often be advantageous to start the screen with two points of origin, reverting to one when observation shows that the fire from one mortar is sufficient to maintain the screen at the required density.

Again, when the weather is unfavourable for smoke, it may often be necessary to concentrate two mortars on to the same point of origin to facilitate the maintenance of the high rate of fire necessary.

6. Ranging.—Ranging should be reduced to a minimum and carried out with H.E. in order not to lose surprise effect. The extent to which ranging will be carried out will depend on the distance the O.P. is displaced and on the degree of command it affords. It will be normal to obtain a long bracket about the area chosen for the point of origin with one mortar. When line is correct and sufficient information has been obtained regarding range, one round platoon or section fire will be ordered from each mortar to be employed in the production of the screen. The O.P. officer will, if necessary, correct from this round of platoon or section fire to bring the fire from each mortar into its correct position for the laying of the smoke screen.

A second or a third round of platoon or section fire may be necessary, but normally one round should be sufficient.

The smoke from these H.E. bombs will give valuable information as to the speed and direction of the wind.

Note.—If three mortars are required for the laying of the screen orders will be given as for a platoon target, one mortar being ordered to "Rest" before platoon fire is ordered.

7. Production of the smoke screen.—As soon as the O.P. officer is satisfied that he has sufficient information to ensure that the smoke bombs will fall in the area (or areas) he has chosen for his points of origin, he will order:

"Smoke, . . . rounds mortar fire".

The O.P. officer, on observing the fall of the last rounds of platoon or section fire, may desire to correct the range and line of one or more mortars, while considering that it is unnecessary to fire any further H.E. bombs. In this event these corrections will follow the order "Smoke" and must be given as "Up (or down) . . . hundred", or "Right (or left) . . . degrees", e.g.:

"Smoke, No. 1 up 200, No. 2 right 2 degrees, . . . rounds mortar fire".

The screen should always be started at a rate slightly faster than is considered necessary and gradually slowed down to the rate required. For this reason it should always be started with two or three rounds mortar fire. When the first smoke bombs burst the
O.P. officer will be able, from observation, to decide on the rate of fire necessary. The true rate of fire can only be determined by careful observation of the behaviour of the smoke bombs.

8. During the shoot each point of origin should be fed by single rounds of mortar fire. If the O.P. officer discovers, during the screen, that he can dispense with one point of origin he will order the mortar concerned to "Rest" and will continue firing with the number of mortars necessary to maintain the screen.

It is of the utmost importance to keep the smoke screen continuous. No gaps must be allowed to appear and the O.P. officer must always keep in mind the time of flight of the bomb when feeding the screen. The order for each round of mortar fire must, therefore, anticipate the time when the burst is required by at least 30 seconds. The screen must be carefully watched throughout, corrections being given when necessary and the rate of fire adjusted according to the behaviour of the screen. Corrections must be ordered quickly and must not be allowed to interfere with the steady feeding of the screen.

The enemy when screened by smoke will often move to alternative positions. To counteract this, those mortars not firing smoke can, on the information of the ranging bombs, fire H.E. into the smoke screen while it is being laid. The O.P. officer will order the M.P.O. to fire H.E. from these mortars at irregular intervals at the range and line the O.P. officer considers likely to be most effective. This fire will be automatic once it has been ordered, and cannot be controlled from the O.P. at the same time as the smoke screen is being produced.

Alternatively, it may often be advantageous to bring down a heavy weight of H.E. on the area immediately the laying of the screen is completed.

This firing of H.E. must never be allowed to interfere with the production of the screen.

LESSON 51.—PREDICTED SHOOTING

1. Introductory.—It is possible to engage areas from information taken from a 1/100,000, 1-in., or larger scale map, without facilities for ranging or observation. It must be understood, however, that the results will be of doubtful accuracy.

The method has certain advantages and disadvantages.

(a) Advantages

(i) Targets can be engaged which cannot be seen from the ground.

(ii) Shoots can be carried out by night or by day.

(b) Disadvantages

(i) Accurate location of points on the map is often difficult.

(ii) Maps are liable to distortion.

(iii) Corrections by observation are not possible.

2. Method.—The method is the same as that of obtaining range and initial line for a normal target, in that these are taken from a map. The only difference is that these calculations, and the map spotting of the mortar position and target, must be carried out with the greatest possible degree of accuracy, wind being allowed for when necessary.

3. In order to cover possible inaccuracies in range, the effect of atmospheric conditions, and lack of calibration in the mortars, it will usually be desirable to fire at ranges 200 yds. greater and 200 yds. less than the computed range to the target.

It may also be necessary to switch to cover the width of the target.

4. Initial line should be determined from a flank base or a point on to the corresponding end of the target, and allowances must be made for differences in range to each end of the target.

5. A fire control chart should be made out for each mortar, giving the following information:

<table>
<thead>
<tr>
<th>Time</th>
<th>Charge Range</th>
<th>Line</th>
<th>Method of fire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>2,000</td>
<td>Z.L.</td>
<td>1 R.M.F. (bedding in)</td>
</tr>
<tr>
<td>Z+3</td>
<td>2,200</td>
<td>Z.L.</td>
<td>3 R.M.F.</td>
</tr>
<tr>
<td>Z+6</td>
<td>2,600</td>
<td>3° L. of Z.</td>
<td>2 R.M.F.</td>
</tr>
</tbody>
</table>

SECTION 11.—TRAINING

1. The training of 4-2-in. mortar platoons may conveniently be divided into three stages:

(a) The individual training of mortar numbers.

(b) The individual training of fire controllers and H.Q personnel.

(c) Platoon and company training.
5. The training of fire controllers and H.Q. personnel

(a) The syllabus given below presupposes that all personnel have reached a satisfactory standard in the subjects included under para. 4.

(b) All N.C.O.s. in the platoon are potential fire controllers and must be trained accordingly.

(c) Sequence of training in battle drill

(i) Introductory lecture (see Lesson 36).
(ii) Lecture on O.P. reconnaissance and occupation, followed by a practical reconnaissance conducted as a T.E.W.T.
(iii) Lecture on mortar position reconnaissance and occupation, followed by at least two reconnaissances conducted as T.E.W.Ts.
(iv) Exercise conducted on a sand or cloth model, to consolidate the lessons already taught.

(v) H.Q. training exercises. These exercises should be designed to practise all H.Q. personnel in the platoon in their duties during an occupation. O.P. and mortar position reconnaissance parties should be complete and should carry out their duties with full attention to speed, ground, and enemy observation. Normal communications should be employed. The remainder of the platoon should be represented by the section commanders' vehicles with their personnel.

(d) Suggested syllabus (not in instructional sequence):

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Subject</th>
<th>Suggested number of periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Organization</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Characteristics</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>General description</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Ammunition</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Packing vehicles</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Maintenance</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Testing and adjusting the sight</td>
<td>3</td>
</tr>
<tr>
<td>10-15</td>
<td>Aiming and laying</td>
<td>3</td>
</tr>
<tr>
<td>16-21</td>
<td>Elementary mortar drill (including tests)</td>
<td>25</td>
</tr>
<tr>
<td>25</td>
<td>Lines of fire (general lecture)</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Loudspeaker equipment</td>
<td>1</td>
</tr>
<tr>
<td>30-35</td>
<td>Platoon drill</td>
<td>30</td>
</tr>
<tr>
<td>35</td>
<td>Battle drill—attack (general lecture)</td>
<td>1</td>
</tr>
<tr>
<td>38</td>
<td>Mortar position occupation (lecture)</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Fire control (general lecture)</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Fire control charts</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>90</strong></td>
</tr>
</tbody>
</table>

-Although only one period has been allotted, constant practice in the quick and accurate handling of the compass is essential.

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6. Platoon and company training

(a) As soon as a satisfactory standard has been reached, by the H.Q. personnel in H.Q. training exercises and by the mortar numbers in platoon drill, the platoon should begin its collective training.

(b) Platoon training exercises should be carried out in as many different types of country as are available, particular emphasis being laid on:

(i) Use of ground and cover by all personnel.
(ii) Speed.
(iii) Modifications of battle drill to suit different situations.

(c) Company exercises should be introduced at a later stage to exercise the personnel of company H.Q. and to test out communications and the arrangements for supply.

7. Mortar firing

(a) Part I is a non-tactical firing exercise the objects of which are to teach:

(i) Fire control with live ammunition.
(ii) Fire discipline.
(iii) Wireless control.

A series of Parts I should be carried out to include the following:

The engagement of targets from an undisplaced O.P.
The engagement of targets from a displaced O.P.
The laying of smoke screens.
The registration of an arc.

(b) Part II is a platoon training exercise with live ammunition.

(c) Part III is a company exercise, culminating in a combined shoot with both platoons engaging targets as in a brigade fire plan.

APPENDIX II

THE 4.2-IN. MORTAR AS A C.W. WEAPON

1. General.—The 4.2-in. mortar will be used in an offensive C.W. role as a complement to the artillery and air gas effort.

The mortar company does not carry any C.W. bombs, and special arrangements will have to be made for the supply and dumping of C.W. ammunition when required.

Should gas be required, the brigade commander will be ordered to use it in accordance with the plan of the higher commander, who will allot tasks as is necessary. Brigade mortars may be massed by the divisional commander for large scale shoots if required.

2. Object of gas.—Gas is to be used when it achieves the object better than other weapons, i.e. when its use is more effective than H.E.

For gas to be fully effective the weather and the ground must be suitable. Under these conditions lethal gas is a more economical harassing weapon than H.E., and the persistent effect of blister gas can be given full scope in the contamination of ground and in attacking troops in slit trenches, buildings and other similar cover.

3. Effects of weather and ground.—The persistence of gases and the travel of gas clouds are both affected to a considerable degree by the prevailing conditions of weather and ground. The best results will be obtained only if these conditions are particularly favourable: ideal conditions, however, will rarely coincide with tactical requirements, and C.W. ammunition can be fired with some degree of success under most conditions.

(a) Effects on blister gas chargings.—High temperatures cause rapid evaporation of the liquid, and consequently give rise to relatively short persistence and at the same time to high vapour danger. Strong winds also cause increased evaporation, but at the same time cause increased rate of removal of vapour, so that the vapour concentration is hardly affected. Blister gas, used for contaminating an area, will remain effective for a long time in cold, still weather. As the ground temperature rises the danger from vapour will increase.

Blister gas will not persist so long on exposed ground as it will in sheltered areas such as woods, bushes, long grass and buildings.

Persistence also varies according to the nature of the surface. On soft, porous ground much of the liquid will soak beneath the surface, where it may remain as a source of danger for a very long time.

Under average conditions, heavy contamination of grass land by liquid mustard gas may produce an occupational risk for several days after the contamination has been put down.

(b) Effects on choking gas chargings.—The effectiveness of choking gas depends upon the concentration that can be produced on the target. Wind direction is of importance, in that it is necessary for bombs to fall on or upwind of the target area. High wind speeds cause dilution of the gas, and consequently lower its effectiveness. High temperatures with sunshine result in an increased degree of turbulence of the air, with consequent rapid dispersion of gas: on cool, clear nights, on the other hand, the gas tends to travel with the wind with relatively little dispersion.
Choking gas tends to hang about in close country, and especially in woods, defiles and built-up areas: in open country, on the other hand, it rapidly disperses.

The conclusion is that the best conditions for the use of choking gas bombs are at night, with little wind, and against sheltered targets in close country.

4. Roles

(a) *Ground contamination with blister gas.*—The object of ground contamination is to prevent the use of ground except at the cost of subsequent casualties. The 4.2-in. mortar, charged blister gas, will achieve this, and, in addition, may cause some direct contamination of individuals. Suitable targets include anti-tank and forward battery positions, and positions generally from which fire may be brought to bear on attacking infantry. Against such targets blister gas may, in some circumstances, be more economical than H.E. in that its effects are not momentary.

On contaminated ground, casualties may result either from contact with the contamination or from exposure to the vapour. It should be noted that time must be allowed for casualties to develop (eight to twenty-four hours after contact or exposure).

The vapour danger will pass off more quickly than the contact danger. Refreshment shots at about 4-hour intervals will maintain the vapour concentration as well as usefully increasing the contact danger. Refreshment is essential if the area is reoccupied by the enemy.

Heavy contamination of ground requires an initial expenditure of about 100 rounds for an area 100 × 100 yards. In putting down the contamination there is no advantage in employing a high rate of fire.

The use of blister gas for ground contamination requires careful planning, since its promiscuous use may interfere with the movements of our own troops.

A contamination shot is usually a deliberate operation as part of a fire plan, requiring some hours for preparation and necessitating the bringing forward of considerable ammunition. In consequence, this type of operation is rarely practicable in the mobile phases of a battle.

(b) *Harassing with choking gas.*—The object of harassing is to interfere with personnel to such an extent as to reduce their efficiency and morale. Suitable targets are troop concentrations in wooded, enclosed, or built-up areas.

Choking gas will normally be fired at night and in repeated short bursts, so that the harassing effect may be fully exploited and use made of the better weather conditions which generally prevail from dusk to dawn. The number of casualties, including deaths, is likely to be increased if the enemy is resting or asleep.

The effects of choking gas depend greatly on the weather and target, but as a rough working rule to get a useful effect, 100 rounds or more should be fired within one minute, all mortars being aimed at the same spot. Fewer rounds may be useful for harassing; a large or important target will demand more. Details would be obtained as indicated in para. 1.

It must be borne in mind that although the general effect envisaged from a 4.2-in. mortar choking gas shot is only one of harassment, the effect of each individual bomb, used against a suitable target, and against any but alert and well-trained troops, is as lethal as that of a H.E. bomb. The mere threat of the use of choking gas is unnerving, and in addition the possibility of delayed effects up to 24 hours after the attack places a certain strain upon enemy commanders and their medical services.

5. Employment in operations

(a) *Attack*

(i) Blister gas is best used on the flanks to render isolated enemy strong points, *e.g.* M.G. posts and anti-tank gun positions, untenable except at the cost of accepting subsequent casualties. Ground afforded the enemy observation of the attack will also provide useful targets.

(ii) Choking gas is best used during the hours of darkness before the attack against likely H.Q. and the areas of probable local concentrations of personnel. If used as part of the attack 20 minutes to 1 hour should be allowed between the concentration and the time our own troops arrive on the ground. Its use in unfavourable winds will be unusual.

(b) *Defence*

(i) Blister gas. Owing to its delay in action in the production of casualties blister gas is best used not less than 8 hours prior to the likely time of attack against defiles and enemy observation and forming up areas. These targets should be kept neutralized by periodical refreshment shots at about 4-hour intervals.

(ii) Choking gas is best used against the areas of probable local personnel concentrations, especially when under cover. Its use, even in unfavourable winds, as a weapon of opportunity for lethal effect at critical moments should be considered.
(c) Withdrawal

(i) Blister gas by itself is no obstacle to troops on foot, horses or any vehicle, but combined with a demolition, minefield, or other obstacle, it adds greatly to the time and labour required for the clearing of a passage. If the withdrawal merges into defence, the advantages of refreshment shoots should be borne in mind.

(ii) Choking gas is of little value in a withdrawal as the advantages to be gained will hardly compensate for the large ammunition supply necessary.

6. Ammunition.—the 4·2-in. chemical mortar bomb weighs about 20 lb. and contains about 3·4 lb. (2½ pints) of gas charging. The chargings available are blister gas and choking gas. The basic colour of all chemical mortar bombs is grey. Colour bands are used to denote the nature of the charging as follows:

- Yellow band ... Blister gas
- Green band ... Choking gas

The letter Y or G, followed by a number or numbers, denotes the code marking of the charging.

Bombs charged blister gas are painted with detector paint round the filling plug and round the seam at the shoulder.

Other markings on the bombs have no C.W. significance.

7. Maintenance of ammunition in the field.—Chemical mortar bombs are no more dangerous to store and handle than H.E. Chemical ammunition is normally issued as complete fused rounds, but without primary cartridges or augmenting charges in position. The bombs are packed two to a wooden box (B.176) which contains a cord sling with a wooden handle for lifting the bombs, two waterproof tail covers, and a tinned plate box holding two primary cartridges and 12 augmenting charges.

The wooden box is painted grey to indicate the nature of the bombs, and a one-inch coloured band corresponding to the charging band on the bombs is painted round the middle of the box. The code marking for the particular chemical charging is stencilled on this coloured band and on the box itself, which also bears a stencilled description of the bombs.

An alternative method of packing is a metal box (C.235) holding four fused bombs with primary and augmenting charges in position. The bombs are packed two to a cardboard carrier. The lids of the carriers are not sealed: this is in order to allow tests to be made for leakage of chemical charging during storage. The metal boxes bear the same markings as the wooden box (B.176).

A new type of watertight steel box (B.182, Mk. I) has been approved for future production. Like C.235, it contains four fused bombs with primary and augmenting charges in position.

Bomb dumps should, if no better protection from the weather is available, be sheeted under tarpaulins.

Bombs in dumps or transport should be inspected from time to time for leakages, particularly after movements of ammunition have taken place.

In the field, leakages are detected and dealt with as follows:

(a) Bombs charged blister gas.—Leaks cause a brownish-red discolouration on the bands of detector paint, and small beads of oily liquid may be seen. Confirmation may be obtained by the use of a detector, gas, ground (carried by all officers and N.C.O.s.) which when pressed on liquid from a leak develops a brownish-red colour. (Note.—Certain oils, including linseed oil, react with detector paint to give a similar colour. If it is necessary to oil ammunition, care should be taken to avoid the detector band.)

Leaking bombs should be treated as follows: Rub the liquid off the bomb with waste or rag well coated with bleach cream (the hands should be protected with gloves or anti-gas ointment during this operation). After the second application of bleach cream, wash off surplus bleach, wipe dry, and repaint the detector band. If after this treatment the leak reappears, the bomb should be fired at the first opportunity. Leaking bombs, which cannot be fired early, should be segregated and marked.

(b) Bombs charged choking gas.—Leaks may be detected by smell (musty hay), or by effects on personnel (coughing or choking).

Leaking bombs should be fired at the first opportunity. If it is not possible to fire them early, they should be buried at least 2 ft. in the earth, and the position of the buried bombs should be marked.

(c) In practice shoots, leaks will be dealt with under local orders.
APPENDIX B
RANGE PRACTICES—SAFETY PRECAUTIONS

1. In view of the possibility of bombs falling short owing to faulty tail unit, pre-ignition of secondaries, etc., spectators should not be within the limits of the template, the dimensions of which are laid down in A.C.I. 35 of 1943.

2. The following additional precautions will be taken:
   (a) The instructor at the O.P. will:
      (i) Ensure that bombs are fired within the limits of safety, both for elevation and direction.
      (ii) Watch for the fall of blinds.
      (iii) Detail the instructor at the mortar position to see that all bombs are fired within certain specified safety limits, both for elevation and direction.
   (b) The instructor in charge of the mortar position and at each base plate position will:
      (i) Ensure that there is overhead clearance at the base plate position.
      (ii) Ensure that the base plate position is properly prepared and that the detachment keep clear of the base plate until it is firmly bedded in.
      (iii) Ensure that the mortar is laid safely for elevation and direction and that the correct range is on the sight.
      (iv) Ensure that bombs are fired with the correct number of secondaries.
      (v) During relaying, check to see that the sight has not slipped.
      (vi) Warn the O.P. in the event of pre-ignition, etc., or a broken tail unit.
      (vii) Ensure that wet weather precautions are properly carried out.
      (viii) Should a bomb become stuck in the barrel and it is not found possible to clear it by use of tool No. 179, no further attempt should be made to remove it. The barrel should be left on the firing site and cleared as soon as possible, by an I.O.O.
   (c) Blinds will be destroyed, or marked with a red flag and their position reported to the appropriate authority.
      In no circumstances will a blind be interfered with except for the purposes of demolition.
The procedure for destroying blinds is laid down in S.A.T., Vol. I, Pamphlet No. 13, 1942, with the addition that a 1-lb. slab of guncotton must be used in conjunction with the detonator and primer.

Before the charge can be placed against the bomb, careful excavation will be carried out to expose one side of the bomb without disturbing it.

(d) A bomb that has been fired from a mortar and has failed to explode will in no circumstances be fired again.

Note.—Aircraft flying below 7,000 feet are liable to be endangered by the bombs.

APPENDIX C

SHOOTING MORTARS WITH AIR O.P. OBSERVATION

General

1. Briefing.—The pilot should know:
   
   Tactical situation, including air and anti-aircraft.
   
   Warning system (enemy fighters).
   
   Mortar position.
   
   Target map reference.
   
   Target description.
   
   Target number.
   
   Type of shoot.
   
   Time of shoot.
   
   Range.
   
   100 per cent. zones.
   
   Time of flight and charge (see para. 2 (e)).
   
   Amount of ammunition allotted for the shoot.
   
   Code sign and suffixes.
   
   Frequency.
   
   Time to net.
   
   Any orders regarding impromptu shoots.

2. Procedure

(a) The pilot should give all orders in the same form as given to artillery, and will expect the same replies, with limitations given in para. 13.

(b) Where these orders differ from mortar orders, interpretation will take place at the mortar position.

(c) "Fire by order" procedure will be standard for all shoots, and will therefore not be included in initial orders.

(d) Ranging will normally be with No. 3 mortar unless otherwise ordered by pilot or MPO. If MPO orders another mortar to range, pilot must be informed.

(e) When using Charge I, times of flight are from 25 secs to 35 secs. When using Charge II, times of flight are from 30 secs to 40 secs. To give the pilot an indication of when to look in, "stand by" will be reported by the mortar position as follows:

   Charge I—20 secs after mortar has fired.
   
   Charge II—25 secs after mortar has fired.
   
   "Stand by" is, therefore, a warning to the pilot that rounds will burst within the next 15 secs.
   
   The signaller at the mortar position will not say "over" after "shot" but will remain at send until "shot . . . stand by, over" has been sent.

3. Communications.—The Air O.P.'s No. 22 set will be netted to that at the mortar position on the latter's fighting frequency. The Air O.P. will require a suffix number.

4. The following notes are based on a platoon of four 4.2-in. mortars, as being the most usual mortar fire unit to be encountered by Air O.P.s.

Notes for the pilot

5. Ammunition.—4.2-in. mortars fire a 20-lb. H.E. or smoke bomb to ranges of 4100 and 3200 respectively. Both bombs are supplied with D.A. fuses only. The H.E. has a large explosive content whose burst is reasonably distinctive from that of the 25-pr. Smoke, however, is of the white phosphorous variety and is apt to pillar.

6. Mortars are sited at about 30 yds apart with lines of fire laid out parallel.

7. Zones.—Mortars fire in the upper register and have large 100 per cent. zones. For 4.2-in. mortars these are:

<table>
<thead>
<tr>
<th>Charge I</th>
<th>Charge II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length ...</td>
<td>...</td>
</tr>
<tr>
<td>Breadth ...</td>
<td>...</td>
</tr>
</tbody>
</table>

This means that:

(a) Only area targets are worth while.

(b) Surprises are likely in observation for line.

(c) No fire may be brought down within 350 yds of our own troops when firing over their heads, or within 200 yds.
in the case of flanking fire. Until an M.P.I. has been established the minimum safety range for overhead is the range to own troops plus 500 yds. For flanking fire no mortars can be laid within 400 yds of own troops until an M.P.I. has been established.

(a) The pilot should fly either behind or well in front of the mortars. 4·2-in. approx. maximum height—7000 ft.

8. Targets

Degree of Ranging

G.F. Destruction NOT possible
Immediate neutralization Long bracket (400 yds) or (called Rapid Engagement) one within the area followed by two rounds gun fire to verify M.P.I.
Ranging on a target for future neutralization, Unverified short bracket (200 yds) followed by two rounds gun fire to verify M.P.I.
Close Close, ... Close, ... As for artillery close targets.
Smoke screens... Smoke screens... Will NOT normally be shot by Air O.P.s.

9. Initial orders

(a) For pre-arranged shoots—as for artillery.
(b) For impromptu shoots the pilot indicates targets by giving:
   (i) Map reference
   or (ii) Switch and range from last target.

10. Ranging

Brackets Long 400 yds.
Short 200 yds.

These brackets are constant at all ranges.

11. Corrections

(a) Ranges or "add " and " drop " may be used.
(b) Gives switches in degrees NOT yds.
(c) As the mortars are not normally laid more accurately than to the nearest degree or 100 yds, corrections of less than these amounts should not be given.

12. Exceptions to normal artillery procedure

(a) There are no such orders as "Concentrate or distribute on or from a named gun." The order "Concentrate" will swing flank guns on to their neighbours, i.e., No. 1 on to No. 2 and No. 4 on to No. 3. The order "Distribute" will swing guns parallel again.

(b) Mortars ignore angle of sight.
(c) The pilot will NOT use smoke during ranging.
(d) Do NOT use "sweep" or "search."
(e) An occasional bomb may fall very short and well off for line due to a defective tail unit. If a defective tail unit is suspected by the M.P.O. he will report "Tail unit " to the pilot.
(f) Before reliable information can be taken from 4·2-in mortars it is necessary to fire one bomb to "bed in" the base plate. This will normally be done before the pilot is airborne, but if a base plate should require repositioning during firing, the M.P.O. will "bed in" without orders from the pilot. This will be done so that the bomb cannot be confused with any ranging round and "Bedding in shot " will be reported to the pilot.

Notes for the M.P.O.

13. Interpretation of orders

Artillery orders

Gun.
Troop.
More.
Less.
Add.
Drop.
Distribute.
Command post.
Immediate neutralization.
Salvo ranging.

Equivalent mortar order
Mortar (e.g., gun fire and mortar fire, etc.).
Platoon.
Right.
Left.
Up.
Down.
Concentration off.
Control post.
Rapid engagement.
One round mortar fire from all mortars.

Section salvo 3500 (used during ranging).
Right (or left) section 3500, one round mortar fire.

All other orders have the same meaning.
In artillery orders line comes before range.

14. Pre-arranged shoots.—As the mortars are already laid on a target known to the pilot, all that is required is for the Air O.P. to establish communication when airborne and order "Target No. . . . fire." Ranging is then carried out normally.

15. Impromptu shots

(a) The pilot should indicate the target either by giving a map reference, or by giving switch and range from the last
101

target (e.g., “Troop target A13 infantry area, map reference 669132, over.”) H.E., No. 3 ranging fire by
order, are understood as being standard orders and the
charge is left to the discretion of the M.P.O.

(b) The M.P.O. works out range and line, and when the mortars
are ready reports “Ready 3300” (i.e., range) to the
aeroplane. No charge or time of flight is reported but
“Stand by” is given as in para 2 (c).

16. Signal Procedure.—Normal signal procedure is used except for
the following conventions:

(a) The report of “Ready” will be answered either by “Fire”
or “Wait”.

(b) The order “Fire” is acknowledged by “Shot... stand by”.

(c) The report of “Shot... stand by” will be acknowledged by
the pilot sending the next fire order.

17. Danger warning.—Lookout(s) will be maintained to give
warning of the approach of the aeroplane. Such warning will be
passed to the pilot by use of the code word “Bandits,” followed by
the direction and height. Directions are confined to the four cardinal
points, and heights to high, medium and low.

Examples of shoots

Task

The Air O.P. has been briefed to record a target (No. A13) as
part of a fire plan, details of which will be issued later. The pilot
already knows the map reference, range, time of flight, etc. The
target position has been similarly briefed. Having finished his
registration the pilot sees an enemy unit forming up for attack.

<table>
<thead>
<tr>
<th>Serial</th>
<th>Air O.P.</th>
<th>&quot;R.T. signaler at mortar position&quot;</th>
<th>M.P.O.'s orders to mortars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&quot;Hello K8 message for K8 and K1A over&quot;</td>
<td>&quot;Hello K1A. Hello K1A OK, over&quot;</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>&quot;K6 OK out&quot;</td>
<td>&quot;K6 OK out&quot;</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>&quot;Target A13 fire over&quot;</td>
<td>&quot;No. 3 fire&quot;</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>&quot;More 3 degrees 3800, over&quot;</td>
<td>&quot;More 3 degrees 3800, 3800 Right 3 degrees&quot;</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>&quot;Fire over&quot;</td>
<td>&quot;Ready, over&quot;</td>
<td></td>
</tr>
</tbody>
</table>

NOTES.

(a) The pilot may not have been in the correct position and so gave “wait.”
(b) The final 2 rounds of gun fire to verify the M.P.O.s. In this case the belt of
fire was correct but slightly plus of the target so the pilot gave drop
100 before recording as target.
(c) Initial orders for an impromptu shoot. A map reference could have been
used instead.
(d) The opening range was always reported to a pilot in an impromptu shoot.
APPENDIX "D"

4.2-inch mortar Skill-at-Arms Badge—conditions of Qualification

1. To qualify for the 4.2-inch mortar Skill-at-Arms Badge a man must:
   
   (a) Be a fully trained mortarman.
   
   (b) Have recently passed all the Tests of Elementary Mortar Drill as laid down in Small Arms Training, Vol. I, Pamphlet No. 26, 1943, Section 4.
   
   (c) Pass the 4.2-inch mortar Skill-at-Arms Badge tests laid down below.

2. Mortarmen who qualify will be eligible to wear the badge for the subsequent 12 months, at the end of which period they must qualify again or forfeit the badge.

3. The Skill-at-Arms Badge tests will be conducted by an officer, fully qualified as a 4.2-inch mortar instructor, who will, whenever possible, be from a unit other than the one undergoing the tests.

4. 4.2-inch mortar Skill-at-Arms Badge tests

   Instructor's Notes
   
   (a) Any incorrect action constitutes a failure.
   
   (b) In no-test should a man be failed when he exceeds the time limit because of the fault of another member of the detachment; he should be re-tested.
   
   (c) Dress for tests 1, 2 and 3—battle order as laid down for the unit.
   

TEST 1.—Action (two posts), rough ground

Nos. 1, 2, 3 and 4 are being tested and will "Fall in" as in Lesson 16. The instructor will inspect the stores after "Fall in" has been completed.

A baseplate position will previously have been prepared which will give an uneven mounting for the tripod necessitating the use of the clamp. Two posts will have been planted as in Lesson 19.

The Instructor will tell the No. 1 to order "Action."

Time will be taken from the command "Action" until No. 1 has reported "Mortar on zero lines."

Standard time: 70 seconds.
TEST 2.—Misfire

Nos. 1, 2 and 3 are being tested. They will be warned before the test begins that the misfire will be due to a faulty primary. The time will be taken from the No. 1's report 'Misfire' until he reports 'On'.

Standard time: 20 seconds.

TEST 3.—Adjust zero lines

Nos. 1 and 2 are being tested. Before the test begins the mortar will be brought into action on a post, and the red pointer post planted. For the purpose of this test the black post will be 15 yards and the red-pointer post 10 yards from the base plate position.

A switch of not more than 10 degrees right (or left) of zero will be ordered. When the mortar has been correctly relaid the test will begin.

'Adjust zero lines' or 'Adjust zero lines at . . . degrees right (or left) of zero.'

The time will be taken from the last executive word of the order until the No. 2 has resumed his position at the mortar. No. 2 will not leave the mortar until No. 1 has checked the aim and ordered 'Posts.'

Standard time: 35 seconds.

TEST 4.—Testing and adjusting the sight

The man to be tested will have two men to assist him in the handling of the stores.

The sight being used for the test will be out of adjustment for line and range. No strict time limit will be imposed, but the test should be completed within approximately 15 minutes.

Standard to pass.—The sight to be correctly adjusted as laid down in Lesson 9.

TEST 5.—Oral test

Each man will be given two questions on each of the undermentioned subjects:

(a) Maintenance.
(b) Ammunition.
(c) Fire control charts.

Standard to pass: Five questions to be answered correctly.

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APPENDIX

The 4·2-in. mortar as a C.W. weapon
INFANTRY HEAVY WEAPONS SCHOOL

4.2-inch Mortar
Loosening & Strengthening Exercises

Before practising the strengthening exercises it is essential the loosening exercises be given. To simplify the teaching it will be noted there are 3 groups of exercises; (a) arms and shoulder, (b) trunk, (c) log; of which 2 groups are taught in that sequence. Approximate time taken for the loosening exercises in 3 minutes, Strengthening Exercises, 7 minutes.

Loosening Exercises.

Arm & Shoulder - (astride) Arms circling forward, downward, sideways and circling backwards.
Trunk - (astride) Trunk bending sideways with hands reaching downwards.
Log - (short astride) Rhythmical knee full bending with arms swinging downward and backward.

Alternative Loosening Exercises

Arm & Shoulder - (astride) Elbows circling, forward and backward, shoulder rolling.
Trunk - (astride, hand on head) Trunk circling.
Log - Skip jumping with knee full bending to touch group with fingers every 6th count.

STRENGTHENING EXERCISES.

Lifting (Log) - Technique of lifting to a carry position (short astride)
Arm & Shoulder - (left foot forward, case to chest, grasp lower compartment) Arms stretching upward.
Trunk - (short astride, forearm carry) Trunk bending downward.
Log - (short astride, forearm carry) Rhythmical full knee bending.
Arm & shoulder - (astride, trunk forward, arms hanging grasp) Arms bending to chest.
Trunk - (astride, arms hanging grasp) Trunk turning from side to side.
Arm & shoulder - (short astride, upright carry, centre grasp at chest) Mover case upwards and downwards, hand over hand.

Netheravon,
19th June 1945.
JRT.
12. Exceptions to normal artillery procedure:

(a) There are no such orders as "Concentrate or Distribute on or from a named gun." The order "Concentrate" will move fires from one to their nearest or No.2, No.1 or No.3. The order "Distribute" will move guns parallel again.

(b) The size target range of sight.

(c) The pilot will NOT use "clear" during ranging.

(d) Do NOT use "away" or "succeed."

(e) An occasional batch will very short and will off for line due to a defective tail unit. The defective tail unit is suspected by the H.P.O., he will report "Tail unit" to the pilot.

(f) Before starting to shoot intake from 4.2" mortars it is necessary to fire one batch to "laid in" the base plates. This will normally be done before the pilot is airborne but if a base plate should require replacement during firing, the H.P.O. will "laid in" without orders from the pilot. This will be done so that the base cannot be confused with any ranging round and "Laid in shot" will be reported to the pilot.

Notes for the H.P.O.

13. Interpretation of Orders

<table>
<thead>
<tr>
<th>Artillery Order</th>
<th>Equivalent Mortar Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gun</td>
<td>Mortar (e.g. fire and mortar fire, etc.)</td>
</tr>
<tr>
<td>Troop</td>
<td>Platoon</td>
</tr>
<tr>
<td>Nave</td>
<td>Right</td>
</tr>
<tr>
<td>Lose</td>
<td>Left</td>
</tr>
<tr>
<td>Add</td>
<td>Up</td>
</tr>
<tr>
<td>Drop</td>
<td>Down</td>
</tr>
<tr>
<td>Distribute</td>
<td>Concentration off</td>
</tr>
<tr>
<td>Command post</td>
<td>Control post</td>
</tr>
<tr>
<td>Immediate neutralization</td>
<td>Avoid engagement</td>
</tr>
<tr>
<td>Solve</td>
<td>One round mortar fire</td>
</tr>
<tr>
<td>Section solve 3000 (and during ranging)</td>
<td>Right (or left) section 3000, one round mortar fire</td>
</tr>
</tbody>
</table>

All other orders have the same meaning.

In artillery orders line across before range.


As the mortars are already laid on a target known to the pilot, all that is required is for the H.P.O. to establish communication then observe and order "Get in." Mortar crews will know exactly where to aim and throw.

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