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26
Manuals
117

GUN DRILL

FOR

Q.F. 12-pdr. (12-cwt.) GUN

(LAND SERVICE)

1925

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ABBREVIATIONS

A.T.C.	Anti-Torpedo Craft.
B.C.	Battery Commander.
B.L.	Breach Loading.
D.A.	Direct Action (Fuzes).
E. and P.	Electric and Percussion.
F.S. (Exploder) ...	Field Service Exploder.
G.S.	General Service (Stores).
H.E.	High Explosive.
I.T.P.B.	Instrument Testing Primary Batteries.
L.B.M.	Lever Breech Mechanism.
M.P.I.	Mean Point of Impact.
M.S.L.	Mean Sea Level.
M.V.	Muzzle Velocity.
O.M.E.	Ordnance Mechanical Engineer.
Q.E....	Quadrant Elevation.
Q.F.	Quick Firing.
R.A.O.S.	Regulations for Army Ordnance Services.
R.G.C.F.	Royal Gun Carriage Factory.
S.C.	Section Commander.

GENERAL INSTRUCTIONS

Practical instruction in the equipment should be given to each recruit before any attempt is made to instruct him in gun drill.

In teaching the duties of each man at the gun, the instructor should try to do so by reasoning rather than by a long explanation in words. By means of question and answer he should try to draw from the recruit the correct solution as to his duties, being careful to lead the man's mind into the desired channel of thought. Should this attempt fail, the instructor should give a demonstration emphasizing the points the recruit has not grasped. Such demonstrations should deal with the work of each man in the detachment, and all men under instruction should, in turn, carry out the work of each particular man.

Instruction in gun drill should begin as soon as the men are conversant with all parts of the equipment and can handle in the best and quickest manner each of the working parts of the gun. When once the work of each man has been thoroughly mastered, it should not take long for a recruit to learn the actual drill.

It is most important that a marked distinction should be drawn between instruction and drill.

During the former the language used should be as simple as possible, and the meaning of all technical terms which are necessary must be carefully explained. A conversational tone should be adopted, and under no circumstances whatever should anything in the nature of long quotation from drill books be allowed. The men should be permitted to assume an easy attitude and their interest should not be allowed to flag. They should be encouraged to ask questions.

At drill, on the contrary, rigid discipline must be maintained, orders must be clear and decisive and the detachments be made to work steadily, smartly and rapidly. At the same time the utmost accuracy is essential, and any deviations from the methods laid down must at once be checked.

It is advisable that a portion of the drill should be such as to give instruction in firing at long ranges.

With certain guns the supply of ammunition is the most difficult and laborious part of the service of the guns. This can best be taught by means of the "loading teachers" and the dummy ammunition supplied for the purpose.

CHAPTER I

GENERAL DUTIES

1. THE DETACHMENT

This chapter summarizes the duties of each man in the detachment. It is intended only as a guide to the instructor, who should use his own words in explaining the various duties to the men.

The detachment is composed of seven men. The service of the gun is divided between them as follows :—

1. (setter)	... ...	in command.
2.	... ...	the breech.
3 and **4**	... ...	the loading.
5 and **6**	... ...	the trollies.
Layer	... ...	the sights.

The duties of each man are as follows :—

2. DUTIES OF 1

1. He COMMANDS and is entirely responsible for the service of his gun.

2. He gives the WORDS OF COMMAND detailed for him in Chapter III. His orders must be given clearly, but not louder than is necessary to enable the detachment to hear. Before giving a word of command he must repeat the letter of his section and the number of his gun.

3. He is RESPONSIBLE for seeing that his GUN is layed on the TARGET ORDERED.

He must be prepared to perform the duties of S.C. when necessary.

He is responsible for seeing that the BORE of his gun is CLEAR, before even drill shell and cartridge are used; this precaution is particularly necessary at night and before firing blank.

When a tube is fired in preparing for action, he will see that no one is in front of the muzzle, and in all cases he is responsible that no charge is in the gun.

NOTE.—*All breech numbers must be warned that under no circumstances may the striker be snapped unless a cartridge, adapter and tube, or a fired (or drill) tube are in the gun; that should it be necessary to ease springs it should be done gently by hand; also that the breech of the gun, if empty, must be closed gently.*

4. He brings up PISTOL GRIP and SHIELD SIGHTS and, assisted by the layer, he brings up and fixes the ELECTRIC FIRING BATTERY in position if it is not already on the mounting.

5. At PREPARATION FOR ACTION, he:—

i. Places PISTOL GRIP and SHIELD SIGHTS in position.

ii. Satisfies himself that the BUFFER is properly connected up, not leaking at the glands, and contains the correct amount of oil.

iii. Sees that the RUNNING-OUT RODS are properly secured.

iv. Sees that the CAPSQUARES are properly secured and that the LUBRICATOR on top of CRADLE is filled with oil.

v. Supervises the work of the rest of the detachment.

6. *Setter's duties.*—DURING ACTION as setter, he :—

i. REPEATS AND APPLIES CORRECTIONS FOR RANGE and LINE ordered by the S.C. Corrections ordered by the layer are never repeated but are applied at once.

ii. When repeating initial corrections he will face towards the S.C. Corrections are to be repeated in order from right to left throughout the section.

iii. Alterations in deflection are cumulative and are to be given in clicks more right (or more left), thus "Right two."

iv. Setters will apply deflection on the deflection clicker. One click, *i.e.*, a quarter-turn of the deflection wheel gives 5 minutes. To ensure the correct number of clicks being applied the setter will count the clicks as they are being put on and call "On," *e.g.* :—

S.C. "Right four."
Setter "One, two, three," "On."
S.C. "Left two."
Setter "One," "On."

The words "*yards*," "*clicks*," and "*deflection*," are understood and are never given.

v. He passes on ORDERS to the LAYER when necessary.

vi. He carries out the DISTRIBUTION OF FIRE SCHEME, subject to correction by the S.C., directing the layer of his gun on to targets in accordance with that scheme by the order "Trail right (or left)."

7. The S.C. is responsible for FIRE CONTROL, and, if present, gives orders for the commencement of fire. Fire control also includes distribution of fire, but during an action the S.C. should not give direct orders as to distribution of fire, unless absolutely necessary, as these orders are embodied in the distribution of fire scheme.

3. DUTIES OF 2

1. He opens and closes the BREECH, FIRES the gun at PERCUSSION firing, and is responsible for the BREECH COVER.

2. He brings up the TRAY STORES complete, electric and percussion TUBES, spare leads, lanyards and waste, and for drill a drill tube.

Contents of Tray stores :—	*Number*
Boxes, tube, garrison (1 to hold spare parts) ...	2
Can, lubricating, No. 9	1
Chalk, piece	1
Extractor, cartridge, hand, Q.F., small... ...	1
Lanyard (rear), firing, No. 8	1
Screwdriver, G.S., 4-inch...	1
Spanner, McMahon, 15-inch	1
Striker, E. and P.	1
Wrench, breech mechanism, No. 67	1
„ „ „ „ 71	1
„ „ „ „ 78	1
„ „ „ „ 79	1
Wrenches, pivot, No. 10	1

3. At PREPARATION FOR ACTION he :—
   i. Hands the ELECTRIC TUBES to the cartridge numbers.
   ii. Fills the PERCUSSION TUBE BOX and attaches it to the left side of the mounting in a convenient position for use.
   iii. Places the SPARE LEADS on the right side of the mounting in a convenient position for use.
   iv. Tests the LANYARDS and attaches them loosely to the right side of the mounting.
   v. OPENS THE BREECH by taking hold of the lever with his right hand and pulling it towards him as far as it will come. EXAMINES the BREECH SCREW and threads of the breech, sees that they are clean and free from burrs, and lubricates the threads with a slight film of oil. Lubricates the breech mechanism thoroughly and places the striker in position.
   vi. Places the CARTRIDGE EXTRACTOR on the gun floor under the breech, his OIL CAN and WASTE in a convenient position on the right of the gun and the remainder of his stores in a convenient position under cover in the tray of stores.
   (The breech is to be left in the open position).

4. On the order "LOAD" :—
   i. AT ELECTRIC FIRING he opens the breech, if it has been closed, by taking hold of the L.B.M. with his right hand (palm to the right) and pulling it towards him as far as it will come, taking care not to jar the carrier against the gun. He closes the breech with his right hand, as soon as the

round has been loaded by **3**, places his right wrist on the clinometer plane, the extended fingers touching the layer lightly on the shoulder, and calls "*Ready*".

ii. AT PERCUSSION FIRING.—As above with the following exceptions :—

After **3** has inserted the cartridge, with adapter, but without tube, **2** closes the breech, to ascertain that the charge is home, then opens the breech carefully, so as not to work the gun extractor, and when **3** has put in the tube closes it carefully to avoid jarring the tube. **2** then cocks the striker, attaches the lanyard, calls "*Ready*" and stands by to fire on the order "*Fire*" from the layer.

On the order "*Fire*" from the layer, he pulls the lanyard and fires the gun.

NOTE 1.—*At percussion firing the lead to the striker should be detached as it might cause a miss-fire.*

NOTE 2.—*When blank is being fired the felt jacket will on no account be removed from the filled cartridge bag.*

5. As soon as the gun has fired **2** grasps the L.B.M. with his right hand, palm to the right, thumb down, and *opens* the breech without jarring the carrier against the gun. Holding the extractor in his left hand, closed forefinger and thumb close up to the horns, he applies it under the adapter and with a quick jerk *ejects* the empty cartridge case over his left hand. (In using the extractor he must avoid turning his wrist and so throwing empty cases out sideways and end over end, as they may injure the numbers in rear).

The gun is at once to be reloaded.

4. DUTIES OF 3

1. He LOADS and is responsible for the MUZZLE COVER.

2. He brings up LOADING TRAY, and DRILL CARTRIDGE with adapter. (The drill cartridge is brought up at all times for carrying out the "Safety and Efficiency Test" of the striker.)

3. At PREPARATION FOR ACTION he :—
   i. Gives each gun floor number a KNEE CAP, places the DRILL CARTRIDGE (with adapter), and the LOADING TRAY on the gun floor, to the left rear of the breech.
   ii. ASSISTS 2 in lubricating the breech mechanism.

4. On the order "LOAD" :—.
   i. He slews to his right without moving his feet, to receive a complete round from 4.

      Note.—In receiving the round he keeps the front of the loading tray slightly elevated and the tray close to his body, thus minimising the chance of the projectile being dropped.

   ii. (*a*) AT ELECTRIC FIRING.—He then grasps the adapter firmly between the thumb and forefinger of his right hand and forces the round home into the gun with a rapid and smooth motion. He then slews round and receives the next complete round from 4.

      (*b*) AT PERCUSSION FIRING.—The cartridge with adapter, but without tube, is loaded into the gun as above, and the breech closed. It is opened again carefully by 2, and 3 then puts a percussion tube into the adapter.

5. DUTIES OF 4

1. He SUPPLIES AMMUNITION to **3**.

2. He brings up the TROLLIES, if not already on the gun floor.

3. At PREPARATION FOR ACTION he :—

   i. Places the TROLLEY in position to the left rear of the breech (the axles of the wheels of the trolley, if produced, should meet at the centre of the pivot of the mounting.)

   ii. Brings up the SECTION and BATTERY STORES and places them where ordered.

Section and Battery Stores.

(Taken up by **4** after he has taken up his gun stores.)

Hammer, claw	1	for each section.	
Pliers, side-cutting, 8-inch ...	1	,,	,,
Bar testing sight	1	,,	work.
Clinometer, large	1	,,	,,

4. On the order " LOAD " he :—

   i. Picks up a complete round from the trolley, grasping the shell about its middle with his right hand, and the cartridge with his left, both hands back up, and with the lid of the cartridge pressing against the base of the shell.

   ii. He places the complete round on **3**'s loading tray, then stoops down and picks up another complete round.

NOTE.—*If for any reason* **3** *is unable to load his round at once,* **4** *can rest himself by slightly bending both knees and allowing shell and cartridge to rest on his legs above the knees.*

6. DUTIES OF 5

1. He attends to the TROLLIES, assisted by **6**.

2. He brings up :—

GREASE BOX, BRUSH, 2 KEYS NO. 5; for drill, a drill shell and shell extractor.

3. At PREPARATION FOR ACTION he :—

i. Fills the right half of the trolley with PROJECTILES (points to the right, fuzed and cleaned).

NOTE.—*When H.E. shell are used, the fuzes will be unpinned and uncapped before being placed in the trolley.*

ii. Prepares to issue projectiles from the recesses or depots as ordered.

iii. For drill he places the drill shell in the right half of the trolley in prolongation of the drill cartridge and places the shell extractor in a convenient position for use.

4. DURING ACTION **5** and **6** keep **4**'s trolley supplied with ammunition or fill another trolley, and when the ammunition in **4**'s trolley is finished remove it and supply **4** with a full trolley.

NOTE.—*When using H.E. shell* **5** *and* **6** *unpin and uncap the fuzes before placing the shell in the trolley.*

7. DUTIES OF 6

1. He attends to the TROLLIES, assisted by **5**.

2. He brings up :—

KEYS of CARTRIDGE and SHELL RECESSES; BRACE MAGAZINE and BIT, 1 KEY NO. 24—adapter or primer, 1 KEY NO. 25—adapter or primer, and CARTRIDGE HOLDER; for drill, a drill cartridge and adapter.

3. At PREPARATION FOR ACTION he :—

i. Unlocks recesses.

ii. Fills the left half of the trolley with CARTRIDGES (adapters to the left), and prepares to issue cartridges from recesses or depots as ordered.

A proportion of the cartridges should be prepared for percussion firing in case of breakdown of electric firing.

iii. For drill he places the drill cartridge in the left half of the trolley.

NOTE.—*Cartridges should always be examined, cleaned of all luting, and gauged in the guns in which they are going to be used.*

4. DURING ACTION 5 and 6 keep 4's trolley supplied with ammunition or fill another trolley, and when the ammunition in 4's trolley is finished remove it and supply 4 with a full trolley.

NOTE.—*When using H.E. shell* 5 *and* 6 *unpin and uncap the fuzes before placing the shell in the trolley.*

8. DUTIES OF LAYER

1. He LAYS, and at ELECTRIC FIRING FIRES the gun.

2. He brings up SIGHT BAR and TELESCOPE, and assists the setter to take up and fix in position the ELECTRIC FIRING BATTERY if it is not already on the mounting.

3. At PREPARATION FOR ACTION he :—

i. FIXES his SIGHT in the cradle and sees that it fits and works properly and that the sight-carrier or bracket is firmly attached to the mounting.

ii. TESTS the SIGHT and if it be found out of adjustment reports to the S.C. and under his supervision readjusts.

iii. Sees that the ELEVATING GEAR is oiled and in good working order and that the mounting TRAVERSES easily.

iv. Connects up and examines the ELECTRIC FIRING CIRCUIT and tightens up and examines all binding screws, terminals, spare leads, and contacts.

v. DATUMS the AUTO-SIGHT under the supervision of the S.C.

4. DURING ACTION he :—

i. REPEATS and APPLIES CORRECTIONS for TIDE-LEVER.

ii. OBSERVES the fire of his gun on the target given him by the setter and ORDERS the necessary CORRECTIONS for LINE, which are then applied by the setter. Should the layer fail so to correct his fire, the S.C. will order corrections.

iii. At ELECTRIC FIRING he FIRES as soon as he has accurately layed the gun and after **2** has called "*Ready*".

iv. At PERCUSSION FIRING he orders "FIRE" as soon as he has accurately layed the gun.

NOTE 1.—*The words* "yards," "clicks," *and* "deflection" *are understood and are never given.*

NOTE 2.—*It is most important that* **layers** *who are being trained for night firing shall at all times be made to close their eyes on firing.*

CHAPTER II

PREPARATION FOR ACTION

(*See* Secs. **41, 42,** and **196** Coast Artillery Training, Vol. I, 1921.)

9. PROCEDURE

1. On the order from the **B.C.** to "Prepare for action", the detachment is moved into the work, and halted in the position of "Detachment rear". Rifles are placed in the arm racks, accoutrements and jackets are removed, all gun floor numbers remove their boots and place them under cover and put on gun floor shoes and knee caps. The detachment then falls in as before.

If more than one gun of a section is being manned, each No. **1** marches his detachment to his gun as above, or to such other convenient position under cover as the **S.C.** may direct.

2. The **S.C.** details which detachment will be responsible for taking up *Section and Battery Stores*, and orders "*A Section Prepare for Action*". No. **1** then marches the detachment to the store and supervises the issue of the stores laid down for each number.

The **S.C.** provides himself with and takes up the gauge protrusion striker and I.T.P.B. or voltameter. (The latter is "a Battery store".)

NOTE.—*When there is more than one section in the battery, the senior S.C. will take up the I.T.P.B. or voltameter. He will also detail one of his detachments to take up the battery stores.*

3. The No. **1** then marches his detachment to the gun, and on arrival at the emplacement floor, all stores are put down, and the detachment stands round and uncovers the gun. **2** removes breech cover, **3** muzzle cover, and the remainder the gun cover. After this has been done "*Detachment Rear*" is formed.

If instructional drill is being carried out the No. 1 then orders "*Take Post*" and the detachment double to their positions.

4. The No. **1** then orders "*A. 1 Prepare for Action.*"

The gun is then prepared for action, each number carrying out the duties laid down in Chapters I and II.

After each number has completed his work he takes post at his position in action.

10. REPORTS

The No. **1** when he sees that the work has been completed, and that the numbers are in their positions in action, calls

his detachment to "*Attention*" and collects reports as follows:—

No. 1 "*A. 1, Attention—Reports—Two.*" 2, "*Correct*" or otherwise. "*Three*" 3. "*Correct,*" or otherwise, and so on through the whole detachment, finishing with the **Layer.**

He then points out to his detachment the position of the *Section and Battery Stores* and *Gun Stores*, sees that the bore is clear, and orders his detachment under cover.

The detachment double to and sit on the forms on the emplacement floor.

11. DUTIES OF SECTION COMMANDER

During the preparation of the gun for action, the **S.C.** personally examines the stud on the breech screw and makes sure that it is sound.

NOTE.—*A faulty stud may cause an accident if resort is made to percussion firing.*

He personally examines and gauges the protrusion of all the strikers (including spare) in his section.

NOTE.—*To examine the striker, disconnect the lead from the striker, open the breech and take out the striker. See that the striker is correctly assembled, insulating washers in position, needle nuts tightened up, cocking handle screwed home and secured by keep-pin. Replace the striker and see that the point of the needle is within the face of the breech screw. Connect up the lead to the striker again.*

To gauge the protrusion of the striker. With the breech still open release the catch retaining breech screw by hand, and

turn the screw into the locked position. Pull the striker to the rear with only just sufficient force to take up any clearance due to wear in the thrust collars, and apply the gauge protrusion striker.

He tests the pistol grip and measures the voltage of the circuit at the point of the striker with the I.T.P.B., or the amperage with the voltameter, with the pistol grip in position, the No. **1** marking in chalk on the left side of the gun the voltage or amperage obtained.

NOTE.—*Should the voltage be less than* 1, *or the amperage less than* 4, *the battery will be tested cell by cell, and the bad cell or cells made good, or removed and replaced by fresh cells.*

He supervises the datuming and adjustment of the sight.

He gives orders to the ammunition numbers with regard to the arrangement and disposal of cartridges and projectiles.

The No. **1** sits his detachment at ease and reports to the **S.C.** "*A. 1 Ready to Load*".

The **S.C.** when he has finished his work goes to the gun and says to the No. **1**, "*I will inspect A. 1*". On this the No. **1** calls his detachment to attention and gives the order, "**Layer 2,** *and* **3**—*Take Post*". The No. **1, Layer, 2,** and **3** double to their positions in action.

12. INSPECTION BY SECTION COMMANDER

The **S.C.** makes sure that the *Recoil, Laying, Firing,* and *Ammunition* arrangements of the gun are correct, by asking the numbers, and by inspection if necessary.

He then orders **3** to load a drill cartridge, fitted with an adapter and electric tube, the **Layer** to press the trigger firmly, and **2** to close the breech by pushing the lever from

him with his right hand until the breech screw is locked, *i.e.*, when the lower stud on the turning lever of the safety stop is half-way down the safety bracket on the L.B.M. In this position the tube should not fire, as the striker is held back from making contact with the tube by the action of the safety stop. The final movement of the lever in fully closing the breech should fire the tube. **2** opens the breech and extracts the cartridge, using the extractor with his left hand. The fired electric tube is then extracted.

The **S.C.** then orders **3** to reload, and **2** to close the breech and open it again, taking care not to work the (gun) extractor. He orders **3** to insert a percussion tube in the adapter, and **2** to close the breech carefully. He then orders **2** to cock the striker, attach the lanyard, and fire the tube. The breech is then opened, the cartridge extracted, and the chamber thoroughly cleaned.

After the inspection the No. **1** orders "**Layer, 2,** *and* **3,** *Under Cover*" and sits his detachment at ease.

NOTE.—*All spare strikers also should be submitted to the foregoing tests under the* S.C's. *supervision, and the drill cartridge placed clear on one side.*

The breech of an unloaded gun is left open unless the **S.C.** orders it to be closed, *e.g.*, when loading will not take place for some considerable time.

The **S.C.** then reports "*A Section—Ready*" or, if he has previously been ordered to load, he orders the guns to be loaded and made safe, and reports "*A Section—Ready*".

NOTE.—*In thick weather and after preparation for action for the night the* S.C. *will always order his guns to be loaded, and his gun look-outs to take post.*

CHAPTER III

GUN DRILL

13. GENERAL INSTRUCTIONS

Coast Artillery Training lays down the principles of fighting the armament of a coast fortress. The gun drill with each nature of armament is laid down in the respective gun drills. This chapter details the orders given, and the procedure by which these orders are carried out in the case of the 12 pdr. 12 cwt. gun (land service).

The procedure must be memorized and strictly adhered to.

The executive order is shown throughout as being given by the **S.C.**, as will normally be the case during training.

Instructors will invariably employ the orders detailed for the **S.C.**, even when drilling a single detachment.

14. THE DETACHMENT

The detachment consists of a No. **1** (who is the **Setter**), a **Layer**, and five other gun numbers.

15. TO FALL IN

The detachment falls in two deep, one pace between ranks, **1** on the right and the **Layer** on the left of the front rank, covered by No. **6**.

16. TO TELL OFF

S.C.

"*A Section—Tell off.*"

1 numbers himself 1, the right-hand man of the rear rank 2, his front rank man 3, and so on. The **Layer** does not number.

Layer	**5**	**3**	**1**	**(Front Rank).**
	6	**4**	**2**	**(Rear Rank).**

After telling off, if the weather is cold, all men are warned to keep their hands as warm as possible, as cold hands lead to slow rates of fire.

17. POSITIONS AT DETACHMENT REAR

Formed up and told off as in Sec. **16** above, halted in line facing the front, on the emplacement floor at the rear of the mounting.

18. TO FORM DETACHMENT REAR

(From positions of "*under cover*" or "*in action*".)

S.C.	**No. 1.**
"*A Section—Detachment Rear.*"	"*A.*1*—Double March.*"

1 doubles to his place (in rear of the gun on the emplacement floor, facing the front), and gives the order "*A.*1*—Double March*". At the order from **1**, the remainder double to their places and halt.

19. TO PROVE

To ascertain that the men are in their correct places the detachment may be proved as follows :—

No. **1.**

"*A*.1.—*Prove your numbers.*"

"**2**," "**3**," &c. "*Down.*"

The number called on will raise his right arm, and extend it smartly to the front, hand open and as high as the shoulder, thumb upwards ; when the next number is called, he will drop his arm ; at "*Down*" the last number called will drop his arm.

20. TO STAND FAST

S.C.	No. **1.**
"*A Section—Stand Fast.*"	

All stand fast whatever they are doing. At the order "*Go on,*" work is continued.

NOTE.—*In peace practice the bugle call "Stand Fast" is acted upon at once by everyone and is followed by the order "Make Safe" from the* S.C.

21. TO CHANGE ROUND

S.C.	No. **1.**
"*A Section—Change Round.*"	

The front rank takes one pace to the left and the rear rank one pace to the right. The layer then takes one pace to his rear and one pace to his right, thus becoming **6**. **2** takes one pace to his front, thus becoming **1**.

(The detachment is then again told off.)

22. POSITIONS UNDER COVER

2, 5 and **6** on right of gun.

3, 4, Layer and **1** (or **Setter**) on left of gun.

23. TO TAKE POST UNDER COVER

(From "*detachment rear*" or "*in action.*")

S.C.	No. 1.
"*A Section—Under cover.*"	

All double to their positions under cover.

24. POSITIONS IN ACTION

Layer in rear of the shoulder piece.

Setter on the left of the **Layer.**

2 in rear of breech in prolongation of right side of gun facing the **Layer.** His feet should be well separated and knees bent slightly. He should stand at such a distance that when opening the breech to the fullest extent with his right hand (palm to the right) closed over the L.B.M., the carrier will just not jar against the gun and throw the **Layer** off the target. He holds the extractor in his left hand.

3 on the left side of the gun, facing **2**, feet well separated, loading tray in left hand, back of the hand down.

4 at right rear of **3** and in rear of the trolley, facing the front.

5 and **6** at recess or depot as ordered.

25. TO TAKE POST IN ACTION

S.C.	No. 1.
"*A Section—Take Post.*"	

All double to their positions in action.

26. TO TEST CIRCUIT

NOTE.—*This test is necessary only when guns have been prepared for action some considerable time before the order to load is given.*

S.C.	No. 1.
"*A Section—Test Circuit.*"	"*A.1—Test Circuit.*"

2 opens the breech, if closed, short circuits the striker to some part of the gun, and calls "*Test,*" the **Layer** presses the lever indicator, and, if there is a deflection calls "*Correct*"; if there is no deflection, he calls "*No Circuit.*"

If there is no time to overhaul the circuit, the **S.C.** orders "*A. 1.—Change to Percussion*".

27. TO LOAD

S.C.	No. 1.
"*A Section.....Load.*"	"*A. 1.....Load.*"

NOTE.—*The* S.C. *does not give this order until the numbers are standing steady in their places, or until the circuits have been reported correct.*

Electric firing.—

2 opens the breech, if it has been closed.

4 supplies a round to **3**, and then picks up another round ready to supply to **3**.

3 takes the round from **4**, forces it home, and slews round to receive the next round from **4**.

2 closes the breech, places his right hand on clinometer plane, extended fingers touching Layer on shoulder, and calls "*Ready*".

Layer fires the gun as soon as he has accurately layed.

5 and **6** keep up the ammunition supply.

Percussion firing—

2 opens the breech, if it has been closed.

4 supplies a round to **3**, and then picks up another round ready to supply to **3**.

3 takes the round from **4**, forces it home, and supplies himself with a tube.

2 closes the breech to ascertain the charge is home, then opens breech carefully, so as not to work the extractor.

3 puts tube into the adapter and then slews round to receive the next round from **4**.

2 closes the breech carefully to avoid jarring the tube, cocks the striker, attaches the lanyard, calls "*Ready*" and stands by to fire on the order "*Fire*" from the **Layer**.

Layer orders "*Fire*" as soon as he has received "*Ready*" from **2** and has accurately layed the gun.

5 and **6** keep up the ammunition supply.

28. TO MAKE SAFE

S.C.	No. 1.
"*A Section—Make Safe.*"	"*A.1—Make Safe.*"

Electric firing—

2 pulls the lever towards him sufficiently to break the circuit.

Percussion firing—

2 detaches the lanyard, opens the breech and releases the striker.

NOTE.—*To continue after "Make Safe" has been ordered,* 2 *closes the breech carefully to avoid jarring the percussion tube, and recocks.*

29. TO LAY AND FIRE

AUTO-SIGHT

Positions

Layer and **Setter** at the sight.

Initial Corrections.

S.C. "*A Section Tide Levers.....Ft. Rise (or Fall).*"
Layer. "*A.* 1, *Tide Lever .....Ft. Rise (or Fall).*"
S.C. "*A Section Right or (Left).....* [*clicks*]."
Setter. "*A.* 1 *Right (or Left).....* [*clicks*]."
S.C. "*A Section Add (or Drop).....* [*clicks*]."
Setter. "*A.* 1 *Add (or Drop).....* [*clicks*]."

Layer and **Setter** apply corrections they have repeated, and repeat and apply all subsequent corrections ordered by the **S.C.** Changes of deflection ordered by the **Layer** are *not* repeated by the **Setter,** but are applied as quickly as possible.

NOTE.—*If sights have been datumed, corrections are applied starting from the false zero marks, if such have been made.*

To Lay

Layer lays for line and elevation and fires, or orders "*Fire*".

To Fire

Electric firing—

"*Gun Fire*" is the only method of fire, and on the **S.C's.** order "*Fire*" **2** closes the breech and calls "*Ready*" and the **Layer,** when accurately layed, fires.

Fire is continued as rapidly as possible.

Percussion firing—

Similarly to electric firing except that **2** attaches the lanyard and calls "*Ready*" and on the order "*Fire*" from the **Layer, 2** pulls the lanyard and fires the gun.

30. MISS-FIRES

Electric Firing

If, when the **Layer** pulls the trigger, the gun fails to fire, he releases the trigger and calls out "*Close the breech.*"

2 gives the L.B.M. a smart tap with his right hand, and ascertains by inspection that it is home; he then calls "*Ready*". The **Layer** then again pulls the trigger, and, if the gun again miss-fires, he holds the trigger pulled while he counts "*One, Two, Three, Four*" aloud in slow time; if it still fails to fire, he releases the trigger and calls "*A.* **1,** *Miss-fire*".

The **Layer** continues to follow the target.

1 then orders "*Stand clear*" and all the numbers stand clear.

1, 2, and **3** look round the circuit, keeping clear of recoil.

They carry this out as follows:—

i. If no deflection is given by the pistol grip they look for a break in the circuit, and see if the fault can

be found and remedied (such as L.B.M. not home, contacts or binding screws loose). The fault, if found, is remedied and fire continued.

ii. If a deflection is given by the pistol grip they look for a short circuit, and, if found, they remedy it and continue firing.

NOTE.—If the fault is found and cannot be quickly remedied, a change is at once made to percussion firing.

If the fault cannot be found the detachment, except the **Layer** and **Setter**, "*Take cover*" by order of the No. **1**.

NOTE.—"*Take cover*" *does not mean taking up* "*Positions under cover*," *but means going to positions of safety should the gun happen to fire. Cartridges will also be put in a position of safety. A sentry should in addition be detailed to prevent persons from interfering with the gun.*

In peace practice the **Layer** keeps the gun layed in a safe direction. (In war the safest direction is that of the vessel being engaged.)

After a pause of five minutes **1** places himself clear of, and in front of, the breech on the left side and opens the breech by applying the loading tray to the L.B.M.

After a further pause of one minute **1**, still keeping clear of the breech, removes the cartridge with extractor and has it placed on one side clear of the gun.

NOTE.—*During any long pause in the firing (or in peace practice at the conclusion of practice) the tube is removed and examined. If it has not fired it is exchanged, and set aside for special examination; if it has fired, the cordite is destroyed and the case, with tube and adapter, returned in the usual way.*

Instructions for the destruction of cordite are contained in R.A.O.S., Part II.

The **Layer** and **1** then test the circuit as follows :—

1 removes the striker and looks for a blowback, remedies it if found, and replaces striker.

1 then closes the lever with the breech in the open position and calls "*Test*".

Layer presses the lever indicator of pistol grip.

If there is a deflection **Layer** calls "*Deflection.*" This denotes a short circuit and **1** orders "*A.* 1 *Take Post—Change to Percussion—Cartridge only Load*".

If there is no deflection, **Layer** calls "*No deflection*". This is correct.

1 then short circuits needle to breech screw and again calls "*Test*".

If there is no deflection, **Layer** calls "*No deflection.*" This denotes a break in the circuit and **1** orders "*A.* 1 *Take Post—Change to Percussion—Cartridge only Load*".

If there is a deflection **Layer** calls "*Deflection.*" This is correct, and **1** orders "*A.* 1 *Take Post—Electric Firing—Cartridge only Load*".

NOTE.—*It is most important that percussion firing should not be resorted to except as a last resource, and every care should consequently be taken of the firing circuit. At the same time it is even more important that guns should be kept in action. If, therefore, a miss-fire occurs, steps should at once be taken to see whether the fault lies in the tube or the circuit, and if the latter (if not immediately remediable) change should at once be made to percussion firing, and at the first pause in the firing the fault should be discovered and rectified.*

Percussion Firing

If when **2** pulls the lanyard the gun fails to fire, **2** calls "*Close the Breech*", gives the L.B.M. a smart tap with his right hand, ascertains by inspection that it is home, recocks, reattaches the lanyard, and calls "*Ready*".

The **Layer** then again orders "*Fire,*" and, if the gun again miss-fires **2** calls "*A. 1, Miss-fire*".

1 then orders "*Take Cover*" and the detachment, except the **Layer** and **Setter,** take cover.

The **Layer** keeps the gun layed in a safe direction.

The procedure then is the same as for electric firing. After the cartridge has been extracted the striker and tube are examined. If the tube *has not* been struck the striker is changed, if the tube *has* been struck a new cartridge and tube are loaded, the breech closed, and the cartridge tried. Should this also miss-fire, *after a further pause as for electric,* the striker is removed and changed.

31. TO STOP FIRING

S.C.

"*A Section—Stop.*"

The detachment continue their duties, but the gun is not fired until the order "*Go on*" is given.

32. TO EMPTY GUNS

S.C.

"*A Section—Empty guns.*"

Any gun loaded is layed and fired.

If a safety pin or cap has been removed before the order is given, the loading is completed and the gun fired.

NOTE.—*In peace practice the layer keeps the gun layed in a safe direction. (In war, the safest direction is that of the vessel being engaged.)*

33. TO UNLOAD (CARTRIDGE ONLY)

S.C.	No. 1.
"*A Section—Cartridge only Unload.*"	"*A.* 1, *Cartridge only Unload.*"

3 turns on his hips to **4**, who removes shell and cartridge from **3's** loading-tray and places them in a trolley. **2** opens the breech and with extractor carefully withdraws cartridge on to **3's** loading tray. **3** again turns on his hips and hands cartridge and loading tray to **4**, who places them across the ammunition in the trolley, adapter of cartridge to the rear.

A cartridge so left signifies "*Shell in the Bore*" and prevents double shotting.

NOTE.—*Unloading the cartridge is merely a further safety precaution which may be rendered necessary at peace practice.*

34. TO CEASE FIRING

Before "*Cease firing*" is ordered guns must be empty.

S.C.

"*A Section—Empty guns, Cease firing.*"

(At drill the gun, if loaded, is unloaded.)

The **Layer** depresses the gun. The gun is stripped of its stores by the numbers who put them on, is then washed out, if necessary, and the breech closed. The detachment then replaces the covers—**2** the breech cover, **3** the muzzle cover, the remainder the gun cover.

The numbers pick up the stores they brought up when preparing for action, fall in at "*Detachment Rear*" and are marched back to the store. Stores are handed in, checked, and the No. **1** collects and reports as to deficiencies.

35. CASUALTIES

(*See also* Sec. **55**, Coast Artillery Training, Vol. I., 1921.)

Casualties will be replaced as follows :—

S.C. by the senior No. **1** in the section.

No. **1** (or **Setter**), **Layer**, and loading numbers by named successors who are generally employed in the detachment among the higher numbers supplying ammunition under cover.

NOTE.—*Any stores which are being used by a number who becomes a casualty are left by him on the gun floor, or are taken from him, e.g., at percussion firing the lanyard used by* **2**, *the extractor used by* **2**, *the loading tray used by* **3**.

36. MISHAPS WHICH MAY OCCUR, AND DRILL FOR OVERCOMING THEM

Dropped shell.—

3 places the cartridge on the ground, and **4** supplies **3** with a complete round, which **3** loads.

Dropped Cartridge.—

4 supplies **3** with a complete round, **3** places the projectile on the ground, and loads the cartridge.

NOTE.—**4** *always supplies a complete round.*

A dropped electric tube should never be used until it has passed the Continuity Test.

37. INSTRUCTIONS AS TO FIRING SALUTES AND BLANK AMMUNITION

1. *Interval.*—In firing salutes there will be an interval of not less than 15 seconds between rounds.

2. *Number of guns.*—A Q.F. gun will not be reloaded within 15 seconds after firing, and not even then until the chamber and bore have been sponged out, and examined by **1**. Consequently with Q.F. guns not less than four guns will be used for a salute.

3. *Detachment.*—The party detailed to fire a salute will consist of three numbers for each gun, of whom there must be at least one N.C.O. to every two guns. The whole will be under the command of an officer assisted by a serjeant, or by the master gunner in charge of the work.

NOTE.—*No officer, N.C.O. or gunner who has not been trained and passed in gun drill is to command a section or form part of a gun detachment firing blank ammunition at salutes or at training.*

4. *Drill.*—

1 commands and fires.
2 opens and closes the breech and sponges.
3 loads.

5. *Loading.*—All the guns will first be loaded by order of the officer in charge; each gun, after it has fired, will immediately be sponged out and reloaded by order of the master gunner or serjeant, who will be responsible that the minimum interval prescribed in para. 2 above has elapsed since the gun was last fired.

Before giving the order to reload he will place himself immediately in rear of the gun to which the order is given.

6. *Firing.*—The guns will be fired in succession from a flank by order of the officer in charge, who is responsible for the interval ordered between rounds (*see* para. 1 above).

Before giving the order to fire, he will place himself immediately in rear of the gun to which the order is given.

The felt jacket of the 12-pdr. Q.F. blank charge will on no account be removed from the filled cartridge bag.

7. *Sponging.*—Side arms and buckets will be provided for each gun. **2** is responsible that the sponge is kept damp; it should be sprinkled with water, and *not* saturated by being dipped into the bucket.

8. *Miss-fires.*—In the event of a miss-fire, the gun next in succession will at once be ordered to fire. A further attempt to fire the gun at which the miss-fire occurred will be made when its turn again comes round.

In the event of a miss-fire the breech will not be opened for at least one minute when firing powder, and ten minutes when firing smokeless charges. No one must be in rear of the breech when it is opened.

When salutes are being fired an officer or senior N.C.O. should be detailed for the special duty of timing the interval after a miss-fire, and informing **1** of that gun when the breech may be opened.

CHAPTER IV

AMMUNITION SUPPLY

38. TROLLEY SUPPLY

The gun is fed with ammunition from trollies on the gun floor. The trollies are filled up by **5** and **6** with ammunition

brought by them, by hand, from recesses and from previously selected depots on or near the emplacement floor. The ammunition is placed at right angles to the axles of the trucks, shell to the right. 4 controls the trolley.

H.E. shell are unpinned and uncapped before being placed in the trollies.

The above form of supply must be made intelligently and the trolley moved as the gun is traversed. When the target is moving to the left, 4 stands at the left rear corner of the trolley, his left foot on the left of the trolley, his right foot in rear of it. He pushes the trolley to the right (the direction in which the breech is moving) with his left ankle. When the target is moving to the right he stands at the right rear corner and pushes the trolley to the left with his right ankle.

NOTE.—*Three trollies are allowed for each gun. Two of the trollies will be filled with cartridges fitted with adapters and electric tubes. The third trolley, which should be specially marked and placed on one side, will contain cartridges fitted with adapters ready for percussion firing.*

39. RECESSES AND DEPOTS

The recesses and depots are to be amply filled before an action from the shell and cartridge stores belonging to the section, and arrangements must be made to re-supply them quickly should the quantity of ammunition on the emplacement floor begin to run low, by detailing the ammunition numbers, assisted by the gun numbers if necessary, for this duty.

Empty cartridge cases are to be removed and stacked during any pauses in the firing.

CHAPTER V

LAYING TESTS

40. INTRODUCTORY

The rules for laying, the syllabus for training of gun layers, and the general instructions for carrying out the examination in gun laying are laid down in Coast Artillery Training, Vol. I, 1921.

The tests and the method of carrying them out are as follows :—

41. SYLLABUS FOR EXAMINATION IN GUN LAYING

In order to qualify, 75 per cent. of the total marks must be obtained with not less than 60 per cent. in any one test.

Tests.	*Total marks*
I. *General knowledge—*	
i. Clinometer. Use, setting, reading and use of calibration scale.	
ii. Telescope. Focussing, testing for parallax, and collimation.	
iii. Rocking bar sight. Testing and adjusting ; setting M.V., and charge temperature corrections on reader of Mk. II elevation indicators.	

Tests.		*Total marks*
I.	*General knowledge*—continued.	
	iv. Training arc. Use; testing adjustment of pointer.	
	v. Auto-sights. Names and uses of various parts; testing and adjustment; datuming; testing for line with adjustments.	
	vi. Tubes. Identification and description; Continuity tests.	35
II.	*Means for firing.*	
	i. Strikers. Removing, stripping, adjusting and replacing; gauging protrusion.	
	ii. Rifle mechanism. Fitting and adjusting.	
	iii. Breech mechanism. Assembling. (For i, ii, and iii, 10 marks).	
	iv. Electric apparatus—	
	(*a*) Description and testing of cells; faults and their remedies; use of voltameter and I.T.P.B.; fitting up and testing lighting circuits. (15 marks)	
	(*b*) Battery box, circuit, and pistol grip; overhauling, connecting up, and testing. (15 marks)	40

Tests. *Total marks*

III. *Laying for line—*

i. Telescope sights. Two sets of sights will be used. The layer, using one set, will keep the gun layed for line on a moving target for one minute. The officer, by means of the other set of sights, will check the laying five times during this minute. When checked, the line must be within 2½ minutes of the correct line, otherwise no marks will be scored for that occasion. (5 marks)

ii. Open sights. As above. (5 marks)

iii. Training arc. Trainings will be called out by the setter for line to represent the uniform movement of a target. The layer will keep the gun layed by means of the training arc for one minute, moving the gun evenly between the graduations on the arc at approximately the rate of change of training. The officer will check the laying five times during this minute.

When checked, the laying must be within ½° of the correct training. (10 marks) 20

Tests. *Total marks*

IV. *Laying for elevation—*

Elevation indicator. Ranges will be called by the setter for range, mechanical and electrical dials being used; the ranges will be those at which the Q.E. corresponds to a range of 7,000 yards, or thereabout, for medium guns with full charge, and 9,000 yards, or thereabout, for heavy guns with full charge.

The gun should be balanced as for firing.

A layer will be stationed at the pistol grip to call "Fire" or to ring a bell (inserted in the circuit) at the word "On" from the layer under test. The officer will order "Pass ranges". After five or six ranges have been called, the officer will order "Gun fire—fire".

A number stationed at the breech will then give "Ready" and the layer under test will call "On" when the gun is layed.

"Ready" will subsequently be called at intervals, corresponding to the rate of fire of the gun used.

The above procedure will be carried out five times with a

Tests.		*Total marks*
IV.	*Laying for elevation*—continued.	
	shortening range, and five times with a lengthening range. With the shortening range, the average of the times from "Ready" to "On" must not exceed 4 seconds, and with the lengthening range must not exceed 6 seconds. The gun must be depressed each time through at least 300 yards, and must be accurately layed to within 10 yards, the layer allowing for the rate of change of range. The rate of change of range should not be slower than 50 yards in 20 seconds. If the layer elevates before the layer for line has fired or has called "Fired," no marks will be scored for that round. With guns fitted with brakes, if the layer fail to apply the brakes before calling "On" no marks will be scored for that round.	30
V.	*Rocking bar sights*— Each competitor will set the range drum to the range indicated on the electric dial, five times with range decreasing, and five times with range increasing. One mark to be deducted for each error in setting, or for failure to take up any backlash in the sight.	10

Tests. *Total marks*

VI. *Auto-sights*—

i. Target. A well-defined stationary target in the water will be chosen. If none be available, an anchored target will be used. The range must be long enough for the ratio of movement of gun and sight to be more than 3 to 1, but reduced charge or aiming rifle cams may be used.

ii. Laying. Telescopes should be used. When testing trained layers, each will lay once slowly and carefully on the water-line of the target, and the mean of these lays will be taken as the "standard lay." In the case of classes under instruction, the "standard lay" will be determined by the instructor. When qualifying gun layers, if there be a rapid variation in rise and fall of tide, candidates should be tested in small groups at a time, and a rise (or fall) of tide diagram be kept in order to ascertain the true standard lay for each competitor. Where possible, tests should be carried out at slack water.

Each competitor will lay five times on the water-line of the target. Before each lay the gun will be

Tests.		*Total marks*
VI.	*Auto-sights*—continued.	

traversed, so that the target is clear of the field of the telescope, and the gun will be elevated above the target before three of these lays, and depressed before the other two, two or more turns of the handle being given in each case, in addition to any turns required to absorb backlash in the elevating gear.

The officer will order "Lay". The competitor will then lay, call "Fired" and step clear. The interval between "Lay" and "Fired" will be measured each time. During two of these intervals deflection will be changed by the layer, according to directions given by the officer before the order "Lay".

iii. Checking the laying. The officer will note if each lay be within 2½ minutes for line. A clinometer will be kept on the gun, and the Q.E., after each lay, will be carefully read and noted, but the gun layer should not be told the result of any lay until he has finished. The sum of these lays divided by the number of them is the mean lay. The difference between each lay and the mean

Tests. *Total marks*

VI. *Auto-sights*—continued.

will then be taken, and the sum of these differences, irrespective of sign, divided by the number of lays, is the *layer's mean error along the gun.*

With every auto-sight a "Table of Angles" is issued, showing corresponding angles of Q.E. and of sight. If two angles of Q.E. be chosen, one on each side of the Q.Es. of the gun during the test, and the difference between them be taken, and also the difference between the corresponding angles of sight, then the ratio which the difference in Q.E. bears to the difference in angle of sight may be taken as the ratio of movement at the range, or the ratio of movement may be ascertained as described in Sec. 215, Coast Artillery Training, Vol. I, 1921.

If the layer's mean error be divided by the figure expressing this ratio, the result will be the *layer's mean error along the sight.*

The difference in Q.E. between the layer's mean lay and the standard lay, divided by the ratio of movement, will give the layer's difference from the standard lay along the sight.

Tests. *Total marks*

VI. *Auto-sights*—continued.

iv. Qualifying. To qualify, every lay must be within 2½ minutes of the proper line. The layer's mean error along the sight must be less than 0·4 minute, and his mean lay along the sight must be within 0·4 minute of the standard lay. The total of the times taken for five lays must not exceed one minute for 6-inch guns and upwards, nor 45 seconds for guns of less calibre.

v. Record. The lays should be plotted on a diagram; each layer's proficiency can then be seen.

vi. System of marking. 10 marks for consistency, 10 for accuracy, and 10 for time.

Consistency—

Layer's errors in minutes along line of sight—

	Marks.
0	10
0·1	9
0·2	8
0·3	7
0·4	6

Tests. *Total marks*

VI. *Auto-sights*—continued.

Accuracy—

Layer's difference in minutes from standard lay along line of sight—

	Marks.
0	10
0·1	9
0·2	8
0·3	7
0·4	6

Time (*for five lays*)—

6-inch guns and upwards.

	Marks.
40–44 seconds	10
44–48 seconds	9
48–52 seconds	8
52–56 seconds	7
56–60 seconds	6

Guns below 6-inch.

20–25 seconds	10
25–30 seconds	9
30–35 seconds	8
35–40 seconds	7
40–45 seconds	6

Total number of marks obtainable ... 30

Tests.		*Total marks*
VII.	*Dials*—	
	Preparation for action; connecting up electric dials; reading electric range and training dials; applying corrections, section difference, and concentration on movable faces of dials; synchronizing electric dials in preparation for change to Case III; applying deflection to training pointer, and corrections to drift and concentration scale; reading range and training indicator dials.	15
	(NOTE.—*The examiner will pay particular attention to details of drill, and to clearness in calling ranges.*)	
VIII.	*Drill*—	
	Preparation for action with guns at the station; duties when changing from one method of laying to another; passing, repeating, and applying corrections and deflections; duties of layers and setters in a Q.F. section; blind setting; distribution of fire scheme.	20
	Grand total	200

CHAPTER VI

CARE AND ADJUSTMENT OF LAYING GEAR

42. CLINOMETERS

Instructions regarding the care, tests, and adjustment of clinometers are laid down in Coast Artillery Training, Vol. I., 1921.

Clinometers must always be tested before being used.

43. CARE OF SIGHTS AND TELESCOPES

1. Sights should be kept clean, oiled, and free from grit. They should on no account be polished.

2. When not in actual use, the telescope, the sight bar, and other fittings attached, should be removed when circumstances permit and placed in a dry store. The removal of the sight bar can be effected by removing a nut and washer, which will be found under the pivot.

3. With the auto-sight, the efficiency of the sight depends upon the accuracy of the cam and roller. Special care must be taken that they receive no damage. They must on no account be polished, but be kept clean and free from grit and dust, by wiping with a clean rag moistened with a few drops of oil.

4. All parts are to be kept clean, working parts well lubricated with clean oil, and (with the exception of the cam groove and roller) lightly smeared with anti-corrosive grease when not in use. Bath brick, emery, or other abrasive substance must not on any account be used for cleaning.

5. The sight gear should not be taken apart unnecessarily, and adjustment should not be made by scraping or filing except on special authority.

6. The exterior surfaces of telescopes are to be cleaned with a soft rag and paraffin only. The exterior surfaces of lenses should be cleaned with a piece of linen cloth, which must be kept perfectly clean and dry, and used for this purpose only.

7. The bearing surfaces of sighting telescopes must be very carefully protected. Any burrs or dents on these surfaces throw the telescope out of adjustment.

8. Telescopes must not be taken to pieces, nor the lenses removed, nor adjustment for collimation attempted, except by a competent person. When not in use they should be closed up, caps replaced, and placed in their cases. They should be kept in as dry a place as possible.

44. TESTS FOR SIGHTING TELESCOPES

1. Telescopes of recent manufacture are focused for individual eyesight by revolving the eyepiece until the pointer is clearly defined. Since with these telescopes changes in focal distance due to change of range are inappreciable, no means of focusing the object glass are provided. The pointer is placed at the focal distance of the object glass, and both it and the distant view should become clear at the same time. An inverted image of the distant view is formed at the focal distance of the object glass.

2. To test if the pointer is at the proper distance from the object glass, focus it with the eyepiece, and then lay so that a very small bright space is left between the tip of the pointer

and some distant object; now move the eye behind the eyepiece, and note if the bright space vanishes or changes size. If it does either, the adjustment of the pointer is incorrect. An inaccuracy, called parallax, will then be caused by changing the position of the eye, and, since both pointer and distant view can no longer be focussed together, the eye will be strained and will tire rapidly. Telescopes found wrong in this particular should be sent for adjustment to the instructor in gunnery.

3. Telescopes are issued, and should as a rule remain correctly collimated. To test for collimation, the telescope is placed in its holders, focussed, and then directed on a well-defined object not less than 400 yards distant. When the telescope is turned round in its brackets, the tip of the pointer should not move off the point laid on. Care should be taken that, in carrying out this test, movements of the gun are not mistaken for movements of the pointer. Telescopes found incorrect for collimation must be adjusted by a properly qualified person.

45. TEST AND ADJUSTMENT OF ROCKING BAR SIGHTS

1. Lay the gun horizontal by means of a clinometer, place the bar, testing sights, in the Y brackets, bringing the marks on it and on the bracket to coincide so as to obtain correct cross level; bring the rocking bar to angles of depression corresponding to the tangent elevations for various ranges corrected for the height of the telescope above the axis of the gun, and for refraction, by working the hand wheel, and see if these ranges correspond with those on the sight drum. If they do not correspond, slacken the screws on the outer

circumference of the range drum, and turn the scale until the correct range is read, afterwards tightening the securing screws.

2. The sight may be datumed at M.S.L. on a datum post by giving the requisite Q.E. to the gun by clinometer, and turning the range drum of the sight till the telescope pointer is on the water-line of the datum. The range drum should then read the true range to the datum. If it does not, adjust as in para. 1 above. This is the most satisfactory adjustment in the case of bent telescope brackets.

3. To test for deflection, lay the gun on a distant mark, obtaining a line of sight through the axial vent (or firing hole bush) and the intersection of two fine cords stretched on the axis lines on the muzzle. The sight, with elevation and deflection set at zero, should be on the same mark. If it is not, bring the sight on to the mark with the deflection gear and adjust the reader of the deflection scale to zero.

46. GENERAL INSTRUCTIONS FOR TESTING AND ADJUSTING AUTO-SIGHTS

1. The auto-sights of all guns will be tested annually by an O.M.E. or by an officer deputed specially for that purpose by the Superintendent, Ordnance Factories. The tests will be such as are prescribed for the original setting up of the sight, and, if necessary, the sight and cam will be reset.

A test will be made of all cams, whether for full or reduced charges, or for aiming rifles.

2. Verticality of pivot and truth of correctional gear will be tested and, if necessary, adjusted, at the same time by the same officer.

A certificate from this officer that he has personally set up the sight, and that it is in correct adjustment, will be furnished to the garrison commander. An entry showing date, and by whom tested, will be made on a form provided for the purpose.

These tests should be carried out before the first series in the annual practice is fired from the gun.

3. If the sights cannot be set up true for all ranges up to the extreme limit of range, and the cam cannot conveniently be returned to be trued at the Royal Arsenal, Woolwich, the O.M.E. will furnish a table showing the errors at each angle on the Woolwich table of angles. This table will be filed with the Woolwich table of angles. In the case of guns used solely for A.T.C. defence the limit of range will depend on the extent of the illuminated area.

4. After testing, the eccentrics on the carrier will be painted over and will on no account be tampered with, except by an O.M.E. or R.G.C.F. artificer.

With the above tests and adjustments, the responsibility of the O.M.E. or the R.G.C.F. with regard to the sights ceases, except as regards sights which may again require to be set up during the year.

5. Officers in charge of guns are responsible for the care and preservation of the sights, and for such tests and adjustments as can be carried out without the assistance of a skilled artificer.

All officers should be able to carry out such tests, and such adjustments as do not require the assistance of artificers. The eccentric bush Q is the only eccentric which may be moved without the assistance of an artificer.

6. Clinometers, large, should be used for adjusting auto-sights. It is very important that these should be in perfect adjustment and be provided with calibration sheets (*see* Sec. **116**, 10, Coast Artillery Training, Vol. I, 1921). When placing the bar, testing sights, in the telescope brackets, the marks on it and on the brackets should coincide, thus ensuring correct cross level.

7. The gun must be balanced as if loaded, and must always be brought into position by a large sweep of depression (except in the case of those guns with which the last motion should be one of elevation; the latter rule must also be observed when firing.

In the case of a mounting with sighting steps, it must be balanced by keeping men in the positions of the layer and setter during the test.

8. When setting the clicker or error-of-day drum, both for testing and putting on corrections, the last movement given should be one of "add".

When setting the tide-lever the last movement should be in the direction of "fall".

9. Cams will be changed as seldom as possible. This operation may be performed under the supervision of the S.C. Guns should, however, usually be fitted with the full charge cam, and in any case a full charge cam must be fitted and tested annually.

Whenever a change is made from one cam to another, and always in preparing for action, the sights will be carefully tested and adjusted by the layers under the supervision of the S.C.

Unnecessary adjustments of eccentrics should be carefully avoided.

47. TEST FOR VERTICALITY OF PIVOT WITH AUTO-SIGHTS

1. With guns of which the sights cannot be corrected for want of level independently of the rest of the mounting :—

Place clinometer on gun and bring bubble central.

Traverse through 180°, halting every 30°. The bubble should return to the same position each time the gun is halted. The training of maximum tilt and the amount the pivot is out of the vertical can be determined by this test.

2. Means are provided with certain guns for correcting the sight independently of the rest of the mounting. With guns thus fitted, the bubble of the spirit level on the cam should come to the same spot, no matter in what position the gun be halted.

An alternative test is to place a clinometer on a bar, testing sights, in the telescope brackets and traverse through 180°, halting every 30°. The gun should be brought horizontal each time, and the angle of depression of the sight should then always be the same. If rapidity be necessary, and the pivot only slightly out of truth, this test may be modified by giving the gun extreme elevation ; small movements of the gun, due to want of level, would have then an inappreciable effect on the sight, and the elevation of the gun need not be attended to during the test.

3. Adjustments for verticality of pivot require the services of an artificer.

48. MECHANICAL TEST WITH AUTO-SIGHTS

NOTE.—*This test should only be employed when the datum test (see Sec.* **50**) *cannot be carried out.*

1. If it be necessary to use auto-sights before the mounting can be restored to level, this test should be carried out in the middle of the arc of fire.

2. Set the clicker or error-of-day drum and deflection scale at zero and tide-lever at M.S.L., and clamp the bar, testing sights, in the telescope brackets. With 12 pdr. Q.F. the trunnions should be clamped. From the Woolwich table of angles, supplied with each auto-sight, select a suitable range ; bring the gun to the corresponding Q.E. ; the angle of depression of the sight should now be the one corresponding to this range. For guns used at night the range selected should be as near the " test range " as possible.

3. The test range for guns used at night is the range when the attack develops. This is the range to the leading vessel at the time it has just entered the illuminated area, or, in the case of guns provided with fighting lights, when first adequately illuminated by such lights.

The test range must not be beyond the accuracy limit of the auto-sight.

4. If the depression angle is not correct, it must be made so by turning the " Q " eccentric, after first slacking its clamping nut, or by turning the clicker or error-of-day drum and noting the reading, which will be taken as the zero for subsequent settings. In some cases this adjustment is carried out by turning the error-of-day drum, after which the movable skin is adjusted to read zero.

The sight should then be set to extreme deflection each way in turn, and the bubble of the clinometer should not move. If it does, the services of an artificer are necessary.

5. If time is available, this test may be repeated for every range in the Woolwich table of angles; if, after adjusting the sight for one of these ranges, the remaining readings are incorrect, the eccentrics on the carrier require adjustment; for this, the services of an artificer are necessary.

For guns used at night these tests will be carried out at ranges on each side of the test range; the sight may be considered correct provided that no test within 500 yards below the test range shows an error greater than that corresponding to one minute of Q.E. The permissible error in the depression angle of the sight will therefore be $\frac{a}{a + \theta}$ minutes. (*See* Sec. 215 Coast Artillery Training, Vol. I., 1921.)

6. In carrying out this test, where local conditions make it certain that the variation in range during action with auto-sights will be small, the quadrant angles shown in the Woolwich table of angles should first be corrected for the variation in M.V. of the gun from the normal M.V. for which the cam was cut.

Such cases are:—

i. Guns mounted on low sites, when the effective limit of auto-sights is under 3,000 yards.

ii. Guns used for the defence of narrow channels, the shape of which makes big variations in range impossible.

iii. Guns used at night, when the range of the guns is limited by that of the lights.

iv. A.T.C. guns.

When this method is employed, the range selected for the test must be approximately the same as the test range.

It must be clearly understood that the alteration of the Woolwich table of angles makes the sight inaccurate at all ranges other than those near the test range, and that, therefore, this method must be strictly limited to guns which will use the auto-sight only under the conditions given above.

49. TEST OF ZERO OF DEFLECTION SCALE OF AUTO-SIGHTS

1. In the case of guns fitted with rocking bar sights and auto-sights, the former is tested for line as described in Sec. 45, and the latter is then checked against it by laying with the auto-sight on a distinct mark on the water. If the deflection scales of the two sights do not now read alike, that of the auto-sight must be made to agree with that of the rocking bar sight.

2. When guns have auto-sights only, the sight must be tested with the bore of the gun, but the mark must be near enough to allow both gun and sight to be laid on it for line, and to eliminate most of the drift correction which is automatically applied on the sight.

50. TO DATUM THE AUTO-SIGHT

1. It is desirable to have a false datum mark to which the angle of depression is the same as that of the test range at M.S.L.

A false datum mark is generally preferable to a water-line datum when datuming auto-sights, as the operation can then be carried out for M.S.L. at all states of tide; also inaccuracies due to waves are eliminated.

Such a mark should not be less than 400 yards from the gun, since the telescope would then be out for parallax.

Failing this, a natural mark should be selected at a range as near the test range as possible.

2. From the datum slide rule or table of Q.Es. ascertain the Q.E. necessary for calibration M.V., allowing for wear of gun since calibration, charge temperature, and, if necessary, for rise or fall of tide, and for raising M.P.I.

All breech fittings should be on shell and cartridge in the bore, and, with 6-inch guns, all layers and setters on the sighting steps, thus balancing the gun exactly as for firing.

Set the tide-lever, test the clinometer for index error, and then lay the gun at the required Q.E., taking care that the last motion is one of depression.

If the tip of the pointer is now found to be very nearly on the datum mark, it should be brought exactly on by means of the clicker or error-of-day drum, taking care that the last motion is one of "add."

If it is not very nearly on, slack off the locking nut of the eccentric bush Q, raise the pointer well above the datum mark by turning the eccentric bush Q, and then bring it down nearly as far as the mark; tightening up the locking nut will give the pointer a further motion of depression, but only constant practice will train a layer to judge the final amount of depression obtained by tightening up the locking nut.

3. After adjusting the sight, the layer must lay the gun at least three times by the auto-sight. If the bubble of the clinometer, set to the required Q.E., comes central each time, the sight is satisfactorily datumed.

If the bubble does not come central each time, adjust on the clicker or error-of-day drum, and again try the three lays.

Not till three consecutive lays are correct can the sight be said to be properly datumed.

4. In datuming, errors of collimation are automatically corrected. Once the sight has been datumed, the telescope must on no account be shifted in the Y brackets; if it is moved at all, a considerable error may be introduced, due to worn Y brackets, worn telescope bearings, or both.

5. *To determine the position for the false datum mark.*—Calculate the depression angle for the test range (*see* Sec. **48**), taking into consideration the height of the axis of the telescope above the trunnions, and the necessary correction for curvature and refraction. See that the pivot of the mounting is vertical, and that the telescope is in correct adjustment for collimation and parallax. Set the sight to the above depression angle, traverse on to some object, and paint a mark thereon in line with the pointer of the telescope. If no natural object is available a post should be erected.

A convenient mark may be used, should one exist approximately in line with the pointer of the telescope, but in this case the range corresponding to the depression angle to this mark must be calculated (*see* Sec. **221** Coast Artillery Training, Vol. I., 1921).

In selecting a position for a false datum care should be taken that there is no ground, such as sand, &c., between the gun and the mark, which might cause variations in refraction.

51. TEST FOR BACKLASH

1. The sight should occasionally be tested by being brought to a certain angle, first by a wide sweep of depression, and

then by a wide sweep of elevation, and the difference between the readings of the clinometer on the gun being noted on each occasion. This should be done at angles corresponding to three or more widely different ranges.

2. When a considerable discrepancy is found between readings, the sight requires overhauling. This will most frequently occur with combined sights. These sights require testing, both as auto-sights and rocking bar sights.

52. TESTS, &c., FOR VERTICALITY OF PIVOT WITH ELEVATION INDICATOR

1. Verticality of pivot should be tested as in Sec. **47**, 1.

2. Since the elevation indicator indicates the elevation of the gun relatively to the mounting, it follows that any inclination of the latter will cause an equal angular error in quadrant elevation. The error will be — or + according as the tilt of the mounting is to the front or rear.

3. The proper correction can be applied at any one training as follows:—Lay the gun by clinometer at the Q.E. for a selected range, and adjust the elevation indicator to read the proper range. This adjustment should be made at the training where there is no tilt, or at what is considered the most important training in the arc of fire as decided locally, and the elevation indicator should always be tested at the same training.

4. For further consideration of the effect of tilt and corrections required, *see* Sec. **207**, Coast Artillery Training, Vol. I, 1921.

CHAPTER VII

CARE OF EQUIPMENT

53. GUNS

1. Guns will, for storage and transport, be greased internally with "composition, preserving," and blocked with painted dry wood blocks, the joints being made tight with putty. This operation should be carried out if possible in dry weather. The exterior of the piece, including clinometer plane and all bright parts, will be painted. Guns will be unblocked for examination every 12 months.

The bright parts of guns will be oiled and if not in frequent use will be covered with red mineral jelly. The bores will be kept cleaned and oiled.

2. Before firing, the "composition preserving" or oil will be removed.

After firing powder, the bore will be washed and, as soon as dry, will be oiled with a greasy cloth or piece of old linen tied over the piasaba brush.

After firing with cordite charges the bore will be thoroughly washed out, and, when dry, coated with red mineral jelly.

After using an aiming rifle in a gun, the bore of the latter will be thoroughly cleaned as soon as possible after the aiming rifle practice and before service ammunition is fired from the gun.

3. Guns will be depressed to prevent rain or moisture lodging inside, the muzzle and breech ends being protected by covers.

4. When guns have to be kept loaded, bores are not to be lubricated or wiped out from the muzzle, as a ring of lubricant may be left at the extreme point reached and this may cause a premature.

Guns are to be unloaded once a month, so that bores may be cleaned and prevented from rusting.

5. Clinometer planes must not be cleaned with any abrasive material.

6. As a general rule, all B.L. and Q.F. guns under 6 inch calibre, when mounted in exposed positions and not in frequent use, will have all fittings removed.

Fittings will be kept in store, the steel portions being covered with mineral jelly.

Fittings remaining with the guns will be treated in a similar manner.

In the case of guns used for drill and practice all fittings must be kept free from dust and grit and all working parts well lubricated.

54. MOUNTINGS

1. When mountings are being overhauled, all parts of a portable nature which are not required for the immediate continuation of the work should be placed in the artillery store, or other suitable place, for safe custody.

2. A thorough cleaning and lubricating of all working parts must take place at least once a month. All grease must be removed, if necessary by scraping, the parts being wiped clean and then freshly greased. In the case of mountings which are much exposed and liable to accumulate dust or sand, the parts should not be left with much grease or oil upon them, but only sufficient to cover the parts. As a thin film serves as protection for only a short time, the parts of such mountings must so much the more often be cleaned and freshly oiled. Special care must be taken to prevent grit from accumulating on the cradle grooves and gun slides or other sliding surfaces.

Friction clutches and brake drums should be kept clean, smooth, and slightly oiled to prevent seizing.

Ball bearings, rollers, and races must be kept well lubricated.

3. When lubricating, the lubricating holes should be cleaned out with a wire and then filled with oil. Care must be taken to replace the screws of lubricating holes; the heads of the screws must be kept bright, so as to be readily seen.

After filling the oil holes, and whenever fresh lubricant has been applied, the parts should be well worked backwards and forwards so as to distribute the lubricant.

Traversing gears, if not working freely, should be examined particularly as regards the ball bearings or rollers. Any broken balls should be replaced at once, and any burrs on rollers or roller paths removed.

Holding-down clips and clip rings should be attended to occasionally to ensure that they do not affect the traversing and that they are in good order.

Brake gears should be regulated by means of the adjusting

screws until the tension of the brake band is just sufficient to do the work required.

Friction plates should be tightened up by means of the adjusting nuts, sufficiently to allow of a slight slip in the gear on firing. All teeth of arcs should be free from burrs.

When adjusting the trunnion bearings of a heavy mounting, the adjusting screws should be screwed up gradually and evenly on either side until the elevating gear can be worked freely by one man, care being taken that the adjusting screws are not screwed up too far, and that they are secured by their set screws.

When not in use, all bearing screws should be slackened.

4. Buffers must be kept filled and in good working order. They should be carefully examined before firing or drill in order to ensure that the cylinders contain the requisite quantity of liquid as shown on the inscription plate; that there is not leakage at the glands; and that the piston rods are properly connected.

All spare leather packings should be kept in store and occasionally rubbed with dubbin in order to prevent them from becoming hard and brittle. The supply of spare packings should never be allowed to run low.

It is most important that grit and dust should be prevented from entering hydraulic cylinders. After drill or firing, a well-oiled twist of tow should be bound lightly round the ram close to the gland of the cylinder and left there till next time of working, when it should be carefully removed so as to clear away any collection of dust. Any grit or dust found on the ram during firing should at once be removed.

5. Electric firing gears and leads should be carefully cleaned periodically at the joints.

Particular care should be observed, when removing or adjusting any parts or gears, not to indent or damage parts by rough usage. An iron hammer should never be used unless with a piece of wood or brass to transmit the blow.

6. Nuts and screws should be slightly oiled before being applied or inserted, and a few turns given by hand before using a spanner. A hammer should never be used to tighten screws or nuts.

7. The points of split pins, which have been replaced, should be well splayed out.

CHAPTER VIII

DISABLEMENT OF ORDNANCE

55. GENERAL INSTRUCTIONS

1. The various methods by which ordnance may be disabled must be considered under three heads, according to circumstances, and are as follows :—

i. *Temporary disablement.*

(*a*) By removing essential stores, such as :—
Breech screw.
Sighting gear.

(*b*) By putting buffers and recuperators out of action :—

Release air pressure.
Remove plugs and buffer nuts.
Empty buffer.

(*c*) By damaging breech mechanism :—

Damage mechanism or screw threads with a crowbar or heavy hammer.

NOTE.—When there is a probability that the gun will shortly be regained, disablement should be confined to the removal of essential fittings and stores.

ii. *Complete disablement.* (In cases of emergency only.)

Release air pressure from recuperator.
Dent the spring cases with a pickaxe, &c.
Remove plugs and buffer nuts.
Empty buffer.
Lay the gun horizontal.
Place an obstruction in the bore. (*See* ii (*a*) below.)
Load with a round of H.E. (and in addition place in the chamber the greatest possible amount of explosive such as guncotton, or any high explosive that may be available). (*See* ii. (*b*) below.)
Fire the gun from under cover, electrically, if possible ; if not, by means of a long lanyard.

(*a*) If shell are fuzed with D.A. or D.A. impact fuzes an obstruction placed in the bore in such a position as will ensure its being struck by the fuze or another shell placed in the muzzle will suffice.

(*b*) With fuzes having shutters fitted such as No. 106E or 101B and E. The 106 type is fired with tape and split collar removed, and another shell placed in the muzzle may function, but 101B or E if available are more reliable if similarly treated, detonation being brought about by the detonation of the gaine.

iii. *Permanent destruction.*—If time permits and material is available, this can be effected best by means of guncotton, as follows :—

(*a*) A shell having been loaded in the ordinary way, the necessary charge is packed in behind it, so as to be in close contact with the shell and with the sides of the chamber.

(*b*) The primer is next inserted in the guncotton slab.

(*c*) Sods, earth, or other material, are then used to keep the guncotton in position.

(*d*) The detonator, with the safety fuze or electric leads attached, is placed in the primer.

(*e*) The breech block is swung to as far as the safety fuze or electric leads will allow.

(*f*) The charge is then fired from under cover.

56. CHARGES, DETONATORS, AND FUZE

1. The charge required (*see* Sec. 55 iii (*a*)) is as follows :—

For a 12-pdr. (12 cwt.) Q.F. gun use 2 lbs.

It is not absolutely necessary to use a shell, but the effect of the explosion is thereby increased.

Other high explosives may be used instead of guncotton, but in some cases special precautions have to be taken, *e.g.*, dynamite is often frozen, and must be carefully and slowly thawed before being used. This should be done in "pan warming dynamite"; if such be not available the dynamite should be placed in a watertight tin and surrounded by warm water until thawed.

2. Guncotton slabs are 6 inches by 3 inches by $1\frac{3}{8}$ inches, with one perforation for the primer. Weight of slab, 16 ounces. Slabs are wet. Guncotton primers are 1·35 inches to 1·15 inches in diameter to fit the perforation in the slab and have one perforation for the detonator. Weight of primer, 1 ounce. Primers are dry.

It is difficult to detonate wet guncotton by itself. A primer is easily detonated. To detonate a charge of wet guncotton a primer is put in close contact with the wet slabs, the primer is detonated, and this causes the wet guncotton to detonate also.

3. There are two kinds of detonators in the service for detonating guncotton:—

(i) Detonator No. 8 for safety fuze.

(ii) Detonator No. 13 for use with electrical firing apparatus.

The No. 8 detonator (Mark VII) consists of a solid drawn copper tube containing 30·8 grains of fulminate of mercury composition.

The exterior of the body is painted red, and a small label bearing the number and numeral of the detonator is attached,

Safety fuze is painted black and carried in tin cylinders, and will burn under water. The usual rate of burning is 3 to 4 ft. a minute, but if it has been kept in store long, especially in a tropical climate, it may burn much quicker; therefore, a piece should be tested.

57. TO PREPARE A CHARGE

1. To prepare a charge to be fired by No. 8 detonator :—
   - i. See that the guncotton slabs are in close contact with each other, and that the primer is properly inserted in and touching a slab.
   - ii. Take a piece of safety fuze of such length that the man lighting it will have time to get to a safe distance before the charge is detonated. Cut one end square and the other on the slant.
   - iii. Insert the square end of the safety fuze into the detonator, taking care not to press it down too far on to the composition ; do not hold the detonator by the end containing the fulminate. Then crimp the end of the detonator case on to the safety fuze with the crimping pliers, if available; if not, any pliers will do ; sufficient force only should be applied to cause the detonator to grip the fuze.
   - iv. Rectify the hole in the primer and insert the detonator carefully into it.
   - v. Light the slanting end of the fuze. A fuze or port fire is more convenient than an ordinary match.

NOTE.—*No. 8 detonators are also issued with 2 feet of safety fuze attached.*

58. TO FIRE A CHARGE

To fire a charge electrically, the primer and slabs are arranged as already described. The No. 13 detonator is connected to the leads and is then inserted in the primer, and is fired by a "F.S. Exploder". Care must be taken that the other ends of the leads are not attached to the exploder till everything is ready for firing.

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