

5738

HANDBOOK

FOR THE

0.45" GARDNER GUN.
(5 BARRELS.)

1884.



By Authority of the Lords Commissioners of the Admiralty.

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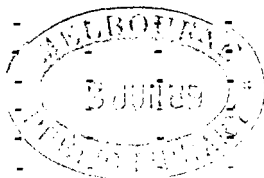
1884.

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TABLE OF CONTENTS.

	PAGE
NOMENCLATURE - - - - -	1
GENERAL DESCRIPTION - - - - -	4
ACTION OF GUN - - - - -	6
SAFETY BAR - - - - -	7
INSTRUCTIONS FOR ARMOURERS IN STRIPPING AND ASSEMBLING THE	
GUN - - - - -	7
FAILURES LIKELY TO OCCUR - - - - -	9
GARDNER GUN EXERCISE - - - - -	10
SPARE PARTS - - - - -	11
ACCURACY - - - - -	11
WEIGHTS AND DIMENSIONS - - - - -	11
AMMUNITION - - - - -	12
DIAGRAMS - - - - -	12



NOMENCLATURE.

(The letters and figures within brackets refer to the diagrams at the end of the book.)

Figures after letters "Pl." refer to the plates at end of book.)

FRAME (A). Pl. 1, 2, 3, 4, 5, 6.	{	Pl. 4	-	Cartridge carrier with four set screws (1).
		Pl. 1, 3, 4, 6		Foresight (2).
		Pl. 1, 4, 5, 6		Crank handle with axis pin right, and fixing pin (3).
		Pl. 3, 4	-	Cam levers with joint pins and set screws (4).
		Pl. 4	-	Axis pin left (5).
BARRELS (B). Pl. 1, 2, 3, 4, 6.	{	Pl. 1, 2, 3, 4, 6.		Bushes, muzzle of barrels with set screws (6).
COVER (C). Pl. 1, 2, 3, 5, 6.	{	Pl. 1, 2, 3, 5		Cascable screw with knob (7).
		Pl. 1, 2, 3, 6		Cartridge feeder with top and bottom slides, stop screws, lever, and pivot screw (8).
		Pl. 1, 2, 3	-	Hopper (9).
		Pl. 5	-	Feed valve (10).
				Feed valve lever, with pivot adjusting and set screws (11).
		Pl. 1, 4, 5	-	Tangent sights, with brackets, cams, screws, and springs (12).
LOCKS (D). Pl. 2, 3, 4.	{	Pl. 2, 3, 4	-	Butt (13).
		Pl. 3, 4	-	Extractor (14).
		Pl. 2, 3	-	Firing pin (15).
				Friction roller.
		Pl. 2, 3	-	Hammer (16).
				Plunger.
		Pl. 2, 3	-	Spring (17).
				Stud, axis and fixing pins.
		Pl. 1, 2, 3, 4		Safety bar (18), with stud and spring.
		Pl. 2, 3, 4	-	Crank disc (19).

CARTRIDGE
HOLDER (E). } Pl. 1 - Cover for do. (20).

MOUNTING.

TRIPOD (F).
Pl. 1. { Pl. 1 - Bearing piece with stop screw, legs with tie rod and two joint pins each, leg ring socket, stop nut, deck plate (21). Holding-down bolt with adjusting nuts (22). Holding-down screws, lengthening key (23).

GUNWALE.
Pl. 2. { Pl. 1, 2 Bearing pieces with one stop screw, each set screws with one cross pin each. Sockets (34).

TRAVERSING GEAR.
Pl. 1, 2, 6. { Casing with under-plate and three fixing screws (24).
Crank handle with fixing pins (25); set screws (26).
Worm and spindle, with collar and adjusting nuts, worm wheel.

ELEVATING GEAR.
Pl. 1, 2. { Break complete with collar (27); hand nut (28); joint pin (29); locking screw (30); elevating sleeve (31).
Joint pin (32); elevating screw (33).

SHIELD COMPLETE (G).
Pl. 7. { Centre collar, lever, and stud (34).
Friction collar with feathers marked L. and R. for left and right (35).
Feeder catch with spring, joint-pin, and fixing pin L. and R. (36).
Feeder catch plate, plate with fixing screw L. and R. (37).
Outside axis plate, with screws L. and R. (38).
Inside do. do. do. (39).
Shaft (40); shield (41); shield-holder with taper pin L. and R. (42); studs for feeder-catch with fixing pins (43).

SIGHTS, TANGENT
ELONGATING, COM-
PLETE (H).
Pl. 8. { Slides (44); stems (45) with stem springs; brackets with fixing screws (46); milled head (47), with pinion and fixing pins.

CONE MOUNTING
COMPLETE (L).
Pl. 9.

Cone with locking bolt (48); cap and fixing screws, cross-head (50), with front clip (51); back-clip (52); four fixing screws (53); one front and two back keeper plates (54); keeper pins for keeper plates, one joint pin and fixing pin for do.

Elevating gear.—Brake (55) with milled head taper pin, set-screw, shoe, spiral-spring, strap with fixing screw gun-metal nut (56); hand-wheel (57); inner screw (58); outer screw (59); joint pin (60); pivot screws with one nut each (61).

Traversing gear.—Worm and spindle (62), with bearing nut, adjusting nuts and collar; hand-wheel (63), with fixing pin, worm wheel.



GENERAL DESCRIPTION.

THESE guns have five barrels; their axes lie in a horizontal plane, and are parallel to each other. The breech ends are fixed into the centre cross-piece of the frame. To the rear of the centre cross-piece the frame is increased in depth to form the breech-casing; in this casing are the locks which carry the mechanism for igniting the cartridges and extracting the empty cartridge-cases. The locks are driven backward and forward by means of a disc crank. At the forward motion the cartridges are pushed into the barrel chambers, and there held during the time of discharge, whilst during the backward motion the empty cases are withdrawn.

The extractor is pivoted to the lock plunger, during the forward motion of which it is free to rise over the cartridge head, whilst during extraction it is held firmly down to the plunger by the feed valve, which receives a slight motion from the cam on the disc crank for this purpose.

A safety bar is added for drill purposes. When the handle is down, or in safe position, cartridges may be worked through the gun unfired.

The gun is fed from a grooved plate or cartridge feeder, which is fixed above the hopper, through openings in which the cartridges fall from the cartridge feeder to the cartridge carrier.

Between the hopper and the cartridge carrier is the feed valve, in which are openings corresponding with openings in the hopper. It has a transverse motion, for the purpose of bringing the cartridges from the openings in the hopper to a position opposite the barrels and in line with the lock plungers.

The cartridge feeder contains 100 cartridges in 5 columns of 20; this is kept supplied during firing from cartridge holders, of which 20 are sent with each gun. The cartridge holder is a wood block with holes sunk to contain 50 cartridges; when filled, the slide is put on, care being taken to keep the brass strips *inside*. The wooden slides will gradually be replaced by brass ones.

The guns are sighted up to 2,000 yards, except some of the earlier ones, which are only sighted up to 1,600 yards.

Mounting.—The gun is furnished with a tripod and six gunwale sockets. The tripod is held in position by the head of the holding-down bolt being passed through the slot in deck plate, after which the holding-down screw is screwed

into the socket until a firm hold is obtained. The gunwale sockets are held in brackets (not issued with the guns) in any position on bulwarks.

The traversing gear is for use in both the tripod mounting and the gunwale sockets.

For service on shore.—A Gatling gun carriage has been fitted with a fixed socket into which the stem and traversing gear can be dropped.

Guns numbered above 774 are fitted with cone mountings, telescope tangent sights, and shields. The 275 guns at present in the service, issued with tripod mountings and ordinary tangent sights, will gradually be fitted with cone mountings, elongating tangent sights, and shields.

The cone mounting consists of the cone, crosshead, traversing and elevating gear. The cone fits into the service holding-down ring; it is bored out to receive the stem of the worm-wheel, and is furnished with a locking-bolt to prevent the worm-wheel turning when it is screwed into position. The crosshead carries the elevating and traversing gear.

The elevating gear consists of telescopic right and left hand screws, working in a nut pivoted to the crosshead; it is furnished with a brake.

The traversing gear consists of a worm-wheel, and worm and spindle; the worm-wheel is attached to the crosshead by means of clips.

The crosshead with elevating and traversing gear may be unscrewed from the cone, and used either in the field carriage or gunwale socket; when it is desired to do this, turn and drop the locking-bolt, take the gun by the fore end of the frame, and the opposite side to the crank-handle, and pull it until the screw (right-hand) upon the stem of the worm-wheel is slack; it will now require three turns to release it from the thread in the cone, when it may be lifted out. If, from the position of the gun, it cannot be turned an entire revolution, it must be first slacked out by the above means, then, by turning the traversing hand-wheel, the stem will be released after the worm-wheel has made three revolutions.

In replacing the gun in cone care should be taken to lower the stem gently into its place, that the threads may not be damaged.

The cone is *not* to be released from the holding-down ring by means of the gun frame, but by blows with the end of a wooden handspike delivered upon the lugs which will be found at the base of the cone.

The *elongating tangent sight* consists of a slide upon which teeth are cut to form a rack, a stem, and a spring which snaps into a recess in the slide, and acts as a stop when the stem is drawn out to its full extent. The slide is marked on its right edge from 0 to 1,300 yards, and on its left edge from 1,400 to 2,000 yards. The right-hand marking is for use when the head of the stem is resting upon the top of the slide; the left-hand marking for when the stem is *fully* withdrawn. The sights are interchangeable, and may be used either as right or left hand.

The *shield* consists of a steel plate, which is held in holders swinging on the sides of the frame: it may be clamped at any desired angle by the friction locking gear, and when not in use may be turned down over the cover, in which position it serves to secure the cartridge-feeder, which is first laid upon the barrels, grooves downwards; the shield itself bears upon the *back*, and the feeder-catches, which are pivoted to the frame, clip the *ends* of the cartridge-feeder.

ACTION.

The springs having been first released by firing; as the crank handle (3) revolves, the crank disc (19) bears down on the hammers (16), and compresses the springs (17). The crank then takes against the rear end of butts of locks (13), and the locks move to the rear extracting the cartridge cases. When the locks are as far back as possible the left cam takes against the left cam lever (4), and moves feed valve (10) from left to right, forcing down a filled cartridge on top of the empty case, which falls to the ground. When crank handle passes the highest part of its revolution the crank takes against the front parts of butts of locks (13), and locks commence to move forward, driving the filled cartridges in front of them. At the same instant the right cam takes against the right cam lever (4), and moves feed valve (10) from right to left. As the handle continues to revolve, the locks move forward till the breech ends of barrels are closed by the plungers when they stop. There is now a slight further action of the right cam lever, which moves the feed valve more to the left, and causes it to bear on the extractors, which are thus forced down over the cartridge rim ready for extracting. The handle then continuing the revolution, each spring is released in succession as the hammers arrive at the break in the crank disc, which allows them to rise.

SAFETY BAR.

Action of safety is, that, (when in safety position, and locks at front end of their stroke), the hammers are bearing against the round part of the bar, and therefore cannot fly forward; the springs being consequently kept compressed.

INSTRUCTIONS FOR ARMOURERS IN STRIPPING AND ASSEMBLING GUN.

To dismount the shield.—Drive out the taper pin from shield holders and lift out the shield; replace the taper pins, unless it is required to strip the friction locking gear, in which case, while the pins are out, draw off the shield holders, when the shaft will come away and may be stripped. When reassembling, see that the friction collars are placed in proper position; they are marked R. and L. for right and left hand.

To remove locks.—See the safety bar is in firing position; open the cover, and turn the crank handle until the cranks are uppermost. When in this position the fore ends of plungers are about two inches from the breech ends of barrels; take hold of the plunger and raise it, at the same time moving the crank slightly (great care being taken to prevent locks remaining in the gun from coming within 1" of breech ends of barrels), the lock will now come away.

N.B.—By not following the instructions as to position of crank the lock may be caught so that it can neither be taken out nor put back; in this case the safety bar must be forced into safety position, when the lock will come away.

Before putting the lock in again, the safety bar must be returned to the firing position.

To remove the cam-levers.—Take out the set-screws, which will be found underneath the breech-casing, and drive out the joint pins.

To remove crank disc.—Place flat part of spanner in the slot of left axis pin, letting the cross-piece or screwdriver end rest upon the frame to the rear. Take hold of the crank handle, and give a smart backward turn; this will loosen the left axis pin; it will not be taken quite out until the right axis pin is loosened; which is accomplished by placing a piece of hard wood between the crank and rear end of breech casing, and turning the crank-handle backwards. Both axis pins being removed, the crank disc may be lifted out.

To remove feed valve.—Take out the pivot screws from the feed valve lever; the feed valve will now slide out.

To remove barrels.—Take out the fixing screws from the muzzle and breech; push the barrel and bush forward until the breech end is clear of the centre crosspiece; take the bush from the muzzle, and draw the barrel to the rear clear of the gun.

To strip the tangent sight.—Drive out the taper pin, and take off the milled head, take out the fixing screws and remove bracket, take out pinion, then remove sight and spring; when it is necessary to take out the stem, the stem spring must be forced back by pressing a piece of wire through the hole in the slide, the stem may then be withdrawn.

To strip a lock.—Compress the spring by means of the hammer; place the jaws of the spanner over the spring as low as possible, this will keep the spring compressed; when the hammer is released, the spring may be taken from the lock; take out the hammer, drive out the firing pins from the plunger, and draw off the butt; take out the firing pin; drive out the firing pin, and remove extractor. If it is necessary to remove the spring from the spanner, compress the spring in a vice, or between the frame and cover of gun, when it will be left free of the spanner.

N.B.—The locks of all Gardner guns should be taken out and oiled monthly.

To strip the traversing gear in cone mounting.—Drive out the taper pin and take off hand wheel, take off the adjusting-nuts and collar, then take out bearing-nuts with the gib-key supplied for that purpose.

To assemble gun.—Reverse the above operations, taking care in replacing the locks to have the cranks in same position as directed for stripping, and see that when inserting the locks, the end of the hammer is under the crank, and not in the opening in the disc.

To replace a barrel.—The spare barrel is interchangeable as regards diameter; should the fixing screw be found difficult to enter, the groove in the barrel may be eased away with a round file until the screw goes home.

The following tools are issued to each gun:—

Cleaning rod	-	-	-	-	1
Clearing plug	-	-	-	-	1
Punches	-	-	-	-	2
Spanner	-	-	-	-	1
Tommy for guns with tripod mounting only	-	-	-	-	1

Tommies, small	-	2	} For guns with cone mounting only.
Key-gib for bearing-nut	-	1	
Screwdriver	-	1	

The clearing plug is used as follows :—

Should the body of a cartridge-case remain in the chamber after the base has broken away, take out the lock, and introduce the clearing plug from the breech; turn the plug with the spanner until the threaded part obtains a fair hold in the case; then with the cleaning rod, used from the muzzle, push or tap out the plug, when the case will be forced to come away with it.

Elevating gear.—If the hand-nut will not tighten up the brake by reason of its coming in contact with the breech-casing, slack out the set-screw and turn the locking-screw until the hand-nut tightens in the desired position, then fix with set-screw. The nuts on the holding-down bolt should be so adjusted that the thread can be screwed about half its length into the socket before the head of the bolt commences to tighten in the deck-plate.

FAILURES LIKELY TO OCCUR.

JAMS.

The jams may be caused in this gun in two ways :—
(1.) Failure to extract. (2.) Explosion in the action.

1. A *failure to extract* is caused by the rim of the cartridge failing or being cut through by the extractor. Should this occur the handle must be backed until the breech-bolt does not rest against the cartridge shell; it can then be extracted by means of a rod passed down the bore from the muzzle.

Non-extraction.—Should any cases of non-extraction occur owing to the extractor rising over the cartridge head during the backward movement of the lock, the feed-valve must be adjusted to bear upon the extractor; to do this, the adjusting screw in the right end of the lever must be drawn out slightly and fixed with the set-screw.

2. An *explosion in the action* is caused by hang-fire;—i.e., a cartridge, not firing immediately after its cap is struck, is drawn some way out of the barrel by the movement of extraction before firing; the case being then unsupported, is burst open by the powder gas, and an explosion occurs. In this case a portion of the body of the case may be left in the barrel, the head being blown off. To remove this a

cartridge clearer is provided at one end of the cleaning rod ; by passing this down the gun from the muzzle end the piece will be removed. If an explosion occurs, even if no part of the case is left in the barrel, firing should at once cease, and the cleaning rod passed down the barrel to see that the bullet has passed out.

3. In the event of a *striker breaking*, the readiest method is to put in the spare lock provided. To replace the broken striker, proceed as described on page 5, "to strip a lock." Put in the new striker, and put the lock together again. Before firing care should be taken that the cover is down and locked by turning in the screw by the cascade knob.

4. *Miss-fires* may be caused by a weak lock spring ; the weight of the spring may be tested with a wire and spring balance ; it should require a pressure not less than 10 lbs. to press the point of the firing pin back slightly.

DRILL FOR 5-BARREL GUN.

Crew consists of 5 men, who fall in in single rank.

5. 3. 1. 2. 4.

Action.—1, in rear, sees elevating and training gear clear, then raises cover, and feels each extractor to ascertain that it is working freely. 2, on the right, revolves the crank handle, and seeshandle of safety bar at "fire," and releases the springs in succession. 1 then replaces the cover, and screws up cascade knob. 3, on the left, provides and places cartridge feeder, seeing bottom slide closed and top slide open. 4 and 5 provide cartridge holders and fill empty ones.

Note.—If a shield is fitted, 1 and 2 raise it at the order "Action," 3 taking off the feeder when free ; 1 then sets up lever, and proceeds as above.

—(*yards*).—1 and 2 adjust the sights.

—(*name the object*).—3 receives two cartridge holders from 4, and slides the cartridges into the cartridge feeder, and returns empty holders to 4. 1 lays the gun, working the training gear with his left hand, and the elevating collar with his right.

Note.—With cone mountings, 1 works training gear with his right hand, and elevating gear with his left.

Commence.—3 opens the bottom slide ; 2 revolves the crank handle, bringing it forward to an horizontal position, and fires by order of 1, by continuing the revolution and bringing the handle back to the same horizontal position ;

Note.—The crank handle must be revolved uniformly and not jerked in any way; an irregularity in the motion tends to drop the cartridges into the receiver slots with the bullet ends down, which may cause a jam.

3 keeps up the supply of cartridges in the cartridge feeder, and returns empty holders to 4; 4 and 5 refill holders.

Cease firing.—2 discontinues the fire and puts safety bar to safe; 3 closes the top and bottom slides, and then removes the cartridge feeder; 1 removes cartridges from the hopper, then lifts the cover and takes out any cartridges that are in the gun, 2 turning the handle backwards as necessary to enable him to do so; 1 then recloses the cover.

1 and 2 put down sights, 3 returns the cartridges, 4 and 5 fill the holders.

Note.—Should it be necessary to cease firing for a short time, the order “Still” should be given; 2 puts safety bar to safe.

SPARE PARTS.

	Spare
Barrels - - - - }	1 per gun
Bushes, muzzle of barrel - - }	
Cartridge holders, with cover - - }	4 “
Crank handle with axis pin right, 1 fixing pin for do., 1 stem, 1 fixing pin for do., and 1 gun-metal grip. }	1 for every 2 guns or less.
Locks, complete - - - - }	2 per gun
“ extractors - - - - }	10 “
“ firing pins - - - - }	
“ hammer - - - - }	2 “
“ springs - - - - }	10 “
“ pins, fixing, extractor - - }	10 “
Springs for safety arrangement - - }	3 “
Sights { Fore - - - - }	2 “
{ Tangents - - - - }	2 “
Springs for tangent sights - - }	2 “
*Traversing gear, complete - - }	1 for every 4 guns, or less.
*Tripod, legs with tie rod and 2 joint pins to each. }	1 per gun

* Not required for guns with cone mounting.

ACCURACY.

The mean absolute deviation at 300 yards is about 4.45 inches.

WEIGHTS AND DIMENSIONS.

Weight of gun with cartridge feeder -	290 lbs.
“ traversing gear - - -	37 “
“ tripod - - - -	59 “

Crosshead with elevating and traversing gear for cone mounting	-	-	117 lbs.
Cone	-	-	63 "
Shield	-	-	77 "
Barrels, number	-	-	5
" calibre	-	-	45 inches
" length extreme	-	-	33 "
" " { from base of bullet to muzzle in calibres	-	-	29 "
Rifling, description	-	-	Henry.
" No. of grooves	-	-	7
" twist, uniform	-	-	1 in 22 inches
" length of	-	-	30 inches
Cartridge holder containing	-	-	50 cartridges
" " weight empty	-	-	3 lbs.
" " full	-	-	8 lbs. 12 oz.

AMMUNITION "GARDNER AND GATLING."

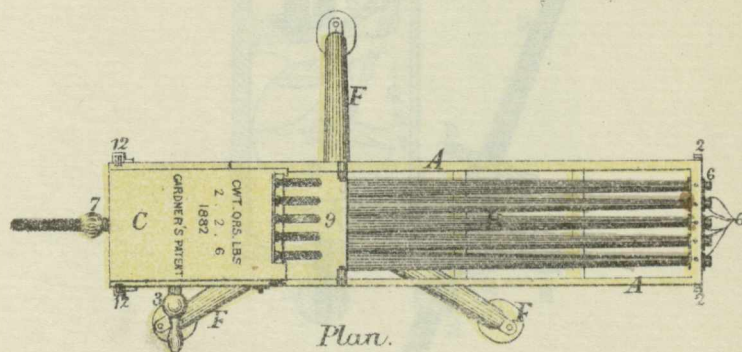
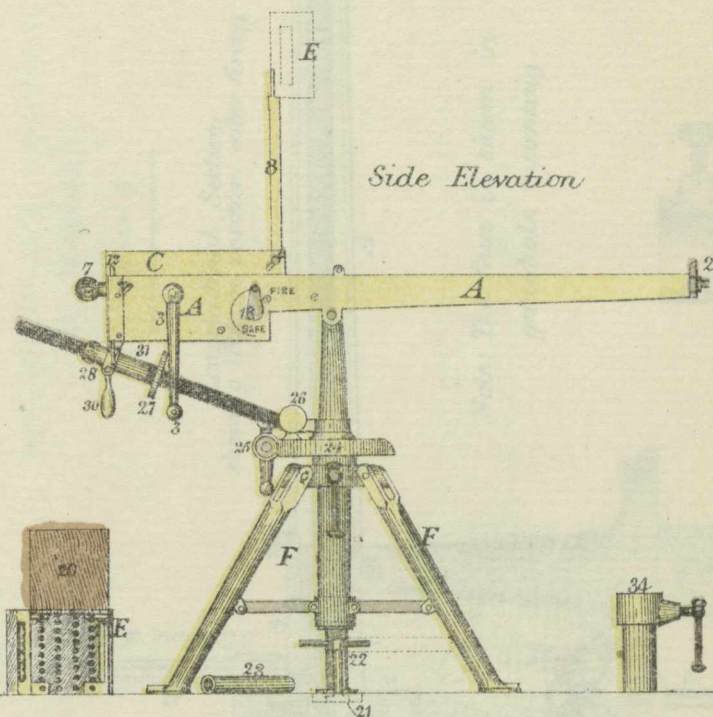
Projectile, nature	-	-	lead
" weight	-	-	480 grs.
Charge, weight	-	-	85 grs. R.F.G.
Length of gun, extreme	-	-	53 inches
" " from pivot to rear end	-	-	19 "
Tripod and Gunwale mounting.	{ Height from bottom of casing of traversing gear to top of gun Height from bottom of casing of traversing gear to top of feeder		14 "
			31 "
Elevation, extreme	-	-	23°
Depression	-	-	40°
Cartridges, No. in box	-	-	680
Weight of box filled	-	-	92 lbs.
Cone mounting:	{ Height from bottom of casing of traversing gear to top of gun		20 inches
	{ Height from bottom of casing of traversing gun to top of feeder		28 "
	{ Height shield raised from top to gun		18 "

MACHINE GUN. GARDNER.

(5 BARRELS.)

SCALE $\frac{1}{16}$.

Side Elevation



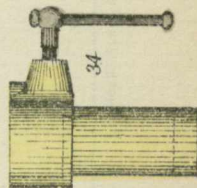
Plan.

MACHINE GUN, CARDNER. (5 BARRELS.)

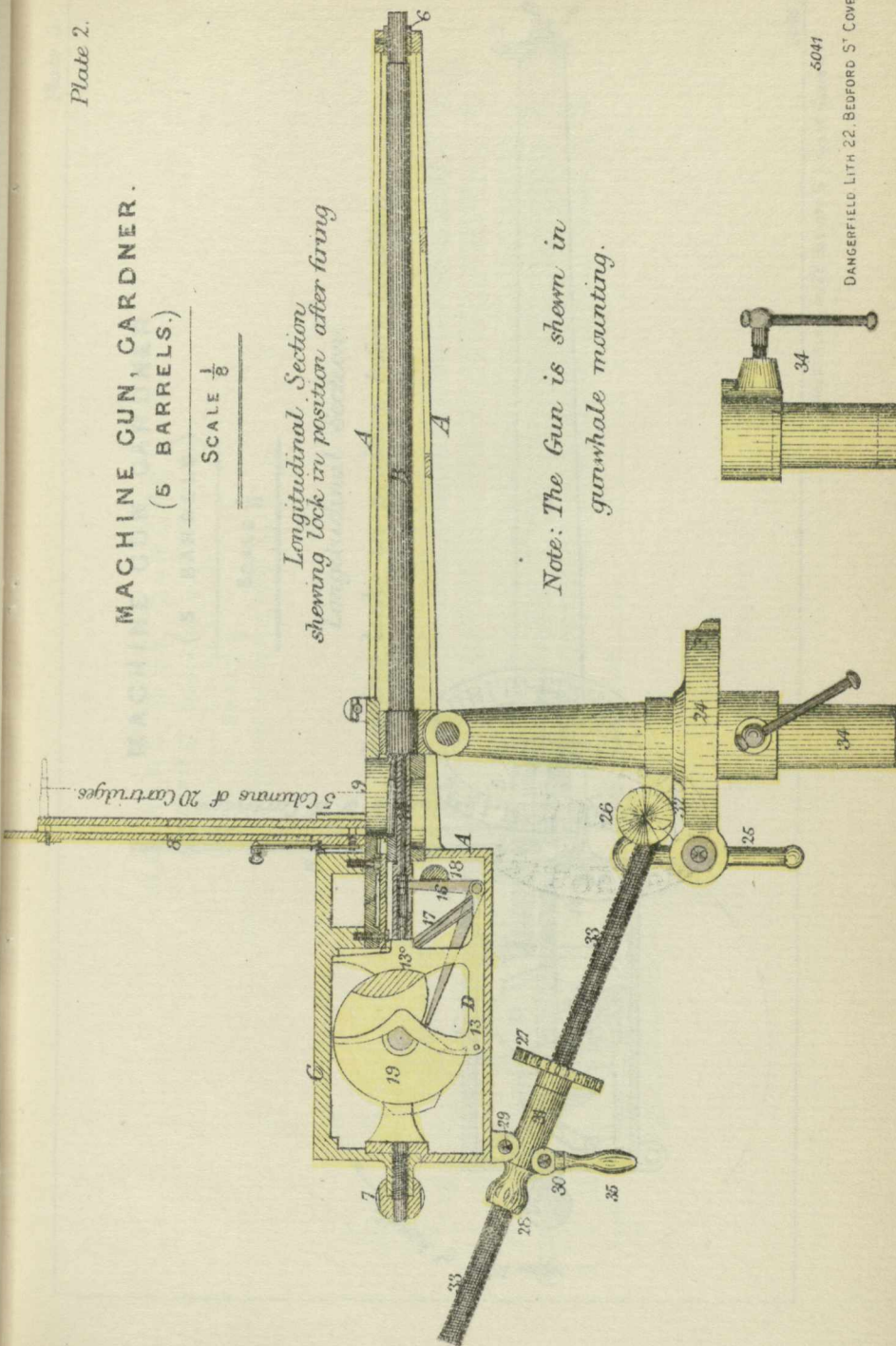
SCALE $\frac{1}{8}$

*Longitudinal Section
showing lock in position after firing*

*Note: The Gun is shown in
gunwhale mounting.*



5041



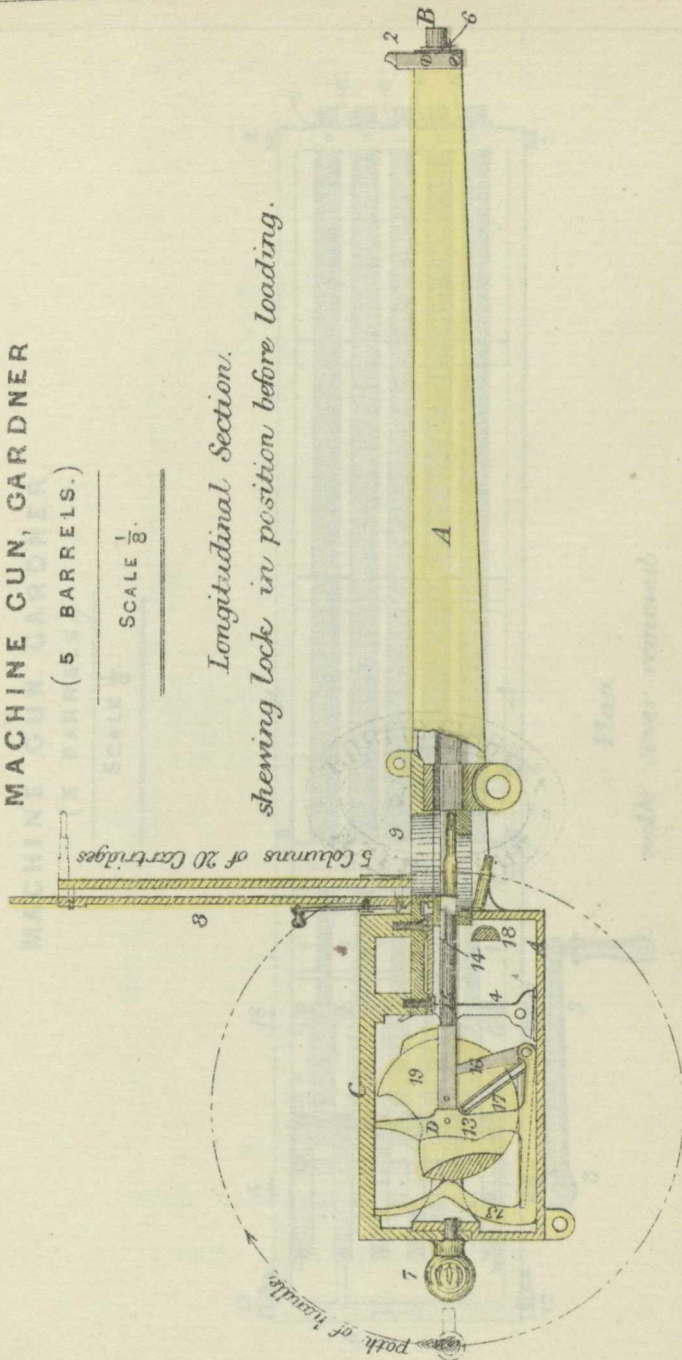
MACHINE GUN, GARDNER

(5 BARRELS.)

SCALE $\frac{1}{8}$.

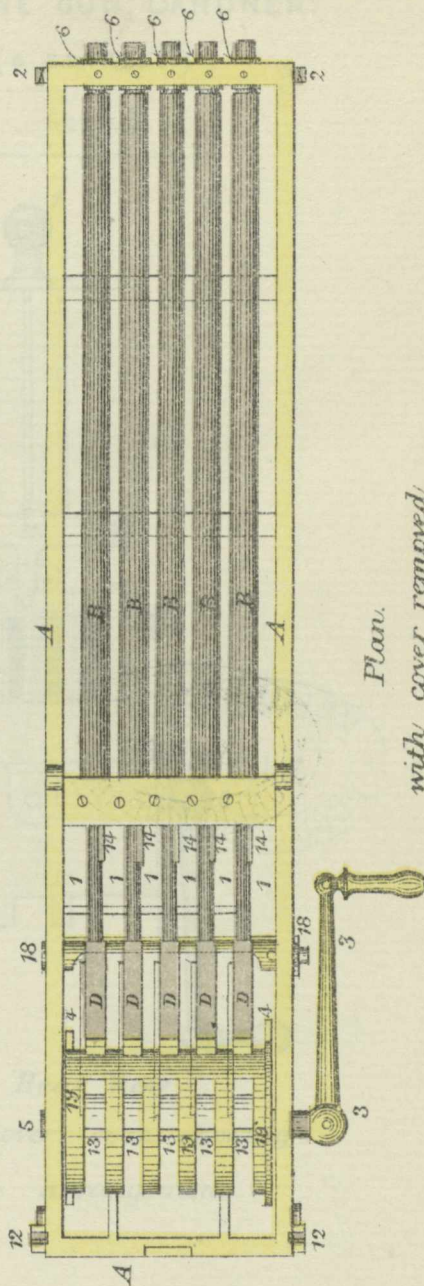
Longitudinal Section.

showing lock in position before loading.



MACHINE GUN. CARDNER.
(5 BARRELS.)

SCALE $\frac{1}{8}$ "



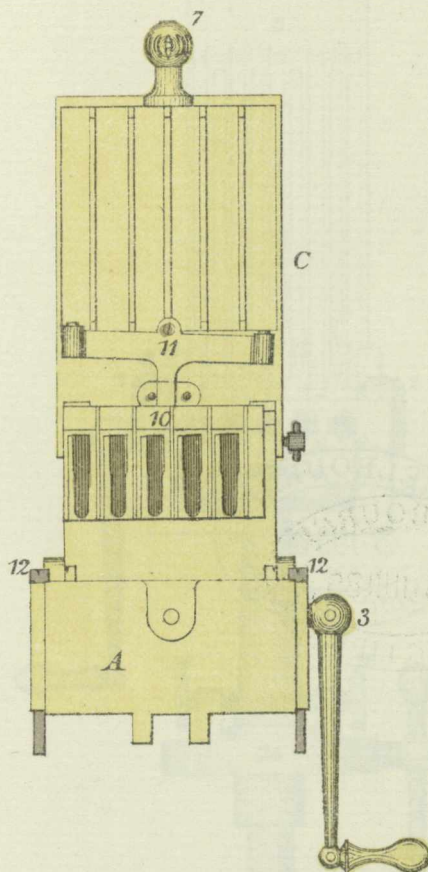
Plan.

with cover removed

MACHINE GUN, CARDNER.

(5 BARRELS.)

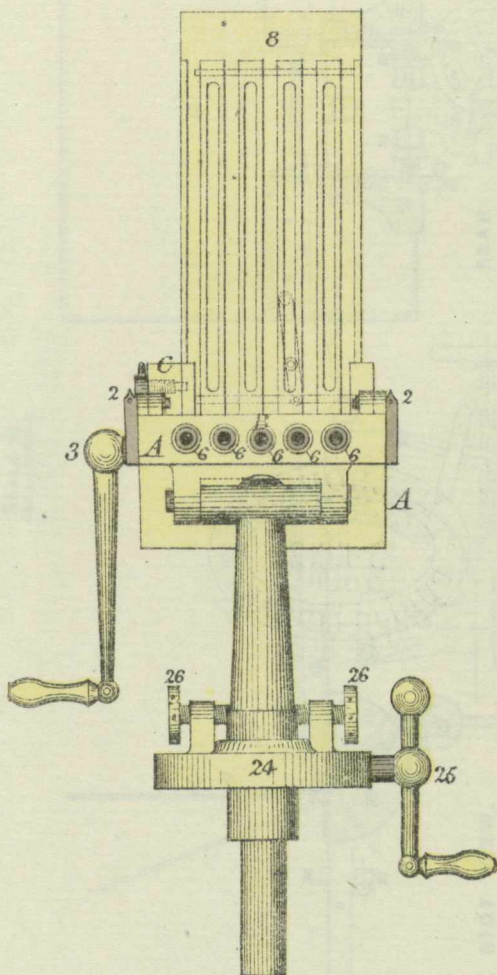
SCALE $\frac{1}{8}$.



*Rear View
with cover open shewing
feed arrangement.*

MACHINE GUN, CARDNER. (5 BARRELS.)

SCALE $\frac{1}{8}$.



Front View

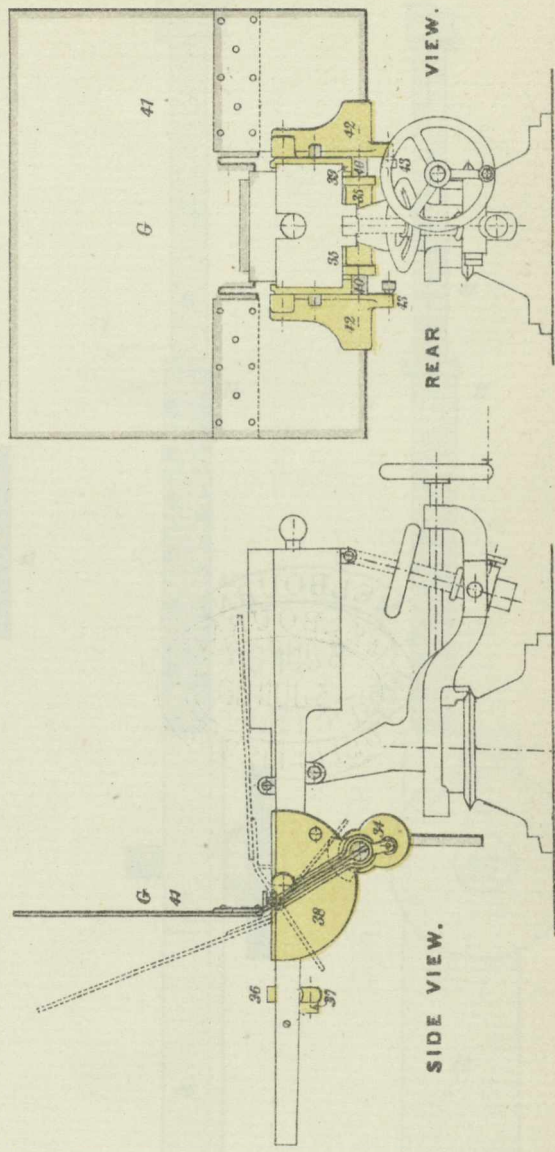
showing gun and traversing gear removed from tripod mounting.

MACHINE GUN, GARDNER.

(5 BARRELS)

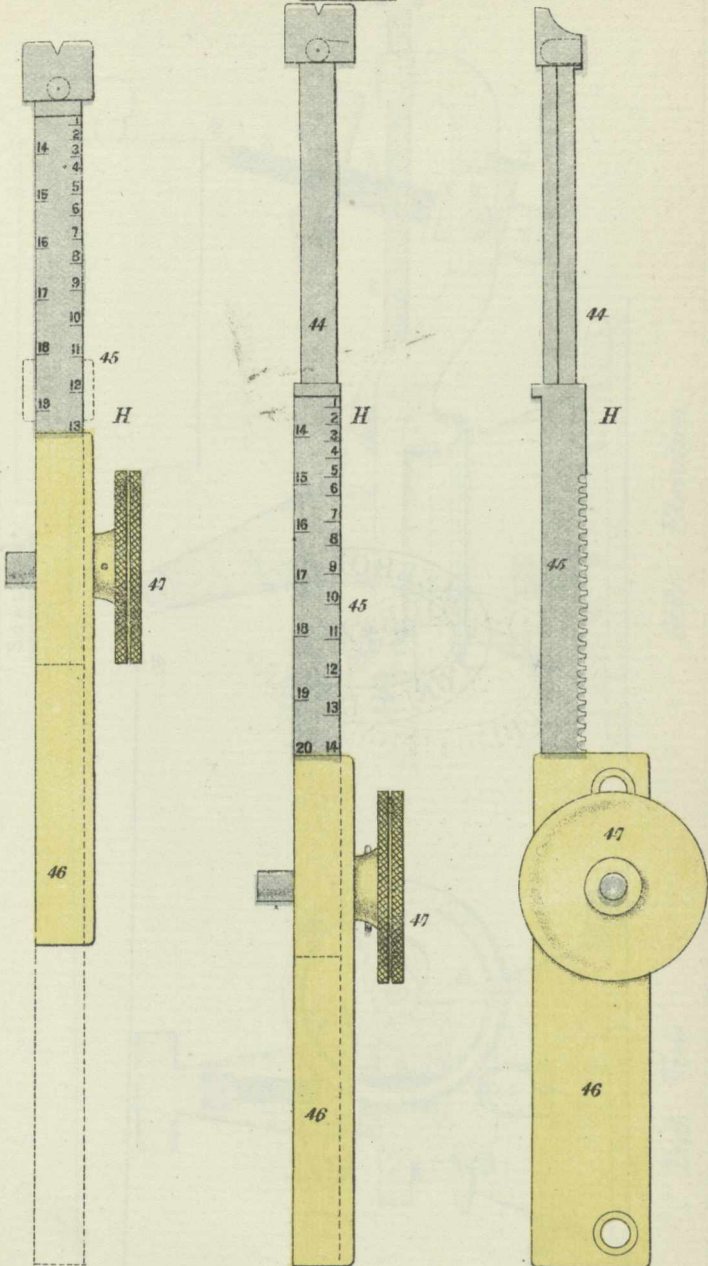
SHIELD

SCALE 1/8".



MACHINE GUN, CARDNER. (5 BARRELS.)
SIGHT, TANGENT, ELONGATING.

SCALE $\frac{1}{2}$.

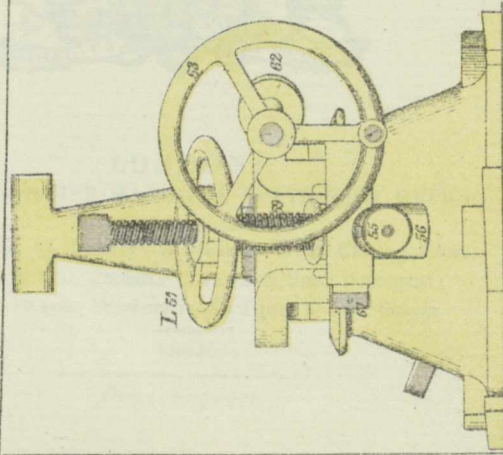


Front Views.

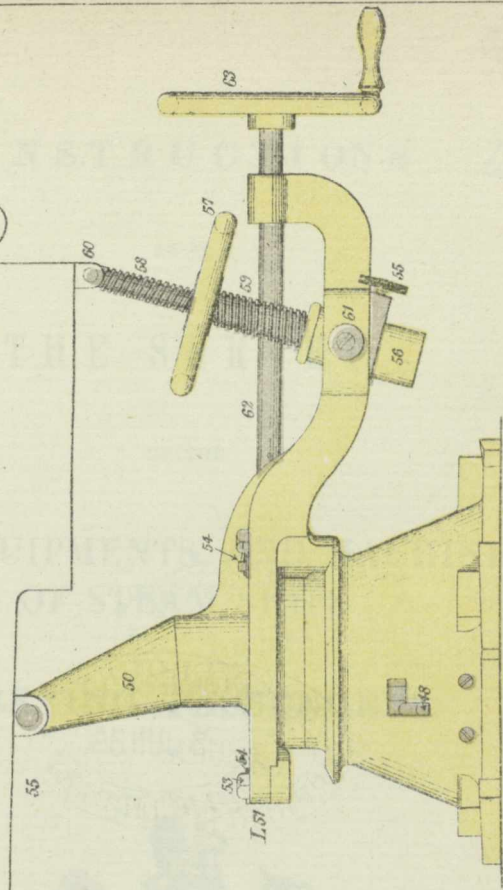
Side View.

MACHINE GUN, GARDNER. (5 BARRELS) CONE MOUNTING.

SCALE $\frac{1}{8}$ IN.



End View.



Side Elevation.