2.

HANDBOOK

OF THE

1″ 4-BARREL NORDENFELT GUN.

1889.

By command of the Lords Commissioners of the Admiralty.

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(*The letters and figures within brackets refer to the diagrams* I. *to* IX., XVIII. *and* XIX. *at the end of the book.*)

1″ 4-BARREL NORDENFELT GUN. (MARK I.)

NOMENCLATURE.

FRAME (A) - - Trunnions (1); underplate with screws (2); hand lever catch (3) with screw; cotter slots (4); cotters; cover stops (5).

FRONT CROSS-PIECE (B) Bolts and nuts (6) for do.; foresight slot (7).

CENTRE CROSS-PIECE (C) Fixing screws for do. (8); set screws (9) for barrels; hopper strip (10) with screws; cover lock (11).

BARRELS (D) - - Breech; bore; muzzle; chamber; recess (12) for cartridge rim; extractor slot (13).

FORE SIGHTS (E) - Fixing screws for do.

TANGENT SIGHTS (F) - Spring; pinion with spring washer and stop ring; milled head with taper pin; brackets with fixing screws.

COVER (G) - - - Pivot screws (14); cover arm (15); action block guides (16); cartridge guides (17); hopper catch with screw (18); hopper strip (19); hopper slide stop (20).

HOPPERS (H) - - Slide; stop screw.

ACTION BLOCK (K) - Spring bar (21) with screws; thumb screw (22) for do.; spiral springs (23); hammers 24; firing pins (25); breech plugs (26) with set screws (27); extractors (28) with screws (29) and springs (30); shield (31) with screws; cocking piece (68) with pin, spring (33), and screw; pivot block (32) and

screws (34); action cam plate (35) with screws; locking bolts (36) with screws; locking bolt plate (37) with stud* (38), washer and split pin; friction roller (39) with stud, collar, and pin.

CARTRIDGE RECEIVER(L) Catch for do. (40) with screws; lever (41); (41*a*) safety studs.

TRIGGER COMB (M) - Cocking cam (42); hammer studs (43); locking guide (44); firing piece (45).

REAR CROSS-PIECE (N) Trigger comb rests (46); tumbler with pin (47); tumbler spring (48) with screws; trigger comb stop (49) with screws; bracket (50) for axis pin with screws; number plate with screws; drill stop.

HAND LEVER (O) - Handle.

ACTION LEVER (P) - Friction roller (51) with stud and cross-pin; axis pin (52) with taper and split pins; trigger finger (53).

MOUNTING.

CONE (Q) - - - Pivot (54) with screws and steady pins; pivot bolt (55) with nuts and washer; worm ring (56).

CROSS HEAD (R) - Cap squares (57), cap square screws; cap square pins with chains.

ELEVATING - - Wheel (58) with key; outer screw (59); inner screw (60); pin (61); nut (62); pivot screws (63) with check nuts; adjusting break (64) with milled head.

TRAVERSING - - Wheel (65) with key; worm (66); spindle (67) with collar and split pin.

The different parts of this gun are not interchangeable. 150 guns of Mark I. pattern have been issued.

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* A keeper screw is also fitted in some of the guns of this mark.

(The letters and figures within brackets refer to diagrams I. *to* IX., XVIII. *and* XIX. *at the end of the book.)*

1″ 4-BARREL NORDENFELT. (MARK II.)

NOMENCLATURE.

The following changes in the Nomenclature of Mark I. gun are the modifications which constitute the Mark II. gun in so far as Nomenclature is concerned:—

FRAME (A)- - - Cover catch; screw for do.

CENTRE CROSS-PIECE (C) Lock (11) for cover has a horizontal instead of vertical motion.

HOPPERS (H) - - Bars across compartments between cartridge columns, to prevent wrong compartments being filled.

ACTION BLOCK (K) - Keeper screws for action cam plate screws; keeper screws for stud (38) of locking bolt plate.

REAR CROSS-PIECE (N) Bracket (50) for axis pin has a third fixing screw.

MOUNTING.

CONE (Q) - - - The screws for pivot (54) have nuts. The holes in the base of the cone are equidistant, and of the same diameter.

The Mark II. guns are interchangeable in the cross heads, and all their spare parts (excepting the cocking piece) are interchangeable.

215 guns of Mark II. pattern have been issued. The Mark "II." will be found on left trunnion in line with the W.D.

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

1″ 4-BARREL NORDENFELT. (MARK III.)

NOMENCLATURE.

FRAME (A) - · Trunnions (1); cover catch (2) with screw; hand lever catch (3) with screw; cotter slots (4); cotters; covers tops (5); action block guide lugs (30).

FRONT CROSS-PIECE (B) Bolts and nuts (6) for do.; foresight slots (7).

CENTRE CROSS-PIECE(C) Fixing screws for do.; recess (9) for cartridge receiver lever; hopper strip (10); cover lock (11) with screw.

BARRELS (D) - - Breech; bore; muzzle; chamber; recess (12) for cartridge rim; extractor slot (13).

FORESIGHTS (E) - - Fixing screws for ditto.

TANGENT SIGHTS (F) - Spring; pinion with spring washer and stop ring; milled head with taper pin; brackets with fixing screws; deflection leaf with screw motion.

COVER (G) - - Pivot screws (14); cover arm (15); action block guides; cartridge guides (17); hopper catch (18) with screw; hopper strip (19); hopper slide stop (20).

HOPPERS (H) - - Slide; stop screw; bars.

ACTION BLOCK (K) - Spring bar (21) with screw, and thumb screw (22) for do.; spiral springs (23); hammers (24); firing pins (25); breech plugs (26); extractors (28) with screw (29); guide slots; triangular cocking piece (32); action cam plate (35) with screw; locking bolts (36);

locking bolt plate (37) with screw (38); friction roller (39) with stud, collar, and pin.

CARTRIDGE RECEIVER(L) Lever slot (40); lever (41); (41*a*) safety studs.

TRIGGER COMB (M) - Hammer studs (43); locking guide (44); firing piece (45).

REAR CROSS-PIECE (N) Trigger comb rests (46); trigger comb spring (48) with holding stud; trigger comb stop (49); number plate with screws; drill stop; bracket for axis pin (50).

HAND LEVER (O) - Handle.

ACTION LEVER (P) - Friction roller (51) with stud and cross-pin; axis pin (52) with taper and split pins; trigger finger (53.)

MOUNTING.

CONE (Q) - - - Pivot (54) with screws, nuts, and steady pins; pivot bolt (55) with nuts and washer; worm ring (56.)

CROSS HEAD (R) - Cap squares (57), cap square screws; cap square keys with chains.

ELEVATING - - Wheel (58) with key; outer screw (59); inner screw (60); pin (61); nut (62); pivot screws (63) with check nuts; adjusting break (64) with milled head.

TRAVERSING - - Wheel (65) with key; worm (66); spindle (67) with collar and split pin.

Description.

The gun consists of a rectangular framework of wrought iron, the sides of which are connected by three plates or transoms.

The four barrels are placed side by side in the frame, their muzzle ends passing through the front cross-piece, while the breech ends are screwed into the centre cross-piece.

Action block. In rear of the centre cross-piece is the action block, which is capable of movement backwards and forwards.

In front of the action block are four breech plugs (26), corresponding to the barrels. These are of steel pierced with channels, in which firing pins move freely, and are furnished with extractors on the right sides. Behind each plunger is a hammer, with a projecting tenon; and behind the hammer a strong spiral spring.

On the under surface of the action block is—

1. The locking bolt plate (37), which pivots on an axis and by means of two curved slots gives reciprocating motion to the locking bolts (36).
2. A director or action plate (35), which is a cam secured to the action block, and having a slot into which fits a roller working on a stud on the action lever.

   A portion of this slot is the arc of a circle, concentric with that described by the arm; the remainder is straight, so that as the arm moves from the right to left the action block advances, and *vice versa*.

Trigger comb. Upon the brackets, secured to the rear cross-piece, is the "trigger comb" (M). This is a plate, capable of transverse movement, and having four teeth bevelled on the left side. A spring (48) fastened to the rear cross-piece presses the trigger comb against the left side of the frame. The cartridge

Cartridge receiver. receiver (L) is a cast-iron plate, having four longitudinal holes for the cartridge cases to drop through when extracted, and a similar number of strips on which to carry the cartridges when loading. It is capable of a slight lateral motion, which is given by the lever (41) pivoting freely on the motive axis (52), and moved to the right or left by the friction roller (39) on the under surface of the action block. The whole mechanism is set in motion by the lever handle (O), which is fixed to the motive axis (52). The safety studs (41*a*) are fitted so as to prevent the movement of the cartridge receiver, when a cartridge remains in the barrel.

The mounting of this gun is shown in diagrams I., II., X., and XI. The trunnions fit into a cross-head pivoting on a cone, which is firmly fixed to the gunwhale or other part

where the gun is to be fired. The training is given by a hand wheel, which works a worm gearing into a worm ring attached to the top of the cone. The elevation is obtained by a wheel working telescopic screws. One turn of the traversing wheel gives 6° of training and one of the elevating wheel 1½° of elevation or depression.

The action of the mechanism is as follows, supposing the discharge to have been just completed, the block closing the breech end of the barrels, and being still secured in its place by the two bolts (36):— Action.

1. The handle (O) begins to move to the rear; the friction roller (51) traverses the concentric part of the action plate, and the action block remains steady. Handle moving to the rear.

   The spring (48) and the heel of the lever, acting on trigger comb, drives it from right to left.

2. As the movement continues, the toe of the action lever acts on the locking bolt plate, and withdraws the bolts (36), leaving the action block free.

3. At the moment these bolts are withdrawn the friction roller (51) engages in the straight part of the action plate, and the action block begins to move back, drawing with it the breech plugs which extract the cartridge cases.

4. When the breech plugs are clear, the friction roller on the action block bears against the forked lever (41) and so pushes the receiver to the left. At the same time (in the Mark I. and II. guns) the cocking piece on action block begins to press against the cocking cam on trigger comb, carrying the latter to the right.

   In the Mark III. gun the bevelled side of the tenons of the hammers press against the bevelled side of the teeth of the trigger comb, and thus carry it to the right.

   The empty cartridge cases fall to the ground, and are replaced by filled ones. The tenons of the hammers pass behind the hammer studs of the trigger comb, which is driven to the left by the spring (48), or by the cocking piece as the action block moves forward.

   In the Mark III. gun the triangular cocking piece (32) pushes the trigger comb to the left, in case the trigger comb spring fails to act.

   The handle (O) is now as far back as possible, and the block in its furthest position from the barrels.

Handle moving forward.

The handle next moves forward with the following effect:—

1. The friction roller (51) on the action lever acts on the action cam plate, and moves the action block to the front. The friction roller on action block, pressing against the fork (41), drives the receiver to the right, thus placing the cartridges in line with the barrels.
2. The action block advances to the front, and the spiral springs are compressed by the hammers, which are kept back by the trigger comb. The breech plugs push the cartridges into barrels.
3. When the cartridges are quite home the action block stops, and the toe of the action lever causes the locking bolt plate to drive the locking bolts (36) into the holes in the gun-frame, so that the breech-closing is complete.
4. The action lever now begins to carry the trigger comb to the right.

   Each hammer is released in turn from the tooth which retains it, and the striker pertaining to it is driven forward in consequence.

Order in which the barrels fire.

In Mark I. and II. guns the barrels are fired successively, commencing with the right-hand one and ending with the left-hand one.

In Mark III. gun, the second barrel from the right fires first, next the third barrel from the right, next the right-hand barrel, and lastly the left-hand barrel.

Drill stop.

The action of the drill stop is this; the hand lever is brought up by it before it has completed the back stroke, so that the hammers cannot pass behind the trigger comb. Thus, the gun is not full cocked, because the springs are not compressed when the action block moves forward.

Sights.

There are three patterns of sights at present in use, viz., one which is graduated as far as 1,800 yards and without any deflection leaf; another, a later pattern, which is graduated as far as 1,900 yards and fitted with a deflection leaf, by which 1° 30′ deflection can be obtained either right or left, this deflection leaf is moved by a horizontal screw fitted with a milled head, and a third, intended for long ranges, graduated from 1,900 to 3,000 yards. These sights are interchangeable.

Instructions for keeping the Gun in Working Order.

Action block.

To take off the action block.—The gun's crew should be instructed to do this as follows:—No. 1 places himself on

the left and No. 2 on the right of the gun. If the hopper is on, No. 1 releases the hopper catch, and takes off the hopper.

No. 2 opens the spring lock and No. 1 raises the cover.

No. 1 releases the cartridge carrier lever catch*; No. 2 draws back the hand-lever until the breech plugs are well clear of the cartridge receiver; No. 1 puts his right hand and No. 2 his left hand through the cartridge slots, raise the cartridge receiver straight up, and No. 2 carries it off to the right side.

No. 2 brings forward the hand lever with his left hand, taking care that the springs are released, until the extractors come within one inch from the centre cross piece; No. 1 takes hold of the left breech plug with his right hand, and No. 2 the right breech plug with his left hand; both raise the action block until the breech plugs are clear of the centre cross-piece, taking the greatest care that the extractors do not catch against the centre cross-piece or the hopper strip; draw the action block forward until the rear end is clear of the cover arms; raise the action block straight up on end and carry it off to the left side.

To replace the action block.—Proceed in the reverse way.

To clean and oil the gun.—The gun's crew should be specially trained to keep the gun in good working order, and great care should be taken to prevent the accumulation of rust, grit, and dust; use Rangoon oil often, but a little at a time, to prevent it from clogging. Cleaning and oiling.

The mechanism should be cleaned and oiled every morning; and the chambers cleaned and oiled whenever an opportunity offers during firing.

The barrels and chambers are cleaned without removing the action block by simply opening the cover, pushing the hand lever into the "ready" position, and cleaning from the muzzle with tow on the cleaning rod, and then oiling the chambers from the breech.

When the mechanism is to be cleaned and oiled, the action block should be taken off, and the trigger comb lifted out by hand; then clean hammers and firing pins, putting on little or no oil, and see that they move quite freely in their channels; clean off all clogged oil and put on fresh oil on the trigger comb rests, studs, and cocking cam and tumbler, into the friction rollers, action cam plate, locking bolts and plate, on the sliding surfaces of the frame for action block and cartridge carrier, on the cocking piece,

* There is no cartridge receiver lever catch in Mark III. gun.

on the working surface of the cartridge receiver lever, on the trunnions and into all the oil holes of the crosshead; feel that the locking bolts run freely; then re-assemble the gun.

The gun's crew should be instructed how to shift spiral springs, hammers, firing pins, and extractors.

Spiral springs.

To change spiral springs.—The action block need not be dismounted; bring back the hand lever to its rearmost position; unscrew the thumbscrew until the shoulder is free; raise the spring bar gradually and let it fall to the left, the chest being placed close behind the action block, so that the spiral springs do not jump out of the gun; change any desired spring; replace the spring bar, and screw home the thumbscrew.

Hammer Mark I. & II.

To take out a hammer or firing pin.—Take out the spiral springs and dismount the action block as above described; place the action block upright, when the four hammers fall down on the spring bar of their own weight, and push the firing pin down with the brass rod provided for this purpose, when the firing pin falls down on to the hammer; turn the action block on its back; open the spring bar; take out and replace hammer or striker; replace all the spiral springs, and close the spring bar.

In putting in a new firing pin, hold it at its rear end through the hammer head slot and push it into its place in the base of the breech plug.

Extractor. Mark I. & II.

To change an extractor.—Press the extractor outwards until the brass rod can be inserted between the extractor spring and the breech plug (*see* Plate IX.); push the brass rod slightly rearwards so as to leave the extractor free when back in position; screw out the extractor screw; change the extractor for a new one out of the tool box; screw home the extractor screw and withdraw the brass rod so that the spring gets into position again.

Mark III.

In the Mark III. gun the centre of the extractor spring must be held down firmly and the extractor screw then taken out. Before putting in an extractor care must be taken that the firing pin is right forward, so that the lug on the rear end of the extractor is behind the shoulder; then by pressing down on the centre of the extractor, the screw may be replaced.

Instructions to be Observed when Working the Gun.

Precautions before firing.

The gun is always to be examined before firing to ascertain:—

1. That the extractors are in working order and not broken.

2. That the firing pins are not jammed by rust or otherwise.
3. That the trigger comb works properly, and the springs are in place.
4. That the cocking piece is not broken, and that the spring attached to it is in working order. This applies to Mark I. and II. guns only.

Loaded hoppers are *never* to be passed up unless target practice is to be carried out. Loaded Hoppers.

In case the elevating screw becomes too easy or runs down when firing.—Tighten the adjusting break screw until the elevating hand wheel requires a suitable force to move it, without making it too stiff to be easily worked round. Elevating screw too easy.

In cases of repeated misfires during firing.—If the caps have not been struck, it is probable that the hand lever has not been moved fully backwards as far as it will go, in which case the gun has not been cocked, or that the hand lever has not been moved fully forwards as far as it will go, in which case one or more hammers have not been released and the corresponding cartridges have been passed through the mechanism without being fired. Misfires.

If the percussion caps have been insufficiently struck, it is probable either that a spiral spring, a hammer head, or a firing pin has broken (in which case exchange the broken part), or that the firing pin or its hole has not been cleaned.

If the percussion cap has been fairly struck, but has not fired the powder, it is probable either that the cartridge has got damp, or that the cap has been too deep set or its fulminate disturbed.

In case the hand lever is stopped in firing by any obstruction, no violence must on any account be used, but the handle should be gently drawn backwards and forwards once or twice as far as it will go, when the obstruction will probably be cleared away. Jams.

It sometimes happens that an extractor spring breaks during practice. Extractor springs breaking.

Should this occur when it is not desirable to cease fire sufficiently long to remove the breech plug and shift the extractor spring, the extractor must be removed and the corresponding column of the hopper not filled.

The breech plug should be removed and the broken spring replaced by a new one as soon as possible in order that practice may be continued with all four barrels. Mark I. & II.

Since the extractor and its spring consist of one piece of metal in the Mark III. gun, if the spring breaks the Mark III.

extractor becomes detached, in which case proceed with the firing, leaving the corresponding column of the hopper empty, or, if there is time, put in a new extractor.

In case one barrel is injured or disabled, the remaining barrels can still be fired without difficulty by only filling the compartments of the hoppers which correspond to the barrels which are in good condition.

If much verdigris has formed on a cartridge case, it will be found very difficult to extract after firing, and most probably the rim will tear away. Such cartridges should not be fired unless well oiled all over.

If the obstruction causes a jam so that the hand lever cannot be moved either forwards or backwards, put the hand underneath the cartridge carrier, and remove any fired case which may hang jammed in the cartridge carrier; if the jam is still not cleared off, remove the action block as above described, and find out and remove the cause of the jam.

In guns that have been fitted with safety studs, if any cartridge is not extracted, the cartridge carrier cannot move to the left; the gun, therefore, will not work until such cartridge has been removed.

If the jam was caused by a broken extractor, exchange it as above described.

Gun unsteady.

If the gun becomes unsteady, so that the volleys fired cause the muzzles to jump, tighten well home the upper pivot bolt nut; if this is not sufficient, screw home hard the elevating pin, ease the check nuts, tighten the pivot screws into the elevating nut, and screw up the check nuts again; if the gun is still unsteady, the cone must be raised, the check nut below the pivot bolt eased, the lower pivot bolt nut screwed home as hard as possible, the check nut tightened, and the cone fastened down again.

If the hand lever becomes loose, drive home the taper pin, and see that the split pin is fixed.

Drill stop.

When not actually firing, the drill stop should always be in action, as otherwise the firing pins are liable to be damaged by repeated snapping.

Pause in firing.

When firing at all Nordenfelt guns, the lever must be drawn fully backwards and forwards until brought to a stop. The men should be taught to make a *slight pause,* both at the end of the forward and backward motion, to diminish the danger of hang fires and to give the springs time to act.

Failures which may occur with the Gun.

1. If an extractor is broken or fails to act, the cartridge will be fired, and the empty case will remain in the chamber, as this will prevent the cartridge carrier moving to the left; it must be pushed out with the cleaning rod inserted from the muzzle. Extractor.

When this occurs, the hopper should be removed and replaced by a fresh one, with that column empty which corresponds to the barrel with the broken extractor.

If time permits, shift the extractor.

2. If the firing pin fails to act, the cartridges will pass through the mechanism unfired. Firing pin.

3. If the extractor and firing pin both fail, a loaded cartridge will be left in the chamber, and, at guns *not* fitted with safety studs, the point of the bullet of the next cartridge will take against its base, whence an accident is likely to occur.

The firing should stop, and the hopper should be removed. The loaded cartridge should be driven back with the cleaning rod, care being taken that it is not driven hard against the breech plug.

The firing may be continued with the other barrels, using a hopper with one empty column.

4. If the cocking piece breaks, the hammer of the left barrel will continue to cock the gun by acting on the trigger comb, but the practice should cease as soon as possible, and a fresh cocking piece should be fitted. Cocking piece Mark I. & II.

5. If the spring fails, the cocking piece will still continue to act, but it should be replaced as soon as possible.

The cocking in the Mark III. gun is effected by the hammers themselves, therefore the above remarks about the cocking piece do not apply to it. Mark III.

6. If the tumbler spring fails, the whole of the hammers may not be caught by the trigger comb; a portion may be, and the corresponding cartridges will be, fired. No danger can result from this cause, but the practice should invariably cease as soon as possible, until the spring has been replaced. Tumbler spring. Mark I. & II.

This last remark does not apply to Mark III., which will be cocked equally well without the trigger comb spring by the action of the triangular cocking piece on the cocking cam of trigger comb. Mark III.

Instructions for Mounting the Gun and for taking it to Pieces.

The following instructions are for the use of armourers, who should alone be permitted to take the gun to pieces.

Cone. *To mount the cone.*—Screw home as tightly as possible the pivot bolt nut and checknut underneath the cone; tighten down all pivot screws with screw driver.

Crosshead. *To mount the crosshead.*—Place the crosshead on the pivot, put washer on the pivot bolt and screw down the upper pivot bolt nut as tightly as possible, ease the check-nuts on the elevating pivot screws, see that these pivot screws are screwed home, so that elevating screws are steady, then tighten check-nuts. If the training spindle is not fixed, place the worm in its position with the keyway upwards, then push the spindle home with the key upwards; fix the collar with taper pin.

Gun. *To mount the gun.*—Raise trunnion caps, run down the outer elevating screw as far as it will go, and the inner elevating screw until the arrowhead on the threads meets the arrowhead on the upper surface of the hand wheel collar; place the gun with the trunnions in their bearings; close the caps and fix them by the keys; fit the eye of the inner elevating screw to the hole in the frame and screw home the elevating pin. If the hand lever is not fitted on the gun, put it on the lower end of the axis pin, drive in taper pin and put in split pin.

To dismount the gun, crosshead, and cone.—Proceed in the reverse way.

Breech plugs. Mark I. & II. *To remove the breech plugs.*—Having first removed the extractors, release the set screws and unscrew the breech plugs with the special spanner, the extractor spring will then fall out.

Mark III. In the Mark III. gun there are no set screws, but the ends of the extractors are made to serve their purpose, so the extractors must first be removed; then proceed to unscrew the breech plugs.

Mark I. & II *To replace a breech plug*—Place the extractor spring in position; screw the breech plug into the action block with the right hand, pressing the left thumb on the back of the extractor spring, so that it is not displaced by shoulder of taphole; screw home the breech plug until the extractor way is perfectly level with the other extractors; fix the set screws; put in the extractor; move the action block

slowly forward, and see that the extractors do not catch inside the extractor slots in the cartridge receiver, nor in the barrel.

In the Mark III. gun the breech plug is screwed in alone, and when home the extractor must be replaced; it then serves to prevent the plug from unscrewing. Mark III.

To remove the barrels.—Take out the bolts in the front cross-piece; slip the front cross-piece forwards off the muzzles of the barrels; release the set screws underneath the breech end of the barrel, and screw out the barrel with the large spanner. Barrels. Mark I. & II.

In the Mark III. gun there are no set screws, and the barrels can be unscrewed as soon as the front cross-piece is removed. Mark III.

To remove the rear cross-piece.—Dismount the mechanism, drive out the cotters, and pull out to the rear. Cross-pieces.

To remove the centre cross-piece.—Dismount the mechanism; remove the barrels and the rear cross-piece; push the rear ends of the frame outwards with the knees until the centre cross-piece can be taken out of its sockets, then pull it out to the rear.

To replace barrels, rear cross-piece, and centre cross-piece.—Proceed in the reverse way.

To strip action block.—Take out spiral springs, hammers, firing pins, and extractors; lift off locking bolt plate after taking out split pin and washer; push each locking bolt outwards until the guide screw can be screwed out; then draw out the locking bolts; take off the friction roller after having driven out the pin and collar. Action block. Mark I. & II.

In the Mark III. gun the screw of locking bolt plate must be removed by first unscrewing its set screw and then taking it out, when the plate will be free and the bolts can be removed; otherwise proceed as in Mark I. and II. guns. Mark III.

To test springs.—The springs in the gun should be tested at fixed intervals, and re-set if required, or replaced by spare springs. The extractor spring is tested by ascertaining that the extractor hook will stand 8 lbs. pull outwards before it can be moved, and that the firing pin when out has to be pushed by 2 lbs. before it recedes. The tumbler spring should be strong enough to necessitate a pull of 16 lbs. to the right before it can be moved. Springs.

In Mark III. gun the test for trigger comb spring is 4 lbs.

The fore-sights should always be removed before shipping or unshipping the heavy shields to prevent their being injured. Fore-sights to be removed.

Handspike, Machine Gun, releasing Cones from holding down Rings.

Instructions for Armourers for alteration of holding down rings to suit the above mentioned handspikes.

See Diagram XIX.

Parts issued.

Gauge, marking position of slot (A), per ship - - 1
Gauge, width and depth of slot (B) per ship - - - 1
Instructions, copies of, per ship - - - - - 1

Instructions.

Place the Gauge A., Fig. 1 on the top surface of the holding-down ring, and bring the face C up against the end of the lug D., Fig. V.; then with a scriber mark off the opening E.; this will give the correct position for the slot F. Observe that the lug worked from is the one opposite the set screw.

Drill, chip, and file out the slot to the lines and to the Gauge B., Fig. I.; this gauge is to be used from the inside of the ring when working for width, the end (G) just standing flush with the outer wall of the holding-down ring when the slot is finished.

Figs. II. and III. shew the method of applying the marking gauge to the holding-down ring.

Fig. IV. shows part of the ring with the slot F. cut in it.

To release the cone.

Turn back the set-screw. Pass the handspike H through the slot in ring, as shewn in Fig. V., and pull in the direction indicated by the arrow.

The following list shows a gun complete with the proportion of spare parts and tools allowed.

Gun, Nordenfelt, 1-inch, 4 bl., Mk. I., II., or III.	1
Hoppers	7
„ drill (2 issued to each ship).	
Mounting, cone	1
Sight, tangent, long range	1

SPARE PARTS.	Proportion allowed.		
	To each Mk. I. Gun.	To each Mk. II. or III. Gun.	
		In Ships with 1 or 2 Guns only.	In Ships with more than 2 Guns.
*Cocking pieces	1	1	1
Extractors	8	12	8
Hammers	3	6	4
Hopper catch	—	1	1
Friction roller with stud, collar and pin	2	2	2
Pins, firing	8	12	8
„ taper for axis pin	—	1	1
*Screws, cocking piece spring	1	1	1
„ extractor	4	4	4
Sight, fore, with fixing screw, left	1	1	1
„ „ „ right	1	1	1
„ tangent, with split pins, spare	2	2	2
*Springs, cocking arrangement	1	1	1
* „ extractor	2	6	4
„ sight, tangent	2	2	2
„ spiral, brake	4	2	2
„ „ drill, stop	4	2	2
„ „ lock	8	12	8
* „ tumbler	2	2	2
† „ dagger comb	—	2	2

* For Mk. I. and II. only. † For Mk. III. only.

TOOLS.

Cans, oil	1	1 set for every 4 or less number of guns.
Drifts, brass wire	4	
Drivers, screw	1	
„ „ for extractor screws	1	
Punches, pin, of traversing spindle	1	
Rods, cleaning	4	
Spanners, large	1	
„ small	1	

AMMUNITION.

The general dimensions of the cartridge are shown on diagram VII., from which it will also be seen that there is no anvil, but a small boss in the chamber instead.

The powder charge weighs 625 grains, and is pressed into the cartridge case, care being taken that it shall always occupy the same space. The effect of this pressure is to break up the weaker grains, and to form a hard solid mass of dust with grains interspersed. The bullet weighs 7¼ oz., and is of steel, the point being hardened; round the base is a cannelure into which the envelope is choked, and on the base are several radial cuts into which it is set on firing.

The space between the envelope and the inside of the cartridge case is filled with pure beeswax as a lubricator.

The rotation is given by the envelope, which is made of very thin brass, the base being shaped into the form of a gas check, and the front end carefully turned over the shoulders of the bullet.

The cartridges are packed in bundles containing 12.

The weight of each bundle is about 8 lbs. 9 ozs.

These bundles are stowed in an ammunition box, Mark IX. or Mark XI.; either of these boxes contains 8 bundles, that is 96 rounds.

The weight of the box filled is 82 lbs.

When any Nordenfelt ammunition boxes, from which a portion of the ammunition has been removed, are required to be returned into store, or to be moved for any other purpose, the vacant place should be completely filled with wood, tow, or other substance, to prevent danger of explosion by the cartridges moving about and striking against each other.

All hoppers on board are to be kept filled.

TABLE of ALLOWANCE of AMMUNITION for 1" NORDENFELT GUNS.

No. of Guns.	No. of Boxes for each Gun.	Total No. of Boxes.	No. of Rounds for each Gun.	Total No. of Rounds for all Guns.	Equipment Weight.	Mark I. and II. T. C. Q. L.	Mark III. T. C. Q. L.
					Guns - -	0 7 1 18	0 7 2 27
					Ammunition -	3 0 0 0	3 0 0 0
1	80	80	7,680	7,680	Total -	3 7 1 18	3 7 2 27
					Guns - -	0 14 3 8	0 15 1 26
					Ammunition -	5 5 0 0	5 5 0 0
2	70	140	6,720	13,440	Total -	5 19 3 8	6 0 1 26
					Guns - -	1 2 0 26	1 3 0 25
					Ammunition -	7 17 2 0	7 17 2 0
3	70	210	6,720	20,160	Total -	8 19 2 26	9 0 2 25
					Guns - -	1 9 2 16	1 10 3 24
					Ammunition -	9 0 0 0	9 0 0 0
4	60	240	5,760	23,040	Total -	10 9 2 16	10 10 3 24
					Guns - -	1 17 0 6	1 18 2 23
					Ammunition -	11 5 0 0	11 5 0 0
5	60	300	5,760	28,800	Total -	13 2 0 6	13 3 2 23
					Guns - -	2 4 1 24	2 6 1 22
					Ammunition -	12 7 2 0	12 7 2 0
6	55	330	5,280	31,680	Total -	14 11 3 24	14 13 3 22
					Guns - -	2 11 3 14	2 14 0 21
					Ammunition -	14 8 3 0	14 8 3 0
7	55	385	5,280	36,960	Total -	17 0 2 14	17 2 3 21
					Guns - -	2 19 1 4	3 1 3 20
					Ammunition -	15 0 0 0	15 0 0 0
8	50	400	4,800	38,400	Total -	17 19 1 4	18 1 3 20
					Guns - -	3 6 2 22	3 9 2 19
					Ammunition -	16 17 2 0	16 17 2 0
9	50	450	4,800	43,200	Total -	20 4 0 22	20 7 0 19
					Guns - -	3 14 0 12	3 17 1 18
					Ammunition -	18 15 0 0	18 15 0 0
10	50	500	4,800	48,000	Total -	22 9 0 12	22 12 1 18
					Guns - -	4 8 3 20	4 12 3 16
					Ammunition -	20 5 0 0	20 5 0 0
12	45	540	4,320	51,840	Total -	24 13 3 20	24 17 3 16

Penetration.

When fired at direct the service ammunition is capable of perforating a ¾-inch Bessemer steel plate at about 200 yards, and a ⅝-inch plate at 300 yards.

Experiments at High Speeds against Torpedo Boats.

The following is a summary of some experiments carried out at Spithead on 13th July, 1880 :—

A 1-inch gun was mounted in a favourable position on the top-gallant forecastle of H.M.S. "Iris," and practice was carried out against wooden models of 2nd class torpedo boats, 60 feet long and 7½ feet extreme breadth.

	1st Run.	2nd Run.
No. of rounds - - -	102	111
Time - - -	1m. 9sec.	1m. 10sec.
Total rounds - - -	213	
No. of hits - - -	110	
Percentage of hits - -	51·6	
Hits per minute - - -	47·4	

In the third run, fire was opened when the target was four points on the bow, and ceased when it bore the same on the quarter. The range varied from 170 to 250 yards, the distance run while firing being about 350 yards.

No. of rounds - - - -	58
„ hits - - - - -	38
Time - - - - - -	22 sec.

Three volleys were lost owing to the drill stop being down.

The speed of the ship in these trials was about 18 knots through the water and about 20 knots over the ground.

Result of Experiments carried out against Cartridges for 1-inch Nordenfelt Guns.

26th November, 1880.

A box of Nordenfelt ammunition, containing 96 rounds, was experimented with to ascertain the effect of exploding one of the cartridges in the centre of the box.

This was done by a fuze inserted into the cartridge, the cap being removed.

Only the cartridge fired by the fuze explod the box was broken to pieces and all the othe were scattered about, except four packets (32 ro

None of the 95 cartridges were injured, and all have loaded.

A 1-inch bullet was also fired into a case; five and jammed six.

The five exploded seem to have been actuall by the bullet fired, or by the point of others fo them.

TABULATED STATEMENT of the RESULT of an EXPERIMENT with CHARGES of VARIOUS NATURES when fired at by MARTINI RIFLE and NORDENFELT GUN.

The trial took place on Whale Island. The charges were placed about 120 yards from the guns. When the rifle failed to explode a charge the Nordenfelt gun was fired at the same charge.

20th September, 1880.

GUN.	CHARGE.													
	80 lbs. Pebble, 2.			80 lbs. Prismatic.			22 lbs. R.L.G.				44 lbs. Pebble.		8 lbs. L.G.	
	In Zinc Cylinder.	In Clarkson's Case.	Exposed.	In Zinc Cylinder.	In Clarkson's Case.	Exposed.	In Zinc Cylinder.	In Clarkson's Case.	In Leather Case.	Exposed.	In Clarkson's Case.	Exposed.	In Leather Case.	Exposed.
Martini Rifle.	Exploded	Exploded	Exploded	Exploded	Exploded	Exploded	Not exploded.*	Not exploded.*	Not exploded.*	Not exploded.*	Exploded	Exploded	Not exploded.*	Not exploded.*
Nordenfelt.	—	—	—	—	—	—	Exploded	Not exploded.	Not exploded.	Not exploded.	—	—	Not exploded.	Not exploded.

* Several rounds were fired in each of these cases.

The powder was very much pulverised in those charges which were not exploded, and in several cases the bag split up, and the powder scattered about the ground.

Accuracy.

The mean absolute deviation at 300 yards is about 5.3 inches.

Dummy Cartridges.

The dummy cartridge Mark II. is made of phosphor bronze lined with wood and is the same weight as the service cartridge, and of the same dimensions. The base is closed by a screw plug of phosphor bronze, having a conical hole in the centre to receive a piece of indiarubber which serves as a cushion for the striker of the gun; it is faced with a small steel disc to prevent wear. To distinguish it from the service cartridge it is tinned all over.

The Mark I. dummy cartridge had a hardened lead bullet, a case filled with sawdust, tinned on the outside and an empty percussion cap in the base.

These cartridges are packed in bundles containing 12. The weight of each bundle is about 7 lbs. 12 ozs. These bundles are stowed in an ammunition box Mark IX. or Mark XI.; either of these boxes contains 8 bundles, that is 96 rounds. The weight of the box filled is 75¾ lbs. Each ship carrying Nordenfelt guns will be supplied with one box of dummy cartridges.

Weights and Dimensions.

	Mark I. and II.	Mark III.
Weight of gun	lbs. 426	447
„ mounting	„ 357	373
„ hopper, empty	„ 20	20
Total weight	„ 803	840
Barrels, number	4	4
„ calibre	inches 1	1
„ length, extreme	„ 35·48	35·48
„ „ from base of bullet to muzzle	cal. 33·25	33·25
Rifling, description	Henry	Henry
„ number of grooves	11	11
„ twist in calibre uniform	1 turn in 60 inches for Mark I. 1 turn in 35 inches for Mark II. and III.	
„ length of	inches 31·37	31·37

	Mark I. and II.	Mark III.
Hopper, number of columns	4	4
„ „ cartridges in each column	10	10
„ Weight filled	lbs. 48	48
Projectile, nature,	solid steel	
„ weight including envelope	oz. 7·25	7·25
„ length	cal. 2·675	2·675
Envelope, weight of	oz. ·8	·8
Charge, weight of	„ 1·43	1·43
Cartridge case, weight of	„ 2·52	2·52
Total weight of cartridge	„ 11·21	11·21
Length of gun, action block forward	in. 57	57·0
Length of gun, action block back	„ 65	64·25
„ from pivot to rear of action block when back	„ 32	30·75
Width across trunnions	„ 20·14	20·14
Height from bottom of cone to centre of trunnions	„ 20·75	20·75
Do. do. to top of hopper	„ 35	35
Elevation	17°	17°
Depression	30°	30°
Motion of cartridge carrier	in. $1\frac{5}{16}$	$\frac{7}{8}$

ANGLES MADE BY LEVER DURING LOADING, FIRING, &c.

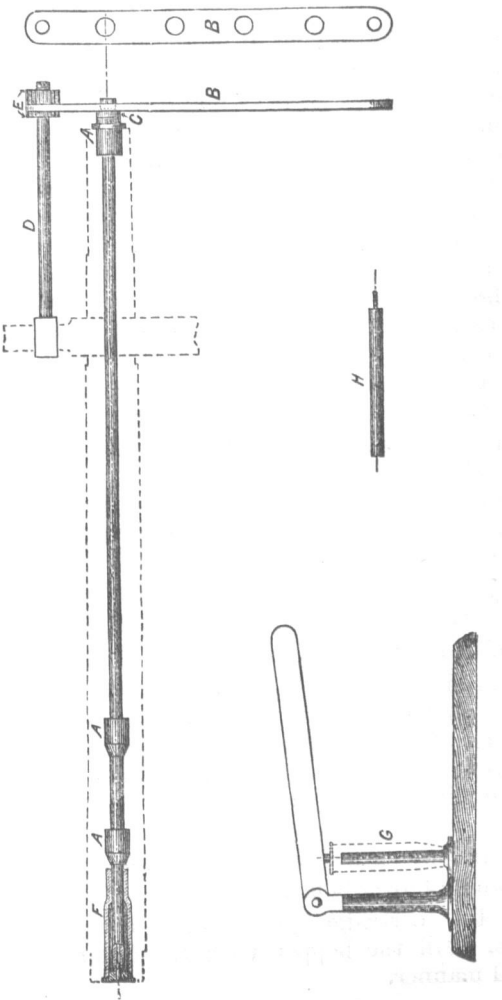
	Total number of degrees passed through by lever. Mark I. and II.	Mark III.
Motion of action block commences	0° „ 0′	0° „ 0′
„ cartridge receiver commences	2 „ 20	3 „ 50
„ cartridge receiver ceases	12 „ 0	6 „ 10
„ action block ceases	71 „ 30	72 „ 0
„ locking bolt commences	77 „ 0	77 „ 0
„ locking bolt ceases	80 „ 0	80 „ 0
First shot	86 „ 0	86 „ 0
Second „	89 „ 0	89 „ 0
Third „	92 „ 0	92 „ 0
Fourth „	94 „ 40	94 „ 40
End of stroke	97 „ 0	97 „ 0

Aiming Tubes, Nordenfelt, 4-Barrel.

The tube, which is of steel, has a calibre of 0.215 inch. It is a smooth-bore for 17·75 inches from the breech end, and is rifled for the remainder of its length with eight grooves. It fires the same ammunition as Morris's aiming tube for the Martini-Henry rifle.

The external diameter of the tubes is $\frac{1}{2}$-inch ; they are supported in the centre of the barrels by three gun-metal bushes (*A*) which are tinned to the tubes. The fore-ends of

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



the tubes project about 1·2 inches from the muzzle, and the rear-ends come to within about $\frac{3}{8}$-inch of the breech end of the barrels. The tubes are fixed in this position by a cross-bar (*B*), which passes over the tube and bears against the front gun-metal bush, which is flanged to prevent the tube being pushed too far into the barrel.

Between the cross-bar and the flanged bush india-rubber washers (*C*) are interposed, which act as a spring to keep the flange firmly against the muzzle of the barrel; but at the same time, if necessary, owing to any irregularity in the length of the barrels, allowing the tube to move longitudinally in the barrel. The cross-bar is kept up to its work by the two clip arms (*D*). These arms are furnished with clips which fit on to the front crosspiece of the gun. The fore-ends of the arms pass through holes in the cross-bar, and are screwed and fitted with nuts (*E*).

The dummy cartridge (*F*), or cartridge carrier, is made of gun-metal with a steel base about $\frac{3}{8}$ inch thick. This base is chambered to receive the aiming cartridge. The chamber is made small enough to require the aiming cartridge to be pressed into it, so that it may keep its position in falling from the hopper to the gun. The rear end of the tube is chambered to receive that part of the aiming cartridge that stands through the base of the dummy cartridge. The dummy cartridge is bored out to fit the end of the tube, over which it passes as it is being pushed into the chamber of the gun barrel.

A cartridge press (*G*) is furnished to force the aiming cartridges into the dummies. This is a wooden stand with a gun-metal stem, upon which the dummies are placed, whilst a lever jointed to a standard upon the same base gives the necessary pressure.

The ejector (*H*) is a steel drift with which the empty cases are driven out of the dummies after firing.

The tubes are used as follows :—

Carefully insert the tubes in the barrels from the muzzle end. See that there are two india-rubber collars on each tube. Place the clip arms over the front crosspiece. Take off the front nuts, and having placed the cross-bar over the tubes and clip arms, replace the nuts and screw up until the cross-bar bears well against the india-rubber collars.

Try a dummy cartridge in the barrel chamber and see that it can be forced home.

With the cartridge press force cartridges into the dummies. Fill the hopper with the dummies, and fire in the usual manner.

After firing, the tubes must be taken out immediately, and the chambers and bore of the barrels well cleaned and oiled.

The following comprise one set of tubes and fittings :—

Tubes, each with two india-rubber collars	4
Cross-bar	1
Clip arms, each with two nuts	2
Cartridge press	1
Ejector	1
Cleaning rods with brush	2
Dummy cartridges, any number not less than one per tube.	

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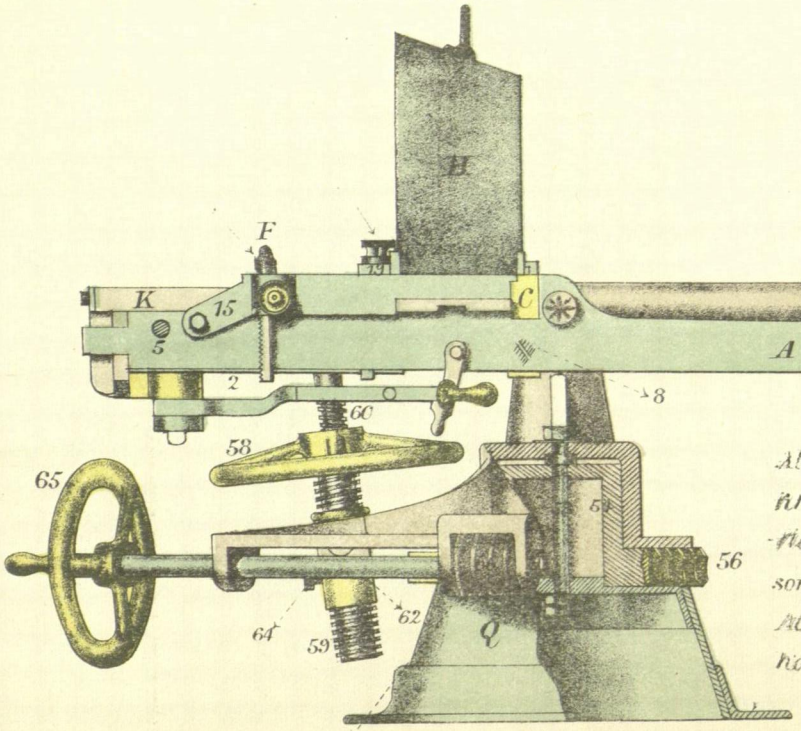
NORDENFELT GUN. MARK I AND II.

Diagram I.



All Mark I & II Guns are now being fitted with tangent sights with deflection leaves. Also with hopper catches somewhat similar to Mark III.
All carves are being altered to suit holding down rings.

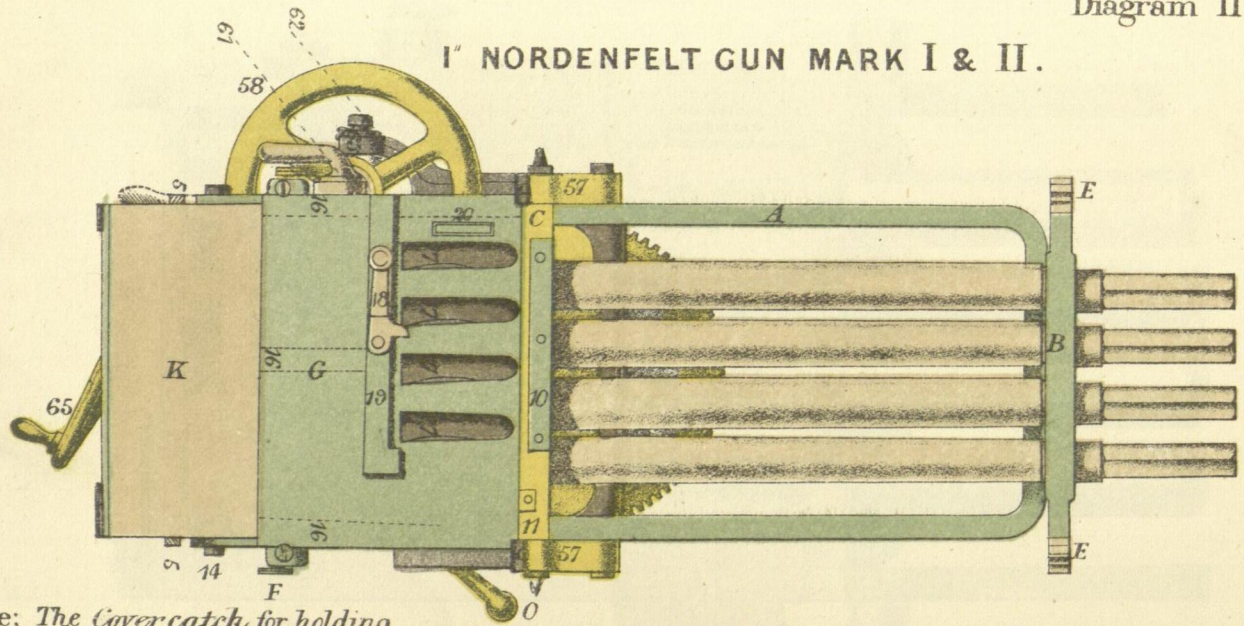
Scale; 1¼ Inch—1 Foot.

5159

DANGERFIELD LITH 22 BEDFORD ST COVENT GARDEN.

Diagram II

1" NORDENFELT GUN MARK I & II.



Note; *The Cover catch for holding up cover shewn in dotted lines is not fitted to Mark I guns.*

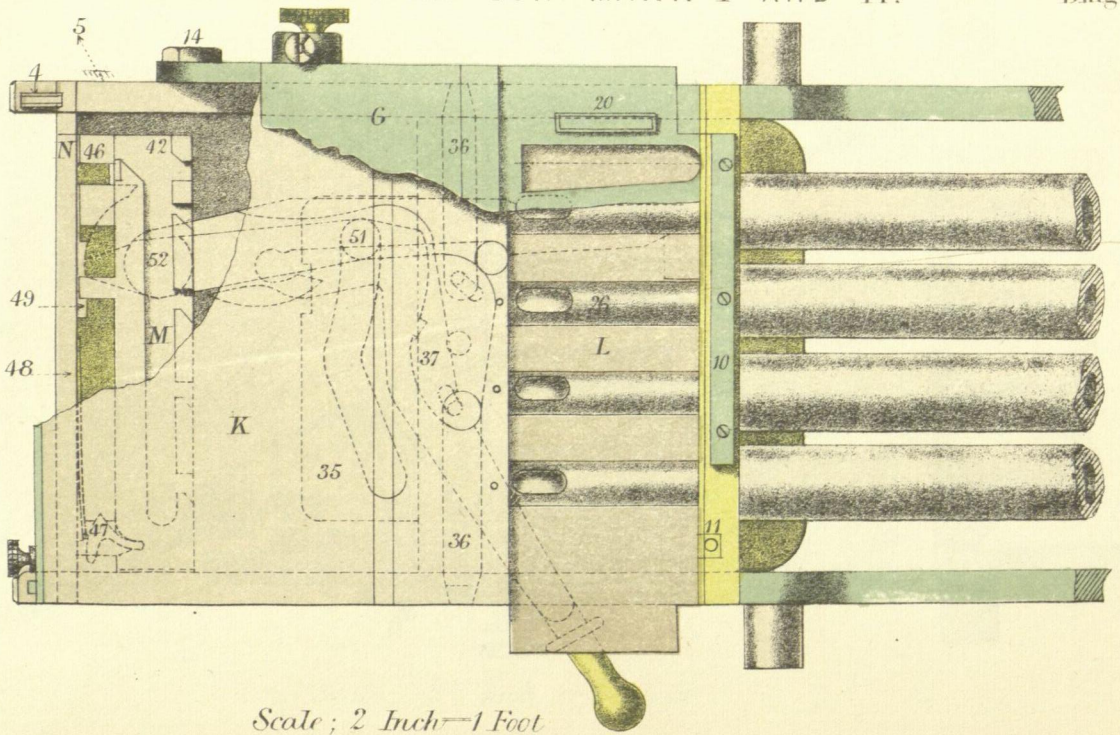
Scale 1 1/4 Inch — 1 Foot.

5884

DANGERFIELD LITH 22 BEDFORD ST COVENT GARDEN.

1" NORDENFELT GUN. MARK I AND II.

Diagram III.



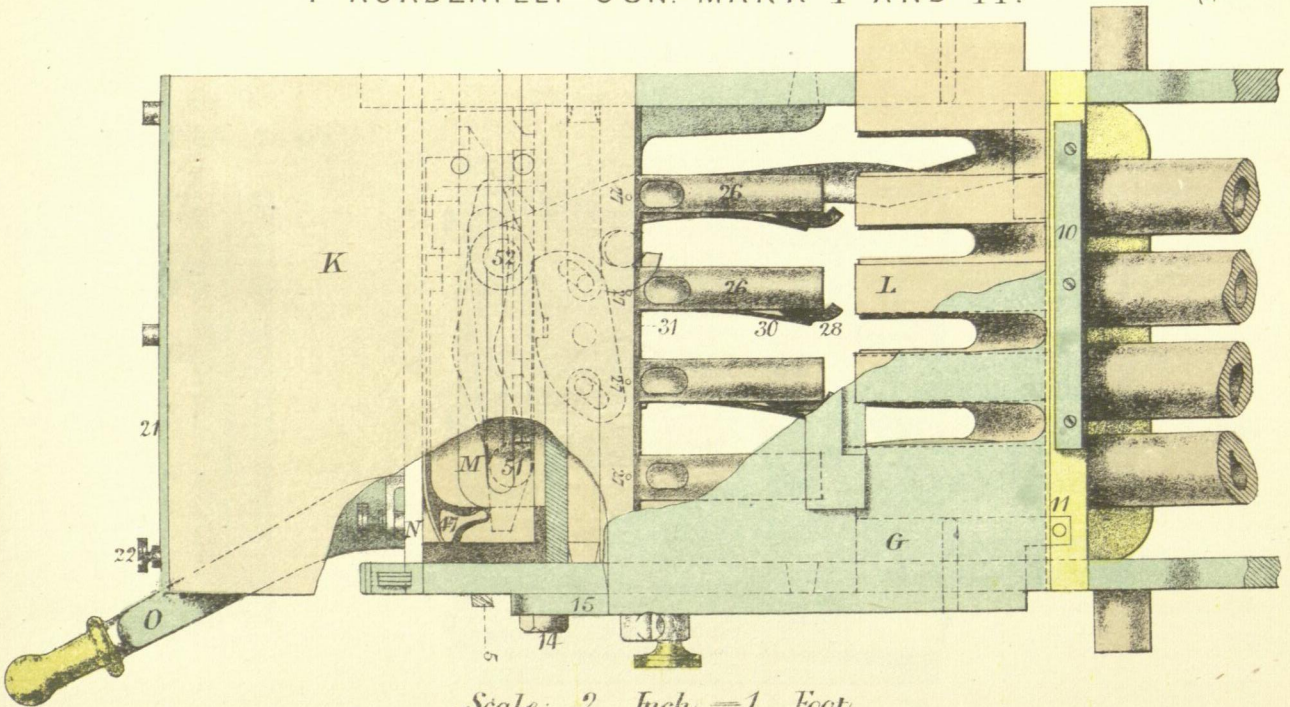
Scale ; 2 Inch=1 Foot

5159

DANGERFIELD LITH 22 BEDFORD ST COVENT GARDEN

1" NORDENFELT GUN. MARK I AND II.

Diagram IV



Scale; 2 Inch = 1 Foot.

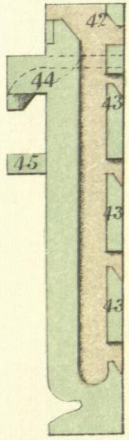
5153

DANGERFIELD LITH 22 BEDFORD ST COVENT GARDEN

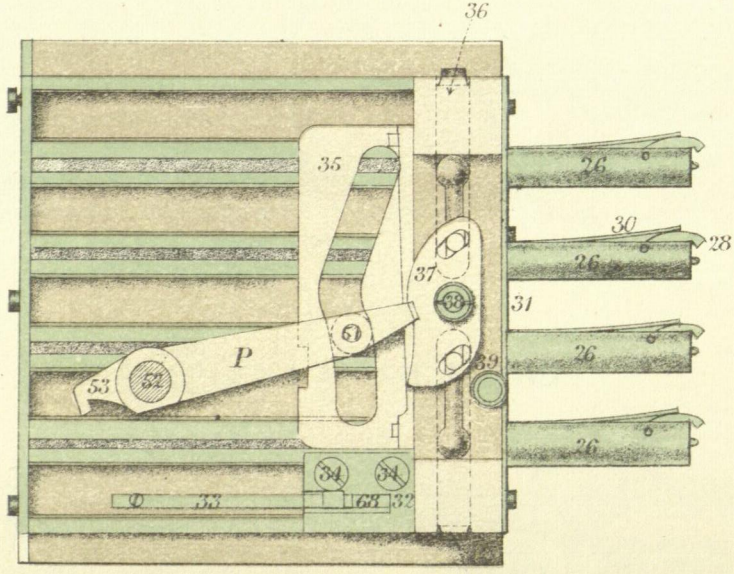
1" NORDENFELT GUN. MARK I AND II.

Diagram V.

PLAN OF
TRIGGER COMB.



ACTION BLOCK
SEEN FROM BELOW.



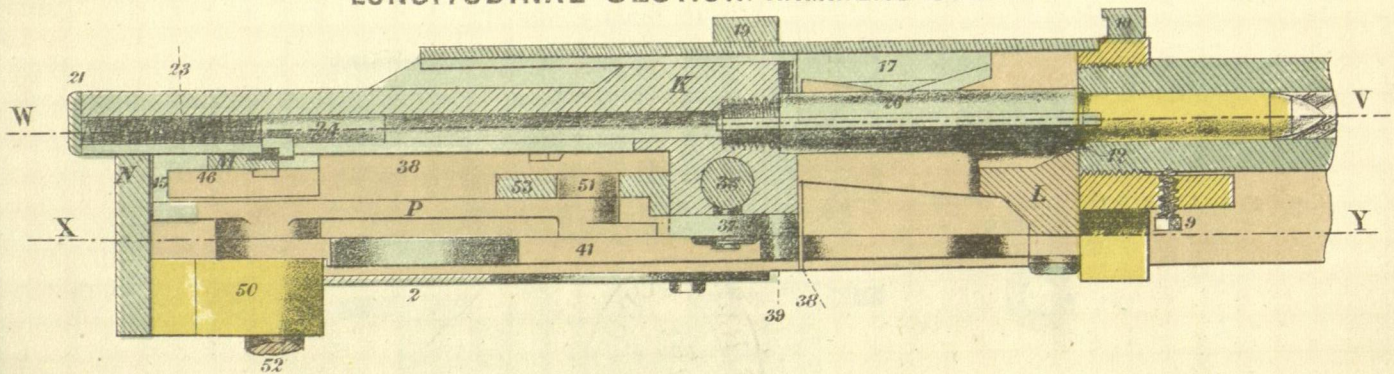
Scale : 2 Inch — 1 Foot.

5159

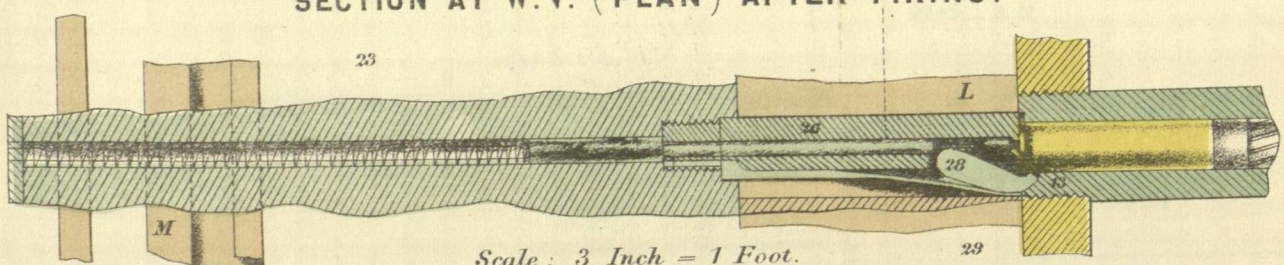
DANGERFIELD LITH 22 BELL YD ST COVENT GARDEN

1" NORDENFELT GUN. MARK I AND II.
LONGITUDINAL SECTION. HAMMERS COCKED.

Diagram VI.



SECTION AT W.V. (PLAN) AFTER FIRING.

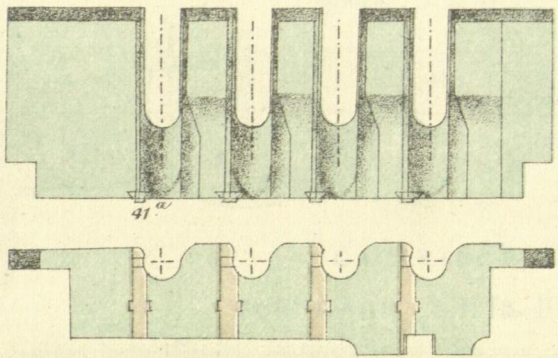


Scale : 3 Inch = 1 Foot.

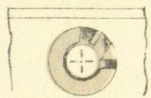
DANGERFIELD, LITH. 22, BEDFORD ST. COVENT GARDEN. 5160.

CARTRIDGE CARRIER. MARK III.

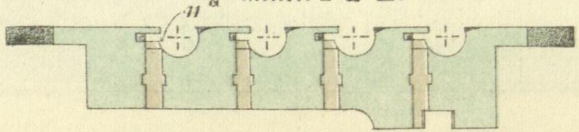
PLAN & FRONT VIEW.



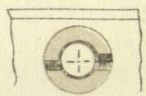
BREECH END OF BARREL
MARK III.



MARK I & II.



MARK I & II.



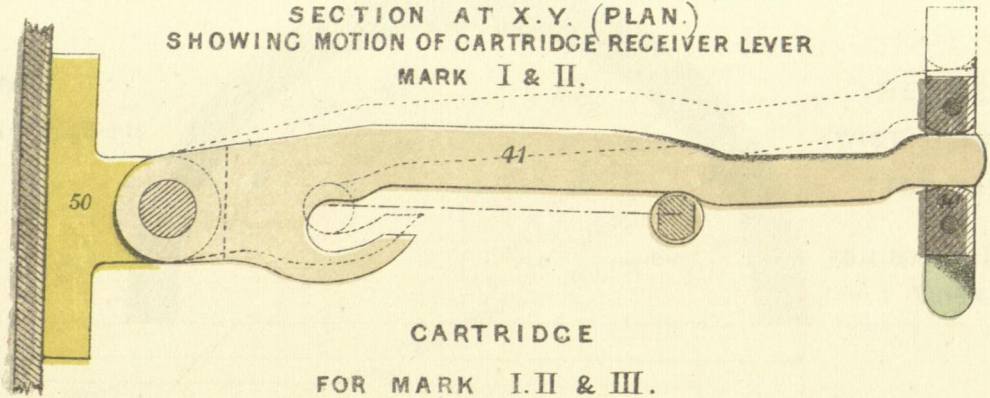
Scale 2=1 Foot.

DANGERFIELD, LITH. 22, BEDFORD ST COVENT GARDEN. 12373. 7/86.

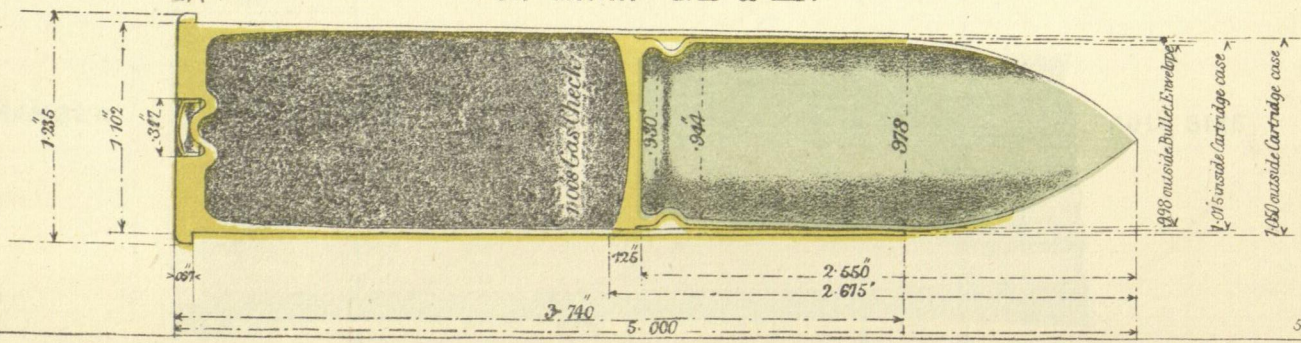
Diagram VII

1" NORDENFELT GUN MARK I. II & III.

SECTION AT X.Y. (PLAN.)
SHOWING MOTION OF CARTRIDGE RECEIVER LEVER
MARK I & II.



CARTRIDGE
FOR MARK I. II & III.



5884.

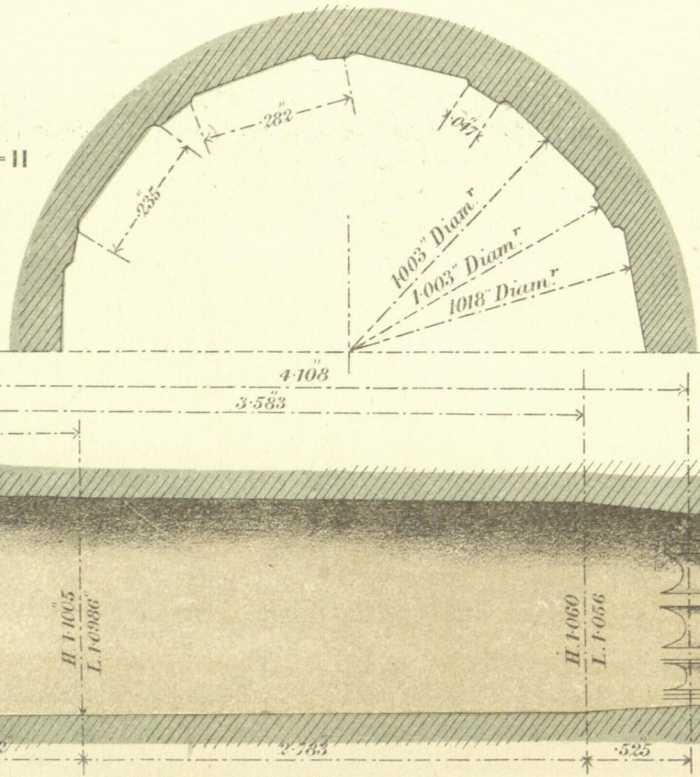
DANGERFIELD LITH 22 BEDFORD ST COVENT GARDEN.

1" NORDENFELT GUN MARK I. II & III.

Diagram VIII.

RIFLING

NUMBER OF GROOVES = 11



TREBLE SIZE.

TWIST = 1 TURN IN 60"

(FOR MARK I.)

FOR MARK II & III.

= 1 TURN IN 35".

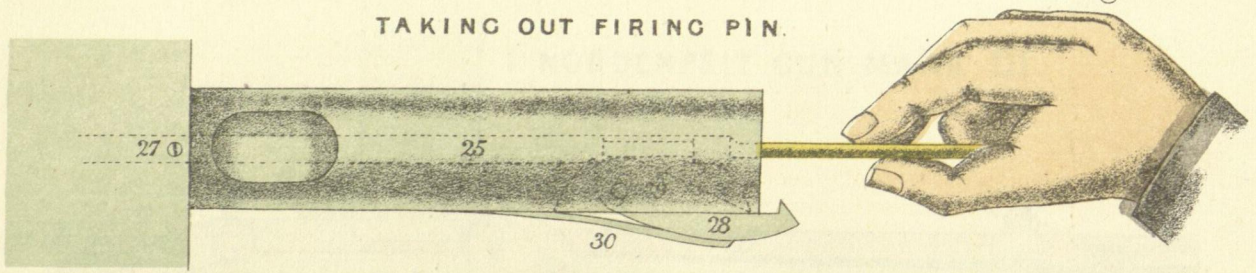
FULL SIZE.

DANGERFIELD, LITH. 22, BEDFORD ST COVENT GARDEN. 5160.

1" NORDENFELT GUN MARK I, II, & III.

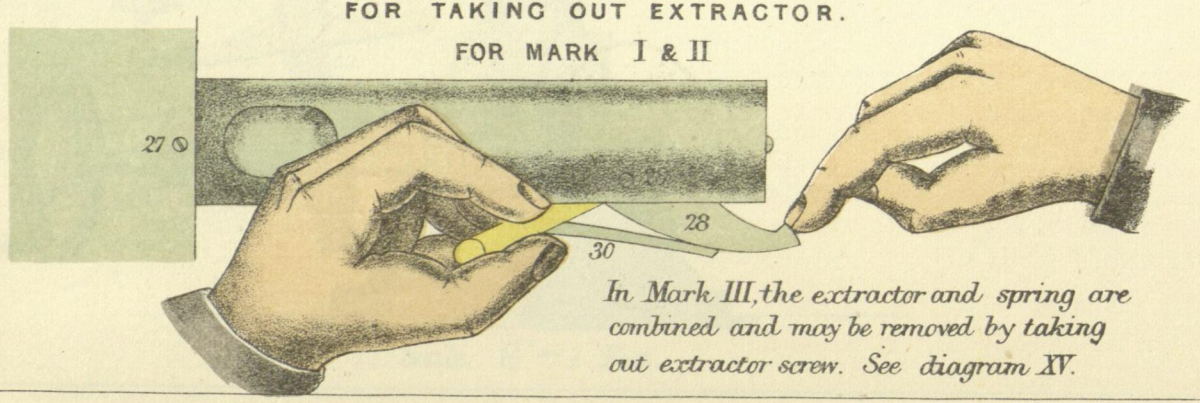
Diagram IX.

TAKING OUT FIRING PIN.



EASING PRESSURE OF EXTRACTOR SPRING FOR TAKING OUT EXTRACTOR.

FOR MARK I & II



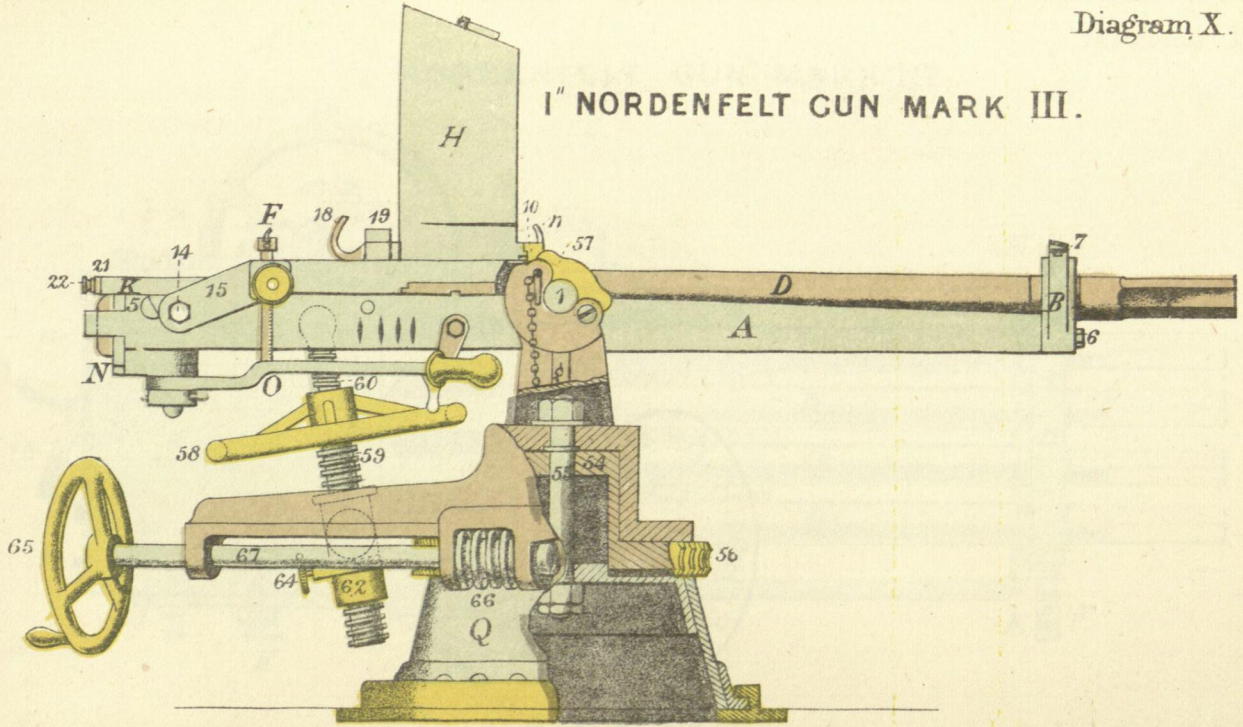
In Mark III, the extractor and spring are combined and may be removed by taking out extractor screw. See diagram XV.

5884

DANGERFIELD, LITH. 22, BEDFORD ST COVENT GARDEN

Diagram X.

1" NORDENFELT GUN MARK III.



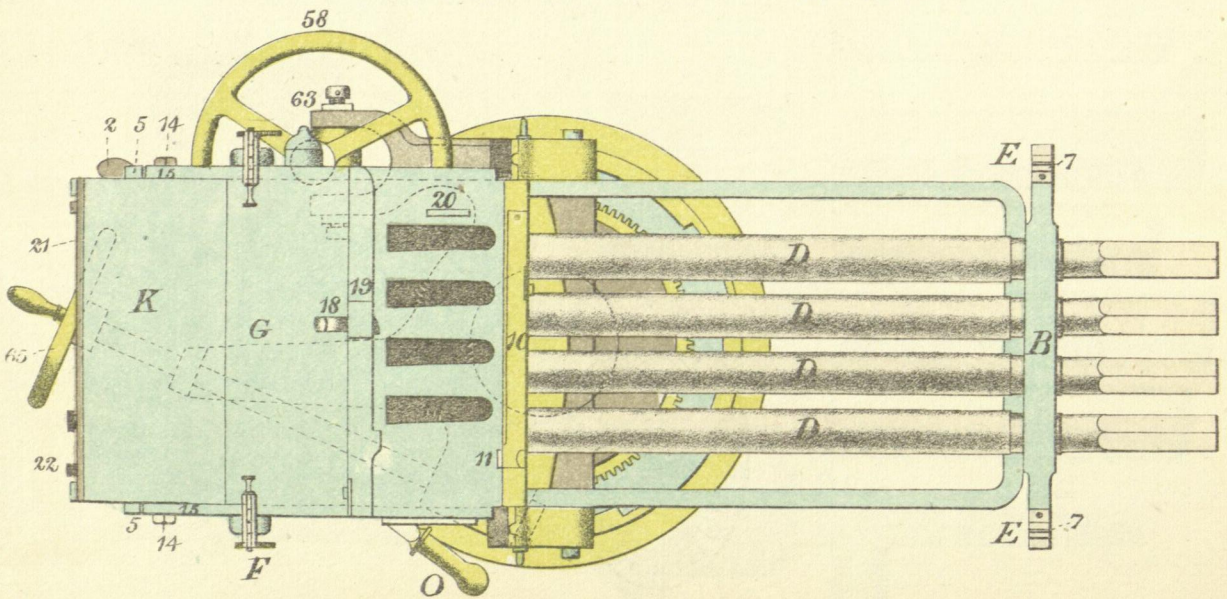
Scale, $1\frac{1}{4}$" — 1 Foot.

5884

DANGERFIELD, LITH. 22 BEDFORD ST. COVENT GARDEN

Diagram XI.

1 NORDENFELT GUN MARK III.



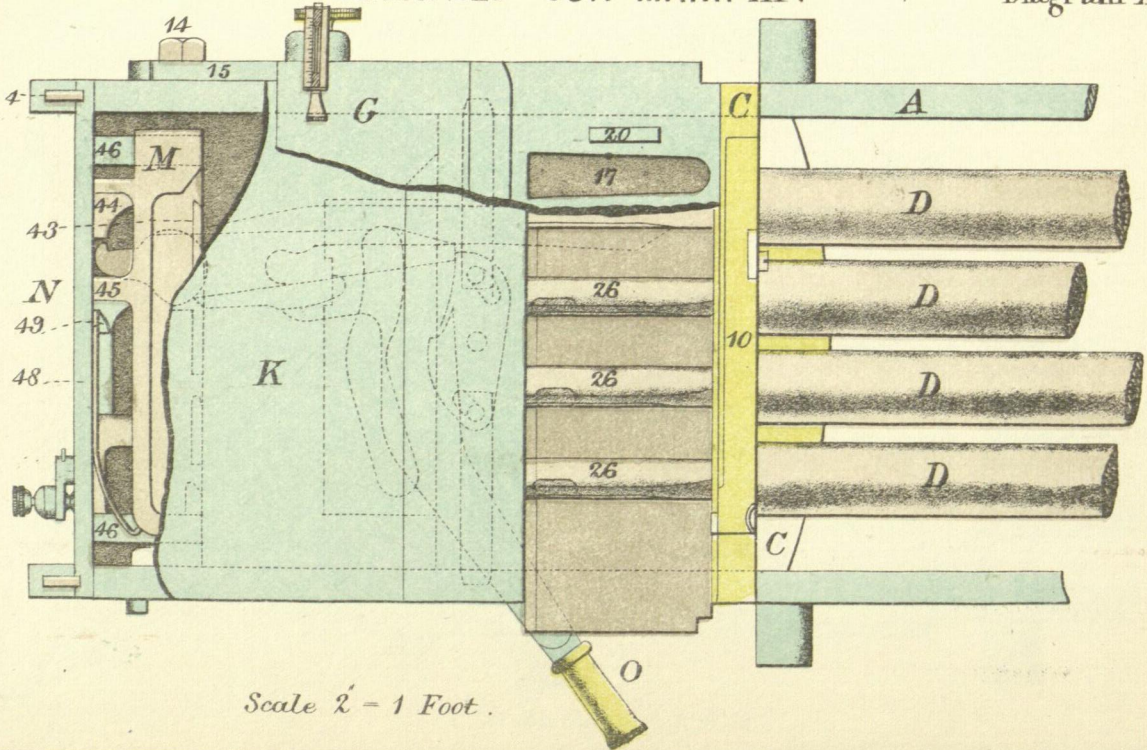
Scale 1 1/4 = 1 Foot.

5885.

DANGERFIELD, LITH. 22, BEDFORD ST. COVENT GARDEN

NORDENFELT GUN MARK III.

Diagram XII.



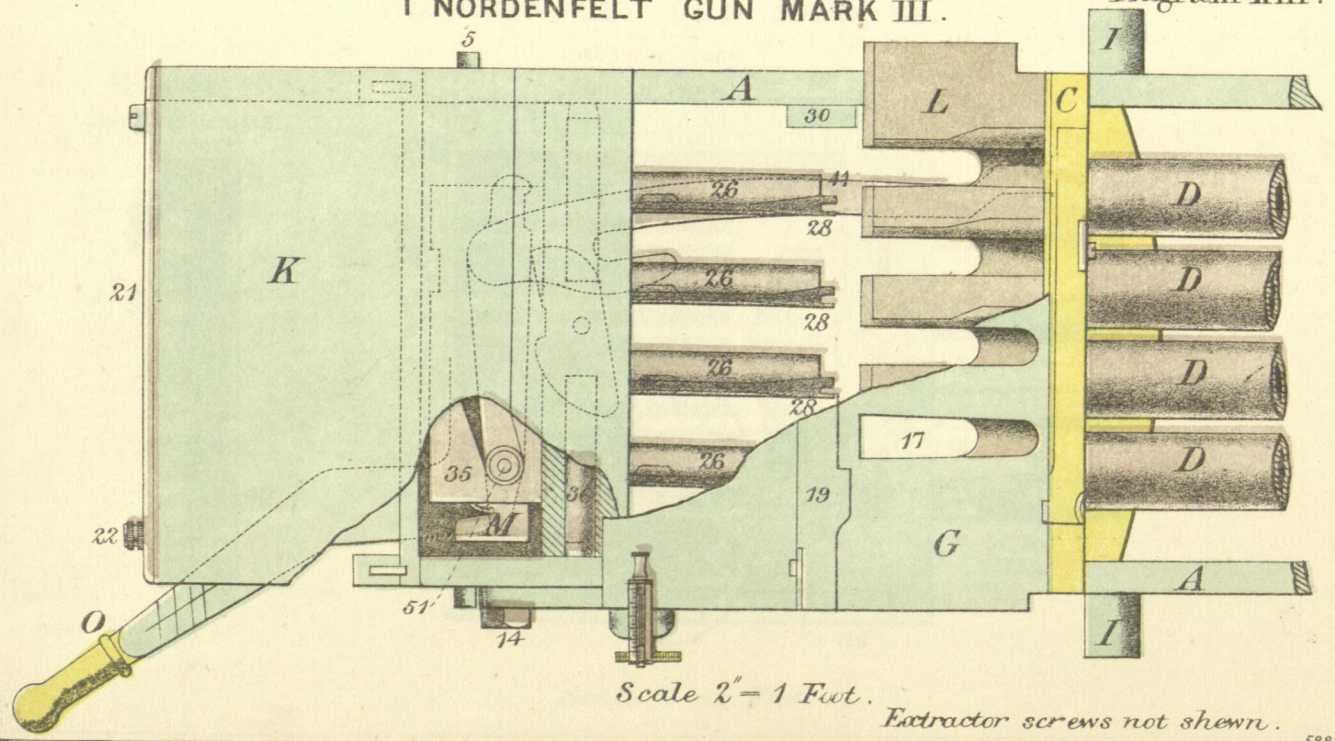
Scale 2′ = 1 Foot.

6885

DANGERFIELD, LITH. 22 BEDFORD ST. COVENT GARDEN.

1" NORDENFELT GUN MARK III.

Diagram XIII.



Scale 2" = 1 Foot.

Extractor screws not shewn.

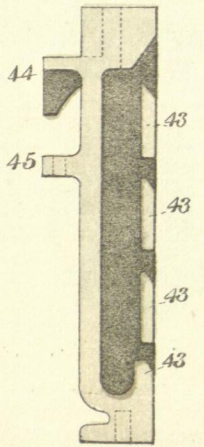
5885

DANGERFIELD. LITH. 22. BEDFORD S^T COVENT GARDEN.

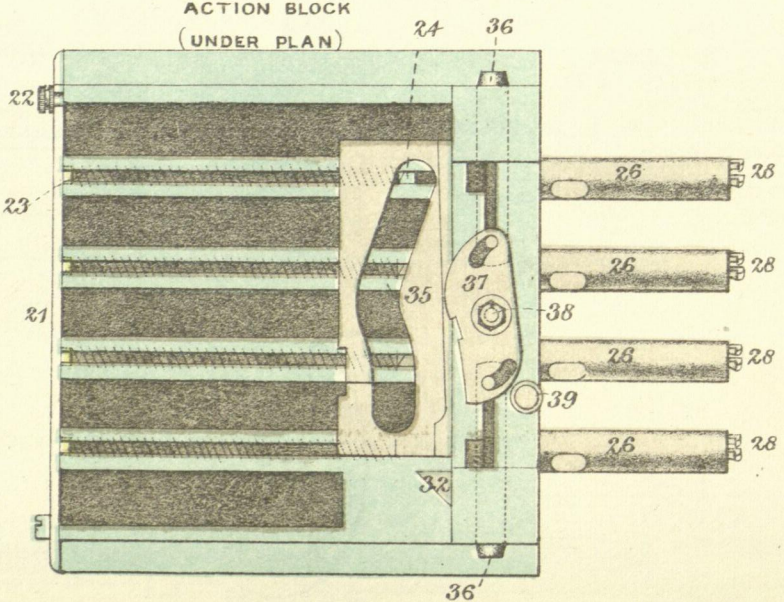
Diagram XIV.

1" NORDENFELT GUN MARK III.

PLAN OF
TRIGGER-COMB.



ACTION BLOCK
(UNDER PLAN)



Scale 2" = 1 Foot

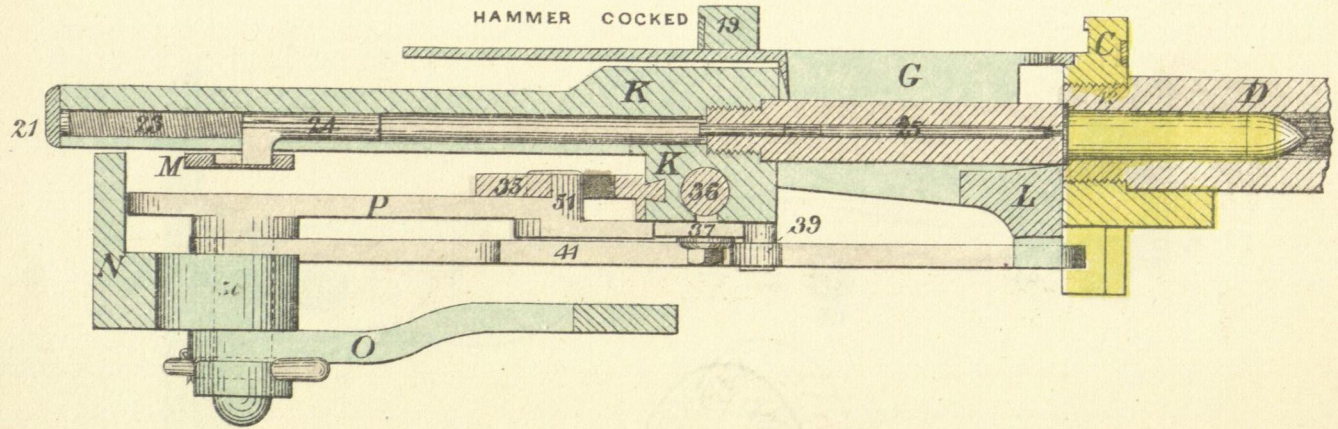
5886

DANGERFIELD. LITH. 22. BEDFORD ST. COVENT GARDEN.

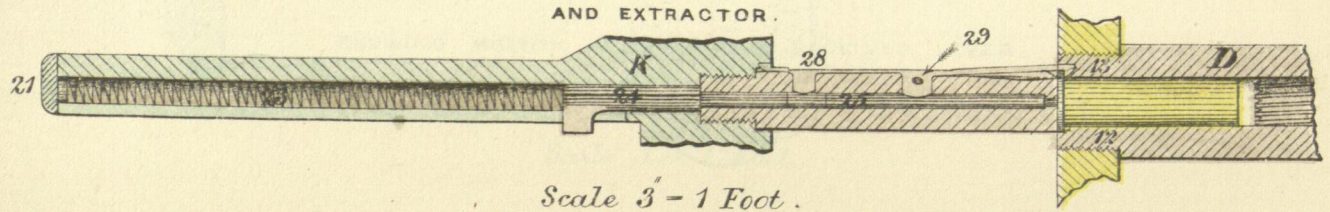
1" NORDENFELT GUN MARK III.

Diagram XV.

LONGITUDINAL SECTION SHOWING HAMMER COCKED



SECTION SHOWING HAMMER AFTER FIRING AND EXTRACTOR.



Scale 3" - 1 Foot.

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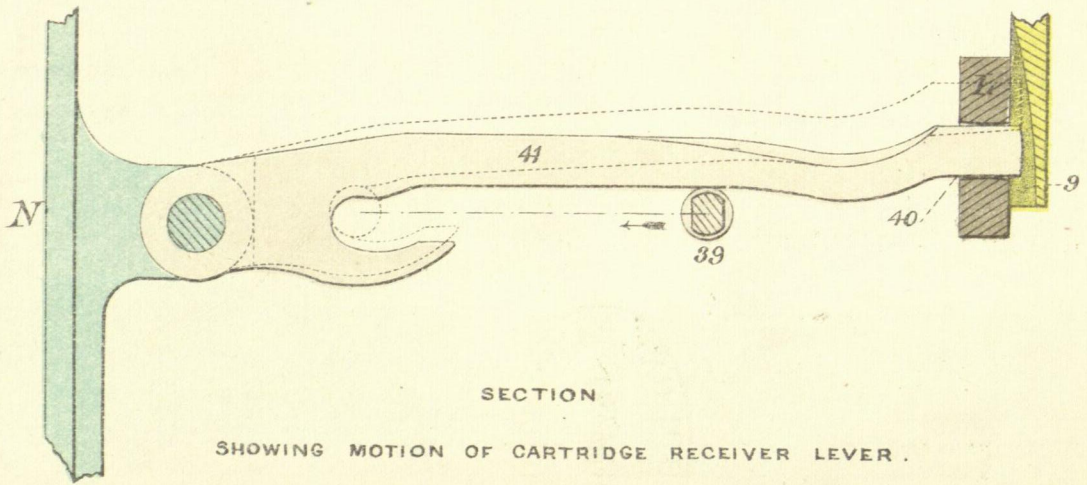
DANGERFIELD LITH 22 BEDFORD ST COVENT GARDEN

Diagram XVI.

NORDENFELT GUN MARK III.



SECTION

SHOWING MOTION OF CARTRIDGE RECEIVER LEVER.

Scale 3″ = 1 Foot.

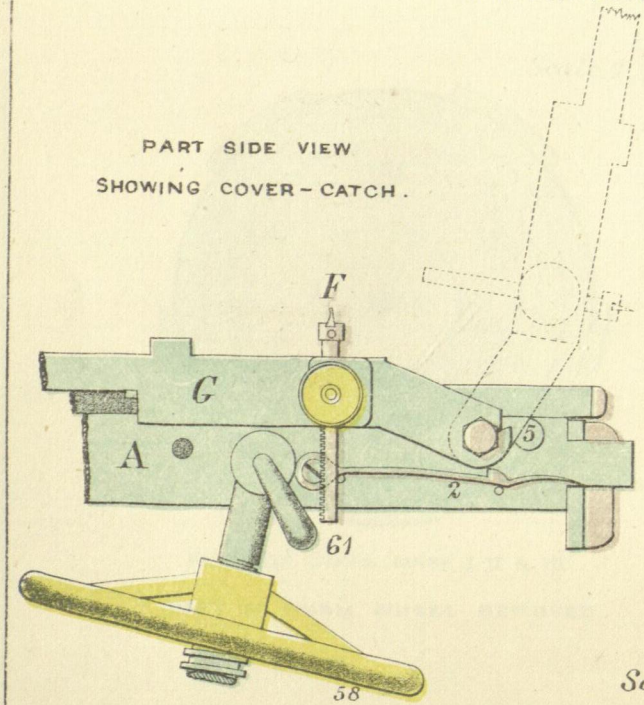
5885.

DANGERFIELD, LITH. 22, BEDFORD ST. COVENT GARDEN

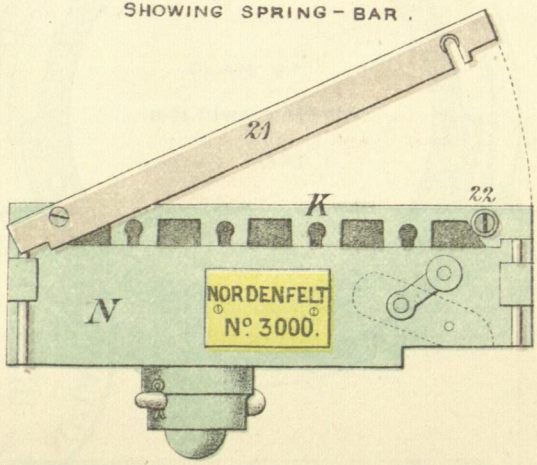
1 NORDENFELT GUN MARK III.

Diagram XVII.

PART SIDE VIEW
SHOWING COVER-CATCH.



REAR VIEW
SHOWING SPRING-BAR.



Scale 2″ = 1 Foot.

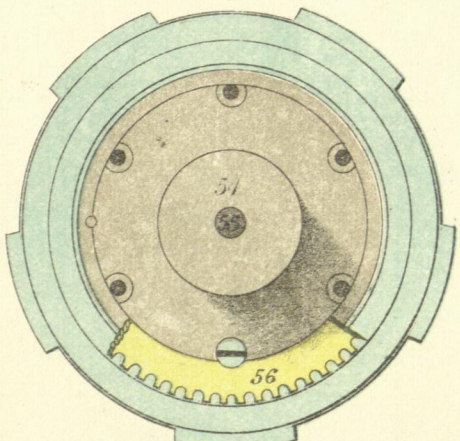
5885.

DANGERFIELD LITH 22, BEDFORD ST COVENT GARDEN

1" NORDENFELT GUN MARK I II & III.

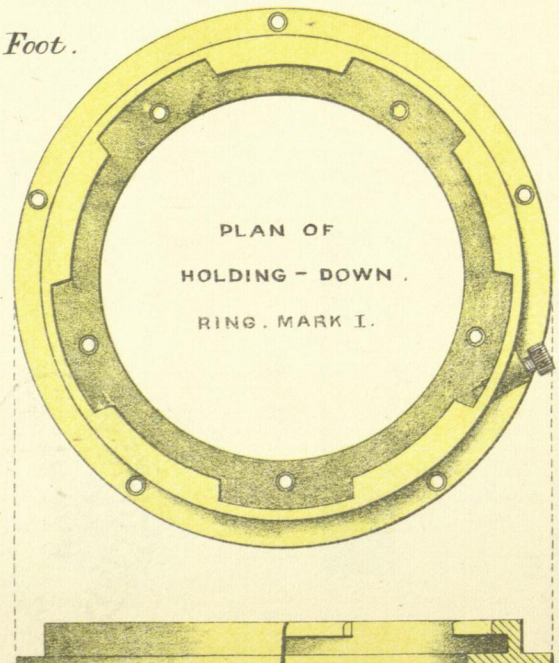
Diagram XVIII.

Scale 1 1/2" = 1 Foot.



PLAN OF CONE. MARK I. II & III.

PART OF WORM WHEEL REMOVED.



PLAN OF

HOLDING - DOWN.

RING. MARK I.

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Diagram XII

METHOD OF RELEASING CONE FROM HOLDING-DOWN RING.

Scale $\frac{1}{6}$

Fig I.

Fig II.

Fig III.

Fig IV.

Fig V.

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