HANDBOOK

FOR

40-PR. R.B.L. GUNS, OF 32 AND 35 CWT.

ON

TRAVELLING SIEGE CARRIAGE AND FLEET PARAPET CARRIAGE.

(MOVABLE ARMAMENT AND VOLUNTEER BATTERIES OF POSITION.)

1899.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE.
BY HARRISON AND SONS, ST. MARTIN'S LANE.
PRINTERS IN ORDINARY TO HER MAJESTY.

And to be purchased, either directly or through any Bookseller, from
EYRE & SPOTTISWOODE, East Harding Street, Fleet Street, E.C.; or
JOHN MENZIES & Co., 12, Hanover Street, Edinburgh, and
90, West Nile Street, Glasgow; or
HODGES, FIGGIS, & Co., Limited, 104, Grafton Street, Dublin.

Price Sixpence.

HANDBOOK

FOR

40-PR. R.B.L. GUNS, OF 32 AND 35-CWT.

ON

TRAVELLING SIEGE CARRIAGE AND 16-FEET PARAPET CARRIAGE.

(MOVABLE ARMAMENT AND VOLUNTEER BATTERIES OF POSITION.)

1899.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY HARRISON AND SONS, ST. MARTIN'S LANE,
PRINTERS IN ORDINARY TO HER MAJESTY.

And to be purchased, either directly or through any Bookseller, from
EYRE & SPOTTISWOODE, East Harding Street, Fleet Street, E.C.; or
JOHN MENZIES & Co., 12, Hanover Street, Edinburgh, and
90, West Nile Street, Glasgow; or
HODGES, FIGGIS, & Co., Limited, 104, Grafton Street, Dublin.

Price Sixpence.

CONTENTS.

PLATES.

This Handbook is corrected up to March, 1899. Any alterations which may be suggested should be forwarded to the Chief Inspector, Woolwich.

40-pr. R.B.L. GUNS.

THE first guns of this nature introduced into the Service weighed 32 cwt., but a strengthened pattern, with a longer and stronger breech-piece rounded off at the end, weighing 35 cwt. was afterwards adopted. A limited number of the latter were afterwards converted into "side-closing guns."

NOTE.—For convenience, in this book, the term "guns (with vent pieces)," *which is not a Service nomenclature*, has been adopted in contradistinction to "guns (side closing)."

GUNS.

(With Vent Pieces.)

Plate I.

		35-cwt. Gun.	32-cwt. Gun.
Material	Exterior	Wrought iron	Wrought iron.
	Tube	Steel	Steel.
Length, nominal (not including breech screw)		121 in.	120 in.
Weight, nominal		35 cwt.	32 cwt.
Preponderance		4 cwt. 3 qrs.	5 cwt. 1 qr. 19 lbs.
Bore	calibre	4·75 in.	4·75 in.
	length	106·375 in.	106·375 in.
	powder chamber	13·5 in.	13·5 in.
	shot chamber	7 in.	7·2 in.
Rifling system		Polygrooved	Polygrooved.
,, twist (uniform)		1 in 36·5 calibres	1 in 36·5 calibres.
,, grooves	number	56	56
	depth	0·06 in.	0·06 in.
	width	0·166 in.	0·166 in.
,, length		92·5 in.	92·5 in.

The gun consists of the barrel (or A tube), the breech piece and B tube, the trunnion ring, and three coils.*

The *slot* or vent opening is made in the top of the breech piece for the introduction and removal of the vent piece, it is continued through the bottom of the breech in the form of a circular hole to facilitate cleaning; it also equalizes the strain on the breech piece.

* The 35-cwt. gun consists of the same number of parts as the 32-cwt. gun, but has a longer and a stronger breech piece, which is unsupported behind the vent slot and rounded off. It has a raised coil in front of the vent slot.

The *vent piece* (so called because the vent happens to go through it), is a block of wrought iron or steel, which closes the ends of the breech before firing; it is dropped down the vent slot into its position, and is then tightened up by means of the breech screw.

The *breech screw* fits the thread cut in the breech piece, its use is for sending home and retaining the vent piece in its proper position when the gun is fired.

The *tappet ring* is fitted on the octagonal parts of the breech screw on which it acts as a wrench, the power being communicated through its projections, from the tappets of the lever.

The *lever* fits on the breech screw behind the tappet; it is free to revolve round the breech screw, but is prevented from falling off by two keep pins working in grooves. The object of the lever and tappet arrangement is to gain a powerful momentum in tightening up and relaxing the vent piece from its seat in the gun.

The *indicator ring* is a thin narrow ring of wrought iron fitted on the breech screw in front of the tappet ring; it is so adjusted on the screw that when the vent piece is home the raised line of brass, or arrow, on the ring and on top of the vent piece must coincide.

The *breech bush* is a ring of copper screwed into the end of the powder chamber by means of the facing implements.

The *vent piece copper ring* is a corresponding ring on the face of the vent piece. The object of these rings is to secure a close fit, to prevent any escape of gas, and also to facilitate the repair of the tube, where there is the greatest wear and expansion. They are coned in opposite directions so as to fit closely into one another.

Side Closing Gun.

Plate II.

All the dimensions, &c. of the 35-cwt, gun tabulated on page 3 apply to this gun with exception of the preponderance, which is 4 cwt. 3 qrs. 2 lbs.

The gun consists of the barrel (or A tube), the breech piece and B tube, the trunnion ring, and three coils.

The *slot* is on the right of the breech piece for the introduction and removal of the breech block; it is continued through the side of the breech in the form of a circular hole.

The *breech block*,* converted from the original vent piece by plugging up the vent, is of wrought iron or steel, and closes the end of the breech before firing. It is supported by an upper and a lower bracket, between which it slides into its position, an indicator has been fitted to the retaining stud to show when the breech block is in the proper position for screwing up, and is then tightened up by means of the breech screw, its movements in and out of the gun being limited by a spring stop worked by a small lever.

The *breech screw* fits the thread cut in the breech piece, its use

* For drill purposes a breech block is issued having its face formed by a bronze plate, in order to prevent injury to the copper bush.

is for sending home and retaining the breech block in its proper position.

The *tappet ring* is fitted on the octagonal parts of the breech screw, on which it acts as a wrench, the power being communicated through its projections from the tappets of the lever.

The *lever* fits on the breech screw behind the tappet ring; it is free to revolve round the breech screw, but is prevented from falling off by two keep pins working in gooves. The object of the lever and tappet arrangement is to gain a powerful momentum in tightening up and relaxing the breech block from its seat in the gun.

The *indicator ring* is a thin narrow ring of wrought iron fitted on the breech screw in front of the tappet ring; it is so adjusted on the screw that when the breech block is home the raised line of brass, or arrow, on the ring and on the top of the breech piece must coincide.

The *breech bush* is a ring of copper screwed into the end of the powder chamber by means of the facing implements.

The breech block *copper ring* is a corresponding ring on the face of the breech block. The object of these rings is to secure a close fit, to prevent any escape of gas, and also to facilitate the repair of the tube, where there is the greatest wear and expansion. They are coned in opposite directions so as to fit closely into one another.

The *vent* is of copper and radial at 6·5 inches from the end of the bore inclined at an angle of 45° to the vertical plane of the axis of the gun, on the right side.

The gun should be examined after firing 150 rounds.

SIGHTS.

The guns are sighted on both sides, to facilitate laying under certain circumstances, and to render the provision of spare sights unnecessary; and are provided with four sights, namely, two tangent sights and two fore sights.

The tangent sights are graduated on one of the narrow sides up to 15°, and on the other up to 3,800 yards. Each degree is divided into 6 divisions of 10 minutes each. The elevating nut under the cross head is marked from 1 to 10 minutes elevation. The permanent angle of deflection is 2° 16′ left, which compensates for the lateral deviation caused by the right-handed rifling. The tangent sights of early pattern are barrel-headed, those of the present pattern have a sliding leaf head, they are marked for $\frac{1}{2}$° deflection right or left.

The fore-sights, "F," are of the "drop" pattern and consist of a pillar, sheath, and socket of gun-metal, a leaf of steel, and screw for fixing the leaf. The socket is permanently fixed in the gun, and the pillar and sheath each lock into it with a bayonet joint, so that when once the sight is in its true position, it cannot be moved without first raising the sheath and turning the pillar round a quarter of a circle.

Two clamps, tangent sight, "A," are supplied with each gun to set the tangent sights to any required elevation.

CARE AND PRESERVATION OF GUN AND FITTINGS.

Extracts from "Regulations for Magazines and the Preservation of Artillery Matériel."

General Instructions.

"473. A 'Memorandum of Examination' is issued with each rifled gun . . . . . It contains a drawing showing the principal dimensions, with a short description of the construction and rifling as well as the particulars of any slight original defects or tool marks which may have existed at the date of issue. In it are recorded in detail the number of rounds fired, and the date and result of any examination.

"474. This memorandum will remain in charge of the officer who has possession of the Ordnance, and a certificate to the effect that it is in his possession and complete up to date will be included in the Annual Return of Rifled Ordnance, Army Form G 872.

"475. At the conclusion of each day's firing an entry will be made in the memorandum by the officer in charge, giving a detail of the rounds fired (including blank charges), so that an accurate record of the firing may always be kept up.

"477. A statement of the results of the examination of any piece will be added to the memorandum by the Inspecting Officer, or other examiner, who performs the duty, and when the gun . . . . is returned into, or issued from, store, the memorandum will accompany the transfer vouchers.

"478. If at any time the memorandum be lost or damaged, a duplicate can be obtained from the Chief Inspector, Woolwich, by whom also, inside sheets for continuation of the record of the number of rounds fired will be supplied on demand.

"479. All ordnance will, as far as possible, be examined after firing (*either with powder or cordite*) the numbers of rounds detailed below, and practice from such ordnance should cease until such examination shall have been carried out. In cases, however, where the examination would happen within a series of rounds allowed for practice, and thus cause inconvenience, the guns will be examined before practice commences, irrespective of the number being completed.

"480. In computing the number of rounds for examination purposes, four rounds of blank charges may be regarded as equal to one round with projectile, but in recording the rounds on the memorandum of examination, "blank" rounds should be shown as such. Ordnance used for saluting purposes, or for time guns, should, however, be examined at least once a year, or oftener if necessary.

"481. The following are the numbers of rounds after which each nature of ordnance must be examined:—

Nature.	No. of rounds with projectile.	Remarks.
* * * * *	*	
R.B.L. 10 pr	150	
* * * * *	*	* * * * *

"481A. Should any accident occur, such as the bursting of a shell in the bore, the splitting of a vent, &c., immediate inquiry will be made into the circumstances, and the guns examined. If the Commanding Officer considers the damage to be of importance, he will send without delay a report of the circumstances through the same channel as his Annual Return, forwarding, if necessary, for the illustration of this report gutta-percha impressions of the damage done to the gun.

"482. All ordnance, whether breech-loading, muzzle-loading or quick-firing, will be kept in good preservation, the exterior being protected from the effects of the atmosphere by a sufficient coating of paint, ... The bore will be well cleaned and oiled, or lacquered, when not in constant use, with the following lacquer :—

Lead {	black	24 lb. 8 oz.
	red	6 „ 12 „
Lampblack		12 „
Oil, linseed, raw		9 gallons.

The lacquer will be applied by means of a brush attached to a holder, and can be removed in a few minutes by brushing the bore with hot potash solution.

"483. At the close of each day's firing the bore will be washed and placed under metal, and as soon as dry will be oiled with a greasy sponge (a sponge cloth or piece of old linen tied over the piasaba brush).

"484. Ordnance, whether mounted or on skidding, will be depressed at the muzzle to prevent rain or moisture lodging inside, and when mounted the muzzle will be stopped with a tampeon. The vent slot . . . . . will be protected by a cover, and the breech of R.B.L. guns by a tampeon, while radial vents will be stopped with a vent plug.

"486. All ordnance forming the armament of fortresses will be cleaned and painted biennially; but should it be found that those mounted on sea faces of works are in a bad state from exposure to the sea spray or those in casemates from damp and dripping, they will be cleaned and painted every year, and oftener if considered necessary, by the O.C.R.A. On this point, considered as a question of expense, a sound discretion will be exercised.

"487. The paint used will be Pulford's magnetic oxide, unless it is considered necessary that the colour should harmonise with the surroundings of the work, when ordinary paint of a suitable colour will be used.

"488. Before the working parties commence work, the ordnance will be dismounted and placed on skidding, in such a position as to admit of the exterior and interior of the piece being thoroughly well

cleaned. In cases where, from the nature or position of the work, it may not be deemed advisable to dismount the pieces, they will be raised out of their trunnion holes to a sufficient height to admit of all parts of the gun being thoroughly scraped and cleaned, the sight sockets, when necessary, being plugged with tow and tallow.

"489. Ordnance will be scraped on the exterior (the scrapers or old swords supplied for the purpose being previously sharpened) until the old paint and all rust which may appear beneath it are entirely removed; the axis lines, sight notches, and all marks will be completely cleaned out and rendered distinct, and the ordnance will afterwards be wiped over with a piece of old canvas or cloth. The radial copper vents will be cleaned with the vent-scrapers.

"490. The exterior of the piece . . . . . will be painted with two coats of paint; the second coat will not be applied until the first coat has thoroughly set, and as in the process of mounting the ordnance the paint gets much rubbed, the second coat should be given, when possible, after the piece has been mounted.

Preservation of Sights.

"494. When mounted in exposed positions, or in batteries accessible to the public, unguarded by sentries, all the sights . . . . . will be removed from the ordnance and kept in store, the sight recesses in the guns being filled with a plug of greased tow to keep out the rain and dirt. These plugs can be readily removed when it is required to fit the sights to the ordnance. Particular attention will be paid to the prevention of rust or grit accumulating in the sight recesses.

"496. The sights will be kept clean, free from grit, and oiled; the tangent sight bars should on no account be polished; the sliding leaf, as well as the collars of the foresights, should have free play.

"497. The exposed portions of the sights are bronzed if made of gunmetal, and blued if of steel, in order to preserve them from corrosion, and on no account will these parts be cleaned or burnished in such manner as to remove the bronzing or blueing.

Preservation of Fittings.

. . . . . .

"499. When R.B.L. guns are not in use, the vent-piece, breech-block, and all the fittings, except the breech-screw and elevating plates, will be removed and laid up in store. . . . . .

"501. All fixing and preserving screws should be occasionally removed and oiled.

Cleaning and Examining the Bore.

"505. For cleaning the bores of ordnance the tools in Tables A and B, Appendices B and C of these Regulations are provided.

R.B.L. Fittings.

"526. The face of the breech-screw should be quite flat and true; the thread should not be broken or burred.

"527. The lever, tappet, and keep-pins should be sound. The

lever handles are sometimes broken off, but the lever can still be used in this state, though not so conveniently.

"528. The vent-piece is the most important fitting, and should be perfectly sound, neither cracked nor bulged. The fracture of vent-pieces is frequently owing to the back not being true to the face of the screw. The copper-ring on the vent-piece, as well as the breech bush at the end of the barrel, must be sufficiently high to prevent the action of the gas on any part of the iron.

"529. The cross-head should not be loose, as instances have occurred of its being broken off while firing. In all cases before taking a vent-piece into use for practice, it will be advisable to test the soundness of the cross-head as well as that of the neck, by tapping with a hammer.

"530. During continuous practice with 40-pr. R.B.L. guns, the vent-pieces should be frequently changed (say at the end of each 10 or 15 rounds). The vent-piece not in use is thus allowed time to become thoroughly cool, and opportunity should then be taken to carefully examine it with reference to the state of the copper ring, &c.

"531. The breech block of the 40-pr. side-closing R.B.L. screw gun should be treated in the same way as the vent-piece, which it resembles generally, except that it has no vent, the gun being radially vented. It has also an indicator showing the word "home" when the gun is properly closed. Care should be taken that this indicator is in working order.

"532. For the 40-pr. R.B.L. guns, a special vent-piece with a bronze face is issued for drill purposes, to save the wear on the service vent-piece. It should invariably be used when at drill."

RIFLES, AIMING, M.H., CHAMBER, EWART.

This apparatus is for use with the gun in imparting instruction in laying, and consists of the following parts:—

Rifles, aiming, M.H. chamber, Ewart—

Bands	Bronze.
Front	With securing bolt, nut, and washer.
Rear	With securing bolt, nut, and washer, buffer, and key.
Barrel, rifle	M.H. rifle barrel, with breech action and metal boss.
Cord, firing	White line, tarred, 2 yards long (with 2 hooks).
Lever, vent*..	Steel.
Link, trigger	Bronze, with fixing screws.
Tube, 0·23-inch "J" ..	Including breech-piece, bushes (movable and fixed), set nut and leather washer.
Lanyard, friction tube, siege, No. 1.	With toggle, 5 feet 5 inches.

* See foot-note, p. 10.

Tube, friction, drill.. .. Dummy, iron, with spring clip.
Tube, 0·23-inch—
Brush, cleaning.
Key, M.H.
Rod, cleaning.

Method of Fitting, Adjusting, and Using the Apparatus.

The aiming rifle is fitted to the left side of the gun in the following manner:—

The two bands are placed over the exterior of the gun, the front band over the chase, and the rear band over the first hoop, immediately in front of the second hoop from the muzzle, the distance between the inner faces of the bands being 27 inches.

The bands are secured round the gun by fixing bolts. The muzzle of the rifle is passed through the hole in the arm projecting from the front band, and the breech is placed in the socket on the rear band, and fastened with a key. A buffer spring, to lessen the strain on recoil, fits into the socket in rear of the rifle. A hole is made at the rear end of the socket to facilitate the extraction of the buffer spring.

To adjust the rifle on the gun, the latter is laid horizontally; the 0·23-in. tube "J" is then inserted in the bore of the rifle, sufficient length being allowed to project from the bore to admit of the application of a spirit level to the 0·23-inch tube, by which means the rifle is levelled, so that the axis of rifle and gun are in parallel horizontal planes. The bands are then firmly screwed up, care being taken to see that they do not shift during the operation, in the event of which they must be slackened and re-adjusted.

Elevation is obtained by means of the gun sights, and any error in line is corrected by use of the deflection scale.

The rifle is fired by means of the firing cord, one end is hooked to the loop of the "Link, trigger," and the other end to an arm of the "Lever, vent"*; the service "Lanyard, friction tube, siege, No. 1" is then hooked to the other arm of the "Lever, vent," the latter being kept in position by the service dummy tube.

Care and Preservation.

The actions and parts of the rifle and tube should be kept perfectly clean and oiled, so as to keep them in good working order and prevent rust. No cutting material, such as emery cloth, is to be used for cleaning.

Ammunition used, see page 17.

CARRIAGE, SIEGE, R.B.L. 40-PR., WOOD.

Plate III.

The carriage is of wood, with block trail, and fitted with double sets of handles on the trail for lifting. The brackets have two sets of

* The "lever, vent" is not used with the side-closing gun, the firing cord and friction tube lanyard are hooked together, and a straight lead from the trigger is obtained by passing the lanyard round the left tangent sight to the firing number.

trunnion holes, one for firing, the other for travelling; the gun being shifted from the one to the other by means of a small wooden roller, which runs on wood cleats faced with iron fitted on the trail between the brackets.

The elevating screw is of the ratchet head pattern, with movable lever handle. It works in a gun-metal nut, which fits into a pan of the same metal let into and fixed in the trail. When not in use the screw and nut are detached, and carried in a leather pocket on the right bracket of the carriage. The lever handle is strapped on the same side.

The traversing arrangement, when the carriage is so fitted, consists of a gun-metal saddle, on which the gun rests, working in dovetailed slots in the trunnion plates of the brackets, and traversed by a lever pivoted on the trail between the brackets, to which it is attached; the other end of the lever is connected with a horizontal screw passing across the trail a little in front of the elevating screw, and worked by a hand wheel fitted to it on outside of the right bracket. A lateral direction of 3° on each side is thus obtained without shifting the trail. Converted carriages (24-pr.) have no traversing arrangement.

The limber is fitted in rear with a straight pintail and keep chain for limbering up; the splinter bar is fitted for four horses abreast.

The shafts of the limber are fitted for farmers' draught when required, that is, with a back band and staples for the attachment of the hooks or tees of short traces.

Particulars of Carriage, Limber, &c.

		cwt.	qrs.	lbs.
Weight of	Carriage, unpacked	28	0	0
	Limber „	12	0	0
	Side arms	2	1	0
		42	1	0

		cwt.	qrs.	lbs.
Weight of carriage and limber packed	(32 cwt. gun)	81	2	0
	(35 cwt. gun)	84	2	0

		ft.	ins.
Track of wheels		5	$3\frac{1}{2}$
Height of axis of gun		4	4
Maximum Elevation		11°	
Maximum Depression		$8\frac{1}{2}$°	
Angle of lock		$47\frac{1}{3}$°	
Space required to turn in		32 feet.	

Wheels	1st Class A— No. 1 (gun)	diameter	5 feet.
		tire, width	6 inches.
		weight, each	4 cwt. 2 qrs. 0 lbs.
	2nd Class A— No. 14 (limber)	diameter	5 feet.
		tire, width	3 inches.
		weight, each	2 cwt. 1 qr. 12 lbs.

Wagon, Ammunition, R.B.L. 40-Pr.

The wagon consists of a perch and two sides of ash, two foot-boards and an axletree of elm, an axletree bed with axletree, and two wheels, 2nd class, A, No. 15, five feet diameter, with wood naves.

The axletree is secured to the bed by bolts, yoke bands, and coupling plates.

The wagon is fitted to carry a spare wheel and two ammunition boxes; the latter are kept in position by front and rear platform boards, and wood battens along the sides and across the centre.

The boxes are secured by straps, which pass through staples fixed along the sides of the wagon and through the handles on the boxes. Four small boxes are attached to the underside, one to carry a grease tin and three for horse-shoes and nails.

A drag shoe and chain are secured to the perch.

The limber is fitted with a hook for the perch. It carries three ammunition boxes—"near," "off," and "centre"—which are not interchangeable with those on the wagon.

The splinter-bar is fitted for two horses abreast.

		cwt.	qrs.	lbs.
Weight of	body, unpacked	11	3	16
	limber, unpacked	10	3	14
	side arms	1	1	7
	spare wheel	2	1	12
	Total	26	1	21

	cwt.	qrs.	lbs.
Weight of wagon packed (see detail)	35	2	0
*Wheels, light wagon or limber, weight each ..	1	3	23

Carriage, Siege, 6 feet Parapet, Mark I.

Plate IV.

The carriage consists of two brackets, trail eye, 1st class axletree, and light siege wheels.

It is fitted with elevating gear, travelling trunnion holes, a drag shoe and chain, and a step for laying; also a folding step on the right side of the carriage for loading purposes.

The brackets are built of frames of angle iron, strengthened by bar and plate-iron stays, forming lattice girders.

The axletree, which is of square iron with the ends drawn down to form the arms, is held by caps in recesses at the bottom of the brackets. Tensile stays, the front ends of which encircle the arms, forming shoulders, join the axletree to the trail.

* A spare heavy wheel for *gun* limber is carried, but the wagon and wagon limber have the light wheel.

The travelling trunnion holes are formed of wrought-iron brackets rivetted on the inside to the top flange of the bracket frames.

The elevating gear consists of a stool bed, supported at one end by bolts passing through the carriage brackets, and at the other by a bolt to a double elevating screw; the nut of the screw being fixed to the base of a wrought-iron box. The outside screw is turned by means of a pair of bevel pinions in the box. One of these is attached to the screw by feathers, the other being on the same spindle as the wrought-iron hand wheel placed on the outside of the right bracket of the carriage.

The wheels are light 1st class, Madras pattern, 5 feet diameter, 4-inch tire, with a 2-inch dish, and no strut.

The nave flanges are of malleable cast iron, and are flush with the pipe box; the front flange having an additional grease recess at the front, with three filling holes in it, closed by screw plugs.

The pipe 12 inches long, of phosphor-bronze, with grooves, is bored to suit a 1st class axletree arm. The spokes are of English oak, 2 inches wide and 3·75 inches deep, the felloes of ash, 4 inches wide and 4·25 inches deep. The ring tire is 4 inches wide and 0·75 inch thick, and has the edges rounded off to 0·625 inch. It is secured by 12 bolts, with collars and nuts. The wheels, if demanded separately, will be called "Wheels, 1st class B, No. 7."

To move the gun to or from the travelling trunnion holes, a wood roller is placed in bearings on the brackets, and tackles are attached to loops on the front of the brackets. The roller used has gudgeons, and is called "Roller, shifting, No. 2."

		ft.	in.
Height to axis of gun in firing position		6	5·5
Track of wheels		5	2
		Degrees.	
Elevation, maximum		15	
Depression		5	
	cwt.	qrs.	lbs.
Weight — carriage	19	3	0
Weight — wheels	7	0	0
Total	26	3	0
	tons.		
Tonnage	7·867		

Limber, Siege, 6 feet Parapet, Mark I.

The limber is the wrought-iron siege limber; the futchels and splinter-bar are of wrought iron; the axletree bed is also of wrought iron; and, with the axletree, constitutes a beam of box-girder section.

The wheels are 2nd class, B, No. 25. The washer is a "loop washer," having a shorter loop than the usual drag washer.

The limber is fitted with a limber-hook, steeled, with a piece of steel welded in, to prevent wear, and fitted with a steel key, $1\frac{1}{4}$ inch diameter.

The shafts are, one pair "near" and "off," the former being of the field pattern, and the latter similar to the field pattern, but having a loop on the iron for the stay of the outrigger; also another pair "framed" and attached to the splinter-bar. There are outriggers for four-horse draught. The shafts are fitted for farmers' draught when necessary.

The limber is arranged with one centre, and two ammunition boxes.

		cwt.	qrs.	lbs.
Weight	limber and shafts	6	3	22
	wheels	4	2	4
	ammunition boxes (2)	1	2	7
	centre box	0	0	22
	Total	13	0	27

CARE AND PRESERVATION OF CARRIAGES, LIMBERS, AND WAGONS.

(*a*) *Extracts from "Regulations for Magazines, and the Preservation of Artillery Matériel."*

General Instructions.

"726. All the working parts . . . . . should be kept clean and free from clotted oil and dirt. All oil holes should be kept clear. In cleaning the bright parts care should be taken to avoid the use of coarse grinding materials, such as sand, emery, files, &c., which unnecessarily wear away the surfaces, and give too much play to the various parts. This particularly applies to the elevating spindle, screw and pin, and various bearings. The joints of hasps, turnbuckles, and ammunition box hinges should be oiled occasionally.

"727. All bolts, screws, and nuts should be kept tightly screwed up, but before inserting them the threads should be oiled. Any bolts, nuts, rivets, screws, split keys, hasps, turnbuckles, or hinges that are damaged or deficient, should be repaired or replaced at once.

"728. In handling gear care should be taken not to indent screws, pinions, spindles, &c. All indents should be neatly removed.

"729. Before repainting the equipment, care should be taken that it is put in proper repair; that all blistered paint, dirt, and grease are thoroughly removed.

"730. The equipment will be painted with lead-colour paint, which is issued prepared ready for use; care must be taken that it is applied thinly and evenly over the surface, and that elevating screws and bright parts are avoided. Before the first coat is applied the surface should be quite dry, and the second coat should not be applied until the first has hardened. If the paint is found to be too

thick to flow evenly from the brush, it should be thinned with the best spirits of turpentine.

"731. On completion of the painting the lettering will be done with white paint, in accordance with Regulations.

"*Wheels.*

"753. Felloes slightly split can, in some cases, be strongly repaired by the insertion of screws. Slip spokes or felloes may be inserted for unserviceable ones. When the joints of felloes have shifted, and tires become twisted on the felloes, they should be adjusted . . . . . .

"757. Wheels acquiring too much play on the axletree arm should have a leather washer placed on the axle at the outer end of the pipe box, between it and the linch-pin washer.

"758. The proper greasing of the wheels is of the greatest importance, and officers . . . . . should personally see that the pipe boxes of wheels and axles of vehicles are kept free from dirt and grit, and properly greased.

"759. When vehicles are in constant use the wheels and axles should be greased periodically, and in cases of vehicles in store, the wheels and axles should be kept greased, and should be re-greased before being used. The points of axletree arms will be greased when not in use . . . . . .

"760. To grease the axle, remove the wheel, and carefully clean all the old grease off the axle and from the inside of the pipe box. Then smear the inside of the pipe box and outside of the axle with fresh grease, and replace the wheel.

"761. It is most important that the old grease should be removed before applying fresh, as the old grease contains small particles of metal and sand, and soon wears the pipe boxes. The metal nave must be kept painted, and on no account polished."

(*b*) *Special Instructions.*

The footboard joints should be cleaned and oiled.

Ammunition boxes should be removed occasionally and examined underneath. Care must be taken to prevent the lodgment of water on any part of the mountings.

When carriages are parked, or placed in a shed with the shafts exposed, the latter should be raised on the props to keep the points dry.

Defects or damage must be made good without delay; if the paint becomes rubbed off at any part it should be patched over as soon as possible. Before repainting they will be thoroughly overhauled by the armament artificers under the Inspector of Ordnance Machinery when there is one in the district.

CLERK'S PLATFORM,* MARK II.

For service the carriage should be mounted on a Clerk's platform.

This consists of two inclined planes of fir having a slope of 3°, four transoms, and a trail plank.

* When existing stock is used up, planks for trail and wheels will be used instead for these guns.

The inclined planes are each fitted on their inner sides with a riband plated with iron along its inner edge; a movable iron stop in front and rear to keep the wheels from running off; a plate round the thin end with a hole for the pivot pin; at the rear a traversing bolt. Three of the transoms are 7 feet long, and the fourth 10 feet.

The first transom has four holes for the pivot pins, the two inner holes for the 40-pr. and 6·3-inch howitzer, the two outer for the 25-pr. The trail plank is of oak 8 feet long; it is plated with iron on the upper surface for a length of 3 feet from the front.

To Lay the Platform.

NOTE.—In addition to the platform itself, two service oak planks 6′×12″×3″, one piece of oak skidding 3′×5″×4″, and two field pickets 2′ 6″ are required to complete it.

Entrenching tools, &c., required:—4 pickaxes, 4 shovels, 2 rammers, 6 pickets, 1 maul, 1 field level, 1 measuring tape or rod.

The line of fire (*lf*) having been ascertained and marked by pickets or banderols, the front transom (*b*), with the holes in it, is laid at right angles to it in the centre of the gun portion, 6 inches from foot of the interior slope of the parapet: this is done by making the distances *ef*, *e′f*, from ends of the transom to any point, *f*, in the line of fire equal. The transom should be flush with the ground, and laid horizontal by means of a field level.

A second front transom *b′*, is laid in rear of, and close to the first. A third or intermediate transom is laid at a clear interval of 3′ 8″ in rear of the second.

The rear transom is laid at such distance from the front that the ends of the inclined planes will rest on them so as to allow a bearing for the handspikes under the traversing bolts.

The ground between the transoms having been well rammed, the side pieces are laid, ribands inside, and pivoted to the inner set of holes in the front transom by means of two iron pins.

The trail plank is then placed between the side pieces, the iron-shod portion of it to the front, and resting on the centre transom and plank.

The rear of the trail plank is supported on a plank placed 15 inches in front of the rear transom, the trail plank being lengthened by a 6-feet oak plank butted against a piece of skidding supported by two pickets. Two small scotches, *s*, *s*, should be screwed down to the centre transom for the front of the trail plank to butt against.

Placing the Gun on the Platform.

This may be done by removing the rear stops and moving the gun up from the rear on inclines of quoins or skidding with planks on them.

It may also be done by placing the gun in position before the inclined planes have been placed and pivoted, the wheels are then raised in succession and the inclined planes run under them and pivoted to the front transom.

For transport the parts are lashed together.

Weight of platform 17 cwt., tonnage 1·6 tons.

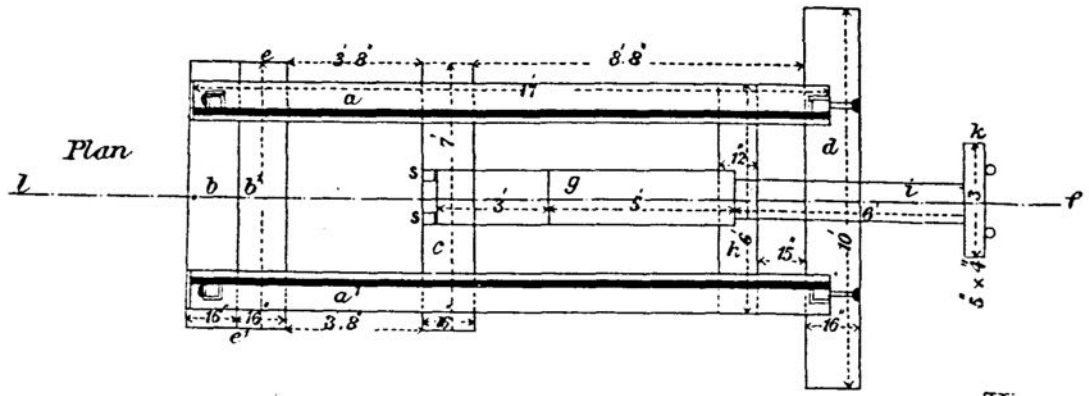
Methods of Checking Recoil.

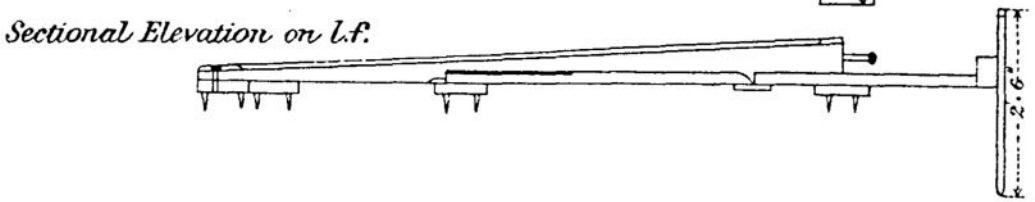
The slope in the Clerk's platform has been generally taken to be a sufficient means to check recoil, but when it is inconveniently severe a pile of sandbags may be made on each inclined plane.

To face page 16.

CLERK'S PLATFORM.

METHOD OF LAYING.





Wyman & Sons, Ltd. Lith. 3009-5-98.

When convenient a holdfast might be established to which the double block of a luff tackle should be attached, the single block being secured to the axletree bed or trail. Two or three sandbags should be made fast to the running end of the fall. By thus causing the gun to overhaul the tackle every time it is fired, the recoil is restrained within convenient limits. It is a good plan to prolong the fall with a drag rope bent on to the running end: this enables the sandbags to be placed well clear of the gun portion, and lessens the chance of their striking any one in their rapid movement.

When Clerk's or D.D. platforms are not used, the wheels and trail should rest on oak planks, or planks with iron or steel faces, and the recoil is checked by means of recoil scotches placed about 1 foot in rear of the wheels. When these are not available a pile of 3 or 4 sand bags, 2 feet in rear of each wheel should be substituted.

AMMUNITION.

CHARGES.

Full, 5 lb. R.L.G. or R.L.G.^{2} powder with paper cylinder and wood socket. Diameter not to exceed 4·77". Length not to exceed 10·75".

Saluting, 3 lb. *blank* powder. Diameter not to exceed 4·77". Length not to exceed 6·25".

Service Cartridge.

The *service cartridge* is of No. 1 class silk cloth, and hooped with silk braid. The paper cylinder is placed in the centre of the powder charge, and the wood socket for the lubricator is choked into the cartridge by the twine attached to the bag.

Cylinder, Paper, R.B.L. Cartridges.—This is necessary to bring the cartridge up to length, to suit the powder chamber of the gun; formerly a larger charge was used. It is 4½ inches long and 3¼ inches diameter. It is varnished to prevent the absorption of moisture. The end formed by a "former" is the stronger, and is placed downwards in the cartridge, the other end is closed by a millboard disc.

Lubricator.—This consists of two tin cups of tinned iron soldered together and contains a mixture of tallow and linseed oil, attached to a felt wad, backed by millboard. It is used to prevent the gun from leading.

Saluting cartridge.

The *saluting cartridge* is of No. 1 class, silk cloth. Paper cylinder and lubricator are not required.

Aiming Tube.

Cartridges, aiming tube.—Mark 1 case is of solid drawn brass with a cap chamber and anvil in the base; two fire holes in the anvil allow the flash to pass from the cap to the charge, which is 3¼ grains "Curtis and Harvey's Diamond No. 2" powder, over it are wads and a bullet of pure lead.

Mark II differs in the arrangement of the wads.

Packed 100 in a cardboard box and issued, usually, 10,000 in a tin-lined box.

Drill Cartridges.

These are of wood, covered with felt, and placed in a leather case, base shod with copper; they are fitted with a dummy lubricator.

PROJECTILES.

(*Plate V.*)

			Weight. lbs. oz.
Shells.	*Segment** (Mark I.)	Empty, about	38 10
		bursting charge, about ..	0 13
	Shrapnel (Mark I.)	filled with 162 mixed metal bullets, 16 to the lb., bursting charge, 3 oz...	39 3
	Common (Mark II)	Empty, about	38 5
		Capacity for bursting charge, L.G.†	2 4
	Case (Mark II)	filled with 35 8-oz. sand shot packed in clay and sand, about	31 8
Shot,	Solid (for practice only)		41 3
	Drill.—A recovered common shell with a sufficient amount of the lead coat turned down, to enable it to pass freely through the bore of the gun ..		38 0

All projectiles, except the case, are lead coated, and slightly larger than the bore of the gun. Occasionally blisters appear on the lead coat, these should be pricked, and hammered down. A high ring gauge should be used occasionally, to see that the lead coat has not set up or enlarged at the base of the projectile so as to render loading difficult, the projectile can be reduced to the proper gauge by filing.

All 40-pr. R.B.L. shells are now issued with their fuze holes adapted to the general service gauge.

Segment and shrapnel shells are used against bodies of troops when the range is beyond the effective powers of case shot.

Common shell is used against earthworks, buildings, &c.

Case shot is used for close quarters against troops.

* These are to be replaced by shrapnel, so soon as the existing stock of segment has been expended at practice.

			P.	F.G.
† For shell, iron, Mark	I.	E.O.C., lbs. oz.	1 12	0 8.
	II.	„ „	1 14	0 8.

Description of Projectiles.

Segment Shell.

This shell will be used up for practice. It is of cast-iron, about $2\frac{1}{4}$ calibres long, lined with 72 cast-iron segments, built up in layers, having a cylindrical powder chamber in the centre. The base is closed with a cast-iron disc.

A thin coat of an alloy of lead extends from base to shoulder; the alloy flows in between the segments, and lines the powder chamber, giving weight and solidity.

The shell is strong against external pressure, while a small bursting charge opens it; the powder chamber is coated with red lacquer, in order to prevent premature explosions.

The lead coating (19 lead to 1 antimony) is 0·05 inch deep over body, and 0·1 inch over base; a cannelure running round the shell to take any lead stripping off the front part.

This shell has a gun-metal bush adapted to the general service gauge, countersunk 0·2 inch below the apex of the shell.

Shrapnel Shell.

The shrapnel shell consists of a hollow body of cast-iron, with a head lightly attached to it, lead-coated like the segment shell, and weakened internally by six longitudinal grooves running down the entire length of the interior.

The base is formed into a chamber, into which fits a tin cup, to contain the bursting charge, 3 oz.

Over the mouth of the powder chamber rests a disc or diaphragm of wrought iron pierced in the centre to take a wrought-iron tube which is screwed into it; the top of this tube is tapped to receive a gun-metal primer employed to assist in carrying the flash of the fuze to the bursting charge in the chamber.

On the diaphragm are placed 162 bullets of lead and antimony, which are fixed by resin being run in among them. Over the bullets is placed a kamptulicon disc.

The head is made of elm, covered with a light shell of Bessemer metal, the wood being bored out to contain a tin socket fitting round the iron tube of the body and holding in its mouth a gun-metal bush of G.S. gauge.

This bush forms a small projecting socket, by which shrapnel are readily distinguished from segment or common shell.

The primer above-mentioned has a conical cup-shaped recess; the bottom of the cup is perforated, and communicates with loose powder in the body of the primer. The bottom is closed by a thin annular disc of brass covered with shalloon. There are two slots in the head for the screw-driver.

The primer Mark III, which has replaced the Mark II, has a larger head, and a leather washer underneath it.

Common Shell.

The common shell is simply a cast-iron shell, lead-coated like the segment, and of the same general form, but about half a calibre longer, and the head rather more pointed; it is lacquered internally,

has a gun-metal bush adapted to the general service gauge, and countersunk 0·2 inch.

Case Shot.

The case of the shot is of sheet iron with iron ends, a wrought-iron disc is dropped loose into the bottom, and on it are placed three wrought-iron curved plates, which form a lining to the sides. It contains 35 sand shot of 8 oz., the interstices between balls being filled with half clay and half sand.

To prevent the case shot from going too far in ramming home, it has a ring of small studs placed near the base.

Distinguishing Marks.

Projectiles will be painted and marked as follow :—

Tips :—

Shot (except case).—To have white tips.
Common shell.—To have black tips.
Segment shell.—To have blue tips.
Shrapnel shell.—To have red tips.

Bands :—

Steel projectiles.—To have white band round head.
All filled shell.—To have red band round head.
Case shot containing chilled iron balls.—To have white band round body.
Projectiles sentenced for practice only (being unfit for service purposes).—To have yellow band round shoulder.

The following additional markings in red paint will be shown on all shells :—

(*a.*) The word "fuzed" if the shell is fuzed.
(*b*) The word "bag" if one has been used.
(*c.*) The monogram of the station.
(*d.*) The date of filling.
(*e.*) A disc, 1 inch in diameter, if shalloon primers have been inserted.
(*f.*) The letters P. or Q.F. (1 inch long) if filled with P. and F.G. or Q.F. and F.G.

The size of type (except the letter P) will be $\frac{1}{2}$ inch.

Shells which have been emptied will be marked on the head with the letter "E," in red paint, and also monogram of station.

FUZES.

Plates VI to IX.

Time.—15 seconds, with detonator, No. 43.
Percussion, R.L., No. 7. } For use with common, segment, or
Percussion, small No. 8, } shrapnel shell; they will act either
Marks III* and IV. } on graze or on impact.
Primer, fuze, percussion, R.L., No. 7.

DESCRIPTION OF FUZES.

Fuze, Time, 15 seconds, with Detonator, No. 43, (Mark III).

Plate VI.

Mark III is of beech wood, coned to suit the G.S. fuze hole gauge. It has a central composition channel, six powder channels, and a detonator screwed into the head.

The detonator consists of a body of gun-metal, hammer supported by a copper wire, and a recess containing detonating composition.

The central channel is driven with fuze composition, having a 0·75-inch pellet of mealed powder above the composition, to prevent cracking when boring for short ranges, which would be the case with composition; the channel is lined with paper to prevent space between the wood and fuze composition in the event of the wood shrinking.

The six powder channels are bored parallel to the central channel, and connected at the bottom by quick match, placed in an annular groove, and closed by pellets of powder; side holes are bored into the channels, and covered with paper, upon which the numbers are painted (reversed to facilitate preparation), and a yellow dot is placed over each side hole.

The steel safety pin passes through the head of the fuze and hammer, so that the fuze cannot be fired accidentally.

Three escape holes above the composition channel allow the gas from the composition to pass out; these are threaded with quick match, and protected by copper discs and papier maché wads, which are forced out by the gas.

The head is woolded with copper wire, soldered over to prevent splitting. The top is covered by a paper disc, showing directions.

The fuze is prepared by being bored through the side hole and powder channel into the composition channel; the safety pin is removed by the braid attached to it; this is done before ramming home in M.L. guns, and before loading in B.L. guns.

Action.—On discharge the hammer sets back and shears the copper suspending wire, ignites the detonating composition, and in turn the powder pellet, and fuze composition, till the bored side hole is reached, when the shell is exploded.

Mark II differs principally in having a thicker suspending wire, consequently it is not so sensitive on discharge of the gun. The

safety pin passes under the detonating hammer, and the copper woolding is lower on the fuze.

Mark I is obsolete.

Percussion, R.L., No. 7.

Plates VII and VIIA.

The body is of gun-metal, screwed to fit the G.S. gauge, and with a square hole in the head to fit the key by which the fuze is screwed into the shell.

The safety pin (of double twisted wire) passes through the head of the fuze, and is kept in its place by the two ends being opened out slightly in the cup, as shown in the Plates. A thin disc of brass is then fitted over the ends, and soldered to keep the fuze watertight. The head of the safety pin is fitted with a loop of string, by which it is withdrawn. *The pin is not to be withdrawn* until the moment of loading the gun.

When the safety pin is withdrawn, the hole through which it passed, if left open, would probably admit of the passage of the flash from the discharge of the gun into the interior of the fuze, and so cause a premature burst. To guard against this a small lead pellet slides freely in a recess cut in the head above the safety-pin hole. When the shell is rammed home, the pellet sets back, and so closes the safety-pin hole.

The percussion arrangement of Mark IV fuze consists of a steel needle, fixed to the centre of the top on the inside, and a lead pellet containing a detonator, covered by a brass disc 0·001 inch thick in its head. The pellet is kept in position by a gun-metal guard, which rests on two feathers on the outside of the pellet. The guard is furnished with a feather on the outside which fits a groove in the body of the fuze, so that body and guard *must* rotate together. On the shock of discharge the guard sets back on the pellet, shearing off the feathers, and on graze or impact the guard and pellet fly forward together, bringing the detonator in contact with the needle, and thereby firing the fuze.

A shield of copper is placed over the top of the lead pellet to prevent the brass safety pin from indenting it, and thereby allowing the detonator to approach too close to the needle.

Mark III has the brass disc over the detonator only 0·001 inch thick, and the guard has no feather. This pattern, when altered to Mark IV pattern, will be known as Mark III*.

Percussion, Small, No. 8.

Plate VIII.

The fuze (Mark IV) consists of the following parts:—

Body, detonator, pellet, with two retaining bolts, spiral spring, safety pin, closing pellet, needle plug, and magazine.

The body is of gun-metal, screwed on the outside to the G.S. gauge. It is bored out from the top to receive the detonator pellet, and is closed by means of the needle plug. Two holes, closed on the outside by brass discs, are bored in the body to receive the retaining bolts of the pellet. Two fire-holes are bored in the bottom to communicate the flash from the pellet to the magazine, which consists of a pierced pellet of pressed powder, secured in the lower end of the fuze by a brass disc spun in.

A detonator, covered by a brass washer 0·03 inch thick, is secured in a recess in the top of the gun-metal pellet, and two fire-holes, filled with F.G. powder, lead from it to the bottom, where they are closed with paper discs. The top of the pellet is reduced to fit inside a spiral spring, which prevents the pellet rebounding or working forward during flight.

The two retaining bolts, with brass spiral springs, pass transversely through the pellet (as shown in the drawing), the springs keeping them locked in the holes in the body until spun out by the rotation of the shell. A screw in the body projects into a groove down the side of the pellet, and prevents it from turning.

The needle plug has a steel needle fixed in the centre, and screws into the top of the body. A hole through the side of the fuze into the needle plug contains a brass pellet, with spiral spring behind it, for closing the safety pin-hole.

The safety pin (of twisted copper wire) passes through the needle plug, down the body, behind the head of one of the retaining bolts, and is bent over at the top into a groove in the needle plug.

Mark III differed from the above in having the detonator pellet held in position by a small screw plug, and in having no protecting washer over the detonator. In Mark II the spiral spring in front of the detonator pellet was found stronger, and was replaced by the same spring as in Mark III, the fuze being then Mark II*, and was identical with Mark III. Marks II* and III will be exchanged for Mark III* or IV.

Mark III fuzes are converted to practically the same as Mark IV, and are then Mark III*.

Action of the Fuze.—The safety pin being withdrawn before loading, the hole is closed by the closing pellet. On discharge, the centrifugal motion of the shell causes the retaining bolts to fly outwards, leaving the detonator pellet free to move forward. On impact, the pellet compresses the spring in front of it, and moves forward on to the needle, which ignites the detonator, and so fires the fuze.

Preparing and Fixing Fuzes.

Fuze, Time, 15 seconds, with Detonator.

Preparing the Fuze.

The wood time-fuzes are prepared for any desired time of flight by boring through the side-hole, corresponding to the required time, into the composition.

When using the hook-borer place the fuze in the hook of the hook-borer in the proper position for boring the required hole; enter the bit into the side-hole and work it forward by pressing hard upon the handle and turning it round at the same time, until the screw takes the thread in the shank of the hook, then screw down to the shoulder; take care not to press upon the fuze so as to prevent its bedding fairly in the hook.

Unscrew till the screw is relieved from the thread in the shank, then pull straight out until the bit is clear and remove the fuze. The length of the bit is so regulated that, when placed in the handle, it will enter sufficiently far into the composition when screwed down to

the shoulder. If the bit should become unserviceable the handle must be detached from the shank and the tightening-screw unscrewed, the square hole in the hook being made for that purpose. Care must be taken when substituting another bit that it is properly placed in the handle, and that the tightening-screw firmly presses upon it, for if any space be left between the handle and the head of the bit the end will not enter a sufficient depth into the composition. The borer should be occasionally examined and cleaned. The operation of preparing the fuze and fixing it in the shell takes, on an average, about 15 seconds; with a little practice these operations may be performed in a shorter time.

Fixing the Fuze.

The wood time fuzes should be screwed into the fuze-hole by hand; when they cannot be screwed any farther they are properly secured. In fixing the fuzes, neither a mallet nor any other instrument is to be used.

Extracting Wood Fuzes.

Fuzes for Rifled Ordnance.—Apply the fuze extractor to the head of the fuze and unscrew; if the adaptor, which is in the fuze-hole of some R.B.L. shells, should also be unscrewed, do not remove the fuze from it by striking it on the end, as a blow in that direction may weaken or break the wire that suspends the hammer in the detonator of the fuze.

Fuzes, Percussion, R.L.

These fuzes require no preparation except the removal of the safety-pin; they are screwed firmly into the fuze-hole by means of the "Key, fuze and plug, G.S.," or "Key, fuze, universal."

Before fixing the fuzes they should always be examined to see that they have not been tampered with, either by the safety-pin being withdrawn, or in any way by which the internal arrangement may have been loosened.

Fixing Plugs, Fuzes, and Securing Shells.

When plugs or metal fuzes are screwed into shells, they will, unless required for immediate use, be lubricated with Mark III luting and mineral jelly, in equal proportion by weight. Each is issued in tin cylinders, and will be mixed locally. The mixture is applied to the threads of the fuze or plug with a brush in sufficient quantity to cover them, care being taken that it does not extend over the bottom. A coat of paint of the same colour as the tip of the shell will be applied over the junction of the G.S. fuze-hole plug and shell when the latter is filled. Projectiles fitted with plugs and kept in exposed situations where the plugs are liable to become set fast by corrosion from the action of salt water, or otherwise, should have the plugs unscrewed occasionally, and the screws cleaned and re-lubricated as above.

Instances have occurred in which fuze-hole plugs of common shells have been so jammed in as to be immovable in consequence of using the "Wrench, base plug." The "Key, fuze and plug, G.S.," the "Key, plug, G.S.," or the "Key, fuze, universal," are the only implements which should be used for screwing in the G.S. plug. In cases where plugs are found to be tightly jammed in shells, the G.S. fuze

and plug key or "turnscrew" on limber must be used for starting the plugs and not the "Key, fuze, universal."

Any plugs or metal fuzes of filled shells, that may be sentenced by the Inspecting Ordnance Officer, at his annual inspection, to be re-lubricated, will be removed and lubricated as above and then screwed tightly home. The plugs and recesses will then be well painted with the same colour as the tip of the shell.

Primer, fuze, percussion, R.L., No. 7.

(*Plate IX.*)

The primer is for use with "fuze, percussion, R.L., No. 7." It resembles the G.S. plug without loop, but is smaller, so as to fit the bottom of the G.S. fuze-hole. It has four fire holes on top, one at each corner of key hole recess.

Primer, Vent Piece.

The primer for vent piece is a tube of leather paper 2½ inches long, driven with mealed powder, and pierced like a tube, having strands of red worsted attached which keep it in the hole in the vent piece; it is used to supplement the tube flash in the vent piece, and ensure the ignition of the charge.

This is only required and used with guns with vent piece, and with "tube, friction, copper, L.S., short." The primer will be used up at practice, and no more will be made.

Tin Cups.

Tin cups are used during practice to stop the escape of gas (on the explosion of the charge the rim of the cup being pressed against the sides of the bore), and as a protector to the copper rings, in order that they may not require re-facing so frequently.

There are two patterns of cup, that used for the side-closing gun having a rectangular slot 0·06 inch in width and 3·33 inches in length, but other dimensions, &c., are the same.

There are also two patterns of extractor, as that used with vent piece guns was unsuitable for service of side-closing guns. The extractor for the latter is of sufficient length to facilitate its being passed through the breech screw when the breech block has been withdrawn; it is fitted with a cross piece which is passed through the slot, and turned so as to engage the cup, which can then be pulled out.

TUBES.

Friction, copper, solid drawn, with ball, Mark II, for use with side closing gun.

Friction, L.S., short, for use with vent-piece guns.

Friction, copper, solid drawn, without ball, Mark I.

The latter will be used when the "Primers, vent-piece" have been used up.

RANGE TABLE FOR 40-PR. R.B.L. GUN.

Charge, { weight, 5 lbs. / gravimetric density, $\frac{63{\cdot}4}{0{\cdot}438}$ / Nature, R.L.G.^{2} }

Projectile, { nature, common shell. / weight, 49 lbs. }

Muzzle velocity, 1180 f.s.

Remaining velocity.	5′ elevation or deflection alters point of impact.		Slope of descent.	Elevation.	Range.	Fuze scale for wood, time, 15 seconds.	Time of flight.
	Range.	Laterally or vertically.					
f.s.	yards.	yards.	One in	degs. mins.	yards.		secs.
1156	40	·14	245	10	100	—	·26
1133	39	·29	137	21	200	1·0	·53
1114	38	·43	90	33	300	1·5	·80
1095	38	·58	66	45	400	2·0	1·07
1078	37	·72	51	58	500	3·0	1·35
1062	36	·87	42	1 12	600	3·5	1·63
1046	35	1·01	35	1 27	700	4·0	1·91
1030	35	1·16	30	1 42	800	4·5	2·20
1015	34	1·31	26	1 57	900	5·5	2·49
1000	33	1·45	23	2 13	1000	6·0	2·79
986	33	1·60	20	2 29	1100	6·5	3 10
973	32	1·74	18	2 46	1200	7·0	3·41
961	31	1·89	16	3 3	1300	8·0	3·73
949	30	2·03	15	3 21	1400	8·5	4·05
938	30	2·18	14	3 39	1500	9·0	4·37
928	29	2·32	13	3 57	1600	9·5	4·69
918	28	2·47	12	4 15	1700	10·5	5·01
909	28	2·61	11	4 33	1800	11·0	5·33
900	27	2·76	10	4 51	1900	11·5	5·65
891	27	2·91	9·1	5 9	2000	12·0	5·98
882	26	3·05	8·5	5 27	2100	13·0	6·31
873	25	3·20	7·9	5 45	2200	13·5	6·65
864	25	3·34	7·4	6 4	2300	14·0	6·99
855	24	3·49	6·9	6 24	2400	15·0	7·34
846	24	3·63	6·5	6 44	2500	15·5	7·69
837	23	3·78	6·1	7 5	2600	16·0	8·04
828	23	3·92	5·7	7 27	2700	17·0	8·40
820	22	4·07	5·4	7 49	2800	17·5	8·76
812	22	4·21	5·1	8 12	2900	18·0	9·13
804	21	4·36	4·8	8 35	3000	19·0	9·51
796	21	4·51	4·6	8 58	3100	19·5	9·89
788	20	4·65	4·3	9 22	3200	20·5	10·28
780	20	4·80	4·1	9 45	3300	21·0	10·67
772	20	4·94	3·9	10 10	3400	22·0	11·07
764	19	5·09	3·7	10 35	3500	22·5	11·47
756	19	5·23	3·6	11 0	3600	23·5	11·87
749	18	5·38	3·4	11 25	3700	24·0	12·28
742	18	5·52	3·3	11 50	3800	25·0	12·69
735	18	5·67	3·1	12 16	3900	26·0	13·10
728	17	5·81	3·0	12 42	4000	26·5	13·52

Drill for Guns on Travelling Siege Carriage, Wood.

The detachment consists of a Gun Captain, a Gun Layer, and six other Gun numbers; also two limber Nos. 8 and 9.

It falls in two deep, the Gun Captain being on the left of the front rank, and the Gun Layer covering him.

To Tell Off.

Gun Group Commander.	*Gun Captain.*
—— *Group Tell off.*	—— *Tell off.*

At "*Tell off*" the Gun Captain takes a pace to his front, turns to his right, and gives the word, "——*Tell off.*"

The Gun Layer does not number.

The right hand man of the rear rank numbers 2, the right hand man of the front rank 3, the second man from the right of the rear rank 4, his front rank man 5, and so on.

After the detachment is told off, the Gun Captain falls in again on the left of the front rank.

If the gun is unlimbered, the detachment is marched into the battery and halted in line facing the front, and to the rear of the trail and when limbered up two yards in rear of the muzzle of the gun. The detachment is now in position of "detachment rear."

If more than one gun of a group is being manned, each Gun Captain marches his detachment to his gun as above, or to such other convenient position under cover as the Gun Group Commander may direct.

The Gun Captain commands, and is responsible to the Gun Group Commander for the regular and efficient service of the gun in all respects.

The gun is never to be fired without his word of command.

At practice he is responsible that the Gun Layer knows the target ordered.

When time fuzes are employed he bores or sets them.

The Gun Captain should also be trained to perform the duties of Gun Group Commander.

It is recommended that, when feasible, this non-commissioned officer should have permanent charge of the gun, and be responsible for its condition and cleanliness, and all stores, etc., connected with it, and also for the emplacement in which it is mounted.

To Prepare for Action.

Gun Group Commander.	*Gun Captain.*
—— *Group prepare for action.*	—— *Prepare for action.*

At "*Prepare for Action*" each number brings up his stores as follows:—

The Gun Layer.—Sights, tubes, tube box, lanyard, 6-ft. handspike, hammer, and punch, and for drill a drill tube.

No. 2.—6 ft.-handspike, side-arms, tin cups (at drill and practice only) in pocket, and tin cup extractor.

No. 3.—6 ft.-handspike and primers in pocket.

No. 4.—6 ft.-handspike and elevating screw.

No. 5.—6 ft.-handspike.

No. 6.—Bucket filled and brush, two cartridge cases, and, for drill, a drill cartridge.

No. 7.—Fuzes, fuze implements, piece of chalk, waste, and, for drill, a drill shell.

The stores will be laid down as follows:—

Gun Layer receives the tubes from the shell store or limber. He straps the tube box round his waist on right side, coils up the lanyard and places it under the belt. He fixes sights, taking care that the foresights fit correctly, and that the deflection leaves of the hind sights work easily. Places his handspike in rear of the trail, bevel up, point to the front, clear of the recoil.

No. 2 places the side-arms on the right of the gun, clear of the wheel, heads to the front, and in line with the breech when the gun is run up, rammer next gun. He places his handspike close to the wheel point to the front, bevel up, centre of the handspike in line with the axletree.

For drill or practice he straps the tin cup pocket round his waist, and places the tin cup extractor in the loop on the carriage.

No. 3 places his handspike close to the wheel, point to the front, bevel up, centre of the handspike in line with the axletree, and straps the primer pocket round his waist. He removes breech and muzzle tampeon and breech apron, placing the apron as a support for the sponge head, and the tampeons on the left of the gun.

No. 4 assists 2 to arrange side-arms, places the elevating screw in position, to enable him to do which 2 places his handspike in the bore, 3 doublemans it. Nos. 2 and 3 then bear down, while 4 puts in the elevating screw. He places his handspike inside of 2's, and about 2 feet in rear, point to the front, bevel up.

No. 5 places his handspike inside of 3's and about 2 feet in rear, point to the front, bevel up.

No. 6 places the sponge bucket and brush near the sponge head, and takes the cartridge cases to the limber.

No. 7 places the time fuzes, hook borer, and piece of chalk in a convenient position for the Gun Captain.

The Gun Captain now sees—

That the gun itself is properly examined by the numbers whose duty it is to do so, and that the fuzes and fuze implements have been brought up and are ready to his hand, and that the breech fittings are properly put on and well oiled.

He receives reports from the numbers of any irregularity or deficiency in connection with the gun, carriage, stores, &c.

He examines the indicator ring, and should it require adjusting, he adjusts it in the following manner:—

The vent piece is screwed home as for firing: 4 places a handspike in the breech; the Gun Layer knocks out the keep pins with a hammer and punch, the lever and tappet ring are then removed by 2 and 3 on to the handspike; the indicator ring is then passed over the octagonal part of the breech screw, so that the arrow marked on

it, or raised line, will be to the left of the mark on the gun, as close as the feather on breech screw will permit. The tappet ring and lever are then replaced. These should be put on so that the lever ball will be on the right side of the gun, in a convenient position for 2 to give two taps after the breech is screwed up.

2 and 3 now open the breech; 2 by taking the lever handle in his right hand, back up, and swinging it round a half-circle towards him from cam to cam. This will strike a blow hard enough to move the screw, which is then unscrewed two turns and the vent piece released, 2 and 3 then lift the vent piece out of the slot and lay it on the flat surface on the top of the breech coil. The Gun Captain looks through the bore; if it is clear, he gives the word "Clear."

If not clear the Gun Captain gives "*Sponge out*," 4 takes up the sponge with his left hand back under, turning to the right about as he does so, and hands it to 2. 2 sponges out in two motions, withdraws the sponge, cleaning the chamber well, and hands it back to 4, who replaces it.

2 and 3 then drop in the vent piece, Gun Layer fires a tube to see that the vent is clear, 2 and 3 again lift out the vent piece, 3 cleans and primes it.

No. 4 examines the elevating gear and sees that it is in working order.

After each number has completed his work as above, he takes post as follows:—

Gun Captain.—Where he can best regain his position for superintending the working of the gun.

Gun Layer.—In rear of the trail, facing the front.

No. 2.—Stands close to and facing the breech on the right side.

No. 3.—Stands close to and facing the breech on the left side.

No. 4.—In line with the trail eye and covering the right wheel.

No. 5.—In line with the trail eye and covering the left wheel.

Nos. 6 and 7 in rear of the limber wheels on their own sides.

Nos. 8 and 9 in rear of the limber.

To Load.

Gun Group Commander.	*Gun Captain.*
———	———
——— *Group.*	—— *Gun.*
—— *Load.*	——— *Load.*

The Gun Layer hooks a tube to the lanyard.

8 and 9 issue a round of ammunition.

7 fixes percussion fuzes and time fuzes after they have been bored by the Gun Captain. He brings up the shell, point to his right, hands it to 3, returns to the limber and prepares another. No. 5 assists No. 7 in his duties.

3 removes the safety pin of the fuze, and introduces the shell, its own length, into the bore, point to the front.

4 turns to the right, and supplies 2 with rammer as detailed for sponge, 2 and 3 ram home the projectile, their outward hands back under, inner hands back up.

6 brings up a cartridge in its case under his right arm. While the projectile is being rammed home, he uncovers the case, and as soon as 3 has withdrawn the cartridge he removes the empty case; 3 places the cartridge in the bore lubricator to the front, 2 presses the cartridge gently home, withdraws the rammer, and hands it to 4, who replaces it.

At drill or practice, 2 would now pass a tin cup down the slot, edge to the front, and press it into the bore. He is responsible that the cup fits the bore, is true in it, and home.

2 and 3 drop in the vent piece; 3 takes the lever handle in his left hand, back up, and turning the handle towards him, screws up the breech screw until it is home, 2 (for additional security) placing both hands on the top of the lever ball, and giving two smart taps. After the breech screw has been screwed home the Gun Captain will make sure by observation that the vent piece is true in the chamber. 2 and 3 then take up their handspikes, place themselves in line with the trail eye, facing the Gun Layer, holding their handspikes diagonally across the body, outward hands at the small ends as high as the ear, inward hands resting on the handspike at the full extent of the arm, bevelled side of the handspike uppermost. 5 goes under cover, or if there is no parapet steps to his rear one yard clear of the wheel.

To lay and fire.

The Gun Layer lays the lanyard over the gun, allowing the toggle to hang over the right side of the carriage; 4 elevates and attends to traversing wheel.

The Gun Layer looks over the sights, steadying himself by leaning on the lever.

At "*Trail right*," 3 heaves over the trail, and at "*Trail left*," 2 heaves it over.

For direction the Gun Layer gives the following signals to the traversing numbers, but if the latter are unable to see the signals, he will direct by word of command.

"*Trail Right or Left.*"—He motions with his hand, his fingers pointing in the required direction, so as to be best seen by the traversing numbers.

"*Halt.*"—He slaps his thigh.

N.B.—When the gun is mounted on Clerk's platform, at "Extreme right (or left)," 2 and 3 apply their handspikes, and, with 4 and 5, heave over the side pieces, after drawing out the iron bolts in rear; when it is necessary to shift the trail plank, 2 and 3, using the side pieces as fulcrums, place the points of their handspikes under the trail handles, and raise the trail; 4 double-mans 2's handspike; 1 and 5 shift the plank.

If it is necessary to run back, 2 and 3 apply their handspikes in front of the wheels, using them as levers of the second order; 4 and 5 take a purchase with theirs over the most horizontal spokes in rear and under the brackets, the whole facing the rear.

At drill, the gun is run back with tackle as with standing carriages.

The Gun Layer lays his gun with the elevation and deflection ordered by the Gun Group Commander, until the final range is given as follows:—

Final Range.

Gun Group Commander.	*Gun Captain.*
—— *Group,*	—— *Gun Lay.*
or	—— *Gun Layer.*
—— *Gun,*	—— *yards,* —— *minutes* (*R. or L.*)
Lay — *yards* — *minutes* (*R. or L.*).	

At the order "Lay," all the Gun Layers, or only the one of the gun named, as the case may be, adjust the tangent sights to the exact elevation ordered.

If firing is to commence as soon as possible after loading the Gun Group Commander should give the "final range" immediately the gun (or guns) is loaded and run up.

The Gun Layer lays his gun with the final range and deflection and awaits the order from the Gun Group Commander "Commence firing."

Commence Firing.

Gun Group Commander.	*Gun Captain.*
—— *Group,* or —— *Gun, Commence Firing.*	*(On seeing Gun Layer clear of recoil.)* —— *Gun Fire.*

At the order "Commence Firing," the Gun Layers of the group, or the gun named, will rapidly make any final corrections of the laying that may be necessary. The Gun Layer then places the tube in the vent and, stepping clear, will hold his right hand above his head, Nos. 2 and 3, laying down their handspikes, go under cover, 4 seizes the lanyard, and on the order "*Fire*," from the Gun Captain, fires.

To Run Up.

After the gun is fired the Gun Captain gives the signal to "Run up" by holding up both his arms vertically over his head. At "Run up," 2, 3, 4, 5 take up their handspikes at the centre, with the hands next the parapet back up, the other hands at the small end back down; 2 and 3 apply their handspikes horizontally over the spokes of the wheels in front under the brackets, close to the breast, and bear down; 4 and 5 use theirs as levers of the second order under the rear part of the wheels, all the numbers at the end of their handspikes, facing to the rear; the Gun Layer applies his handspike under the trail eye, and guides the gun into the line of fire. As soon as the wheels nearly touch the harter, the Gun Captain gives the signal "Halt" by raising his right arm. The Gun Layer slides his right hand, back up, to the centre of the handspike, and throws it to the rear; 2, 3, 4, and 5 withdraw their handspikes, turn inwards and lay them down; 4 and 5 take post.

2 and 3 unscrew the breech screw and lift out the vent piece, 3 cleans and primes it. At practice, 2 removes the old tin cup.

As soon as the vent piece is lifted out, the Gun Captain will look through the bore, and, if clear, give "Clear," or, if necessary, give "Sponge out," when 2 and 4 will proceed as at "Examine gun."

To Run Back and Unload at Drill.

To run back is the converse of running up.

The gun is unloaded by the operation of sponging.* Nos. 6 and 7 will recover the drill ammunition and return it to the limber.

---

* If at drill, the gun is run back after every round, the Gun Captain gives the signal to "Run up" before the gun is sponged out; if, however, it is inconvenient to unload when the guns are run up, the unloading may be done when the guns are run back.

To Cease Firing and Replace Stores.

Gun Group Commander.	*Gun Captain.*
—— *Group,*	—— *Gun,*
Cease Firing and replace stores.	*Cease Firing and replace stores.*

The Gun Captain sees that the gun is depressed to an angle of about 4 degrees. The stores are replaced by the numbers who brought them up.

After replacing stores, the detachment falls in, two deep, in rear of the gun as at first.

The following movements will be required at times, should the gun be mounted behind cover.

To take Post under Cover and form Detachment Rear.

To take Post Under Cover.

Gun Group Commander.	*Gun Captain.*
"—— *Group take post under cover.*"	"*Double March.*"

Each man doubles to his position as follows:—

Gun Captain.—Where he can best regain his position for superintending the working of the gun.

Gun Layer.—On the left of No. 4.

Nos. 2 and 4.—On the right of the gun, 2 next muzzle.

Nos 3 and 5.—On the left of gun, 3 next muzzle.

No. 6.—Outside the cartridge store.

No. 7.—Outside the shell store.

Nos. 8 and 9.—To ammunition stores or limbers.

To Form Detachment Rear.

Gun Group Commander.	*Gun Captain.*
"*Detachment Rear.*"	"*Double March.*"

The Gun Captain doubles out and places himself at the rear of the platform, facing to the front; on the word "*Double March,*" the numbers double to their places in "*Detachment Rear,*" halting and fronting as they come up.

To Unlimber.

This must be done when the gun is in the firing trunnion holes.

Gun Group Commander.	*Gun Captain.*
Unlimber.	*Prepare to unlimber.* *Lift.* *Limber drive on.* *Lower.*

"*Prepare to unlimber.*"—The Gun Layer unkeys the keep chain, and with 2, 3, 4, 5, 6, and 7 stands to the trail, 2 and 3 nearest the gun.

If there are no horses 9 goes to the shafts, and 8 to the splinter bar on the near side.

At "*Lift*" the trail is lifted clear of the pintail, at "*Limber drive on*" the limber moves on and halts in any convenient position, if possible, under cover; and at "*Lower*" the trail is lowered to the ground.

To Limber Up.

Gun Group Commander.	*Gun Captain.*
Limber up.	*Prepare to limber up.* *Lift.*

The several numbers place themselves as for unlimbering, and at "*Lift*" lift the trail until the muzzle rests on the ground; they then close in towards the breech, and haul down the trail, when the limber is in position for limbering up. The Gun Layer keys up, and the detachment forms the order of march as hereinafter detailed.

Position of Detachment when Limbered up.

In Order of March.

Gun Captain.—In line with the point of the near shaft, and two yards on the left of it.

Gun Layer.—In line with the centre of the shaft, in rear of Gun Captain.

Nos. 2 and 3.—In line with the axletree of the gun carriage.

Nos. 4 and 5.—In line with the centre of the trail.

Nos. 6 and 7.—In line with the axletree of the limber.

Nos. 8 and 9.—In line with the splinter bar.

The Nos. stand covering, one yard from the wheels.

In Rear.

Two deep, two yards in rear of the muzzle of the gun, 2 and 3 covering the off wheel.

To Form the Order of March from Detachment Rear.

Gun Group Commander.	*Gun Captain.*
Form the order of march.	*Left turn.* *Double march.*

The detachments proceed direct. The Gun Captain heads the rear rank. Each number halts when at his post.

To Form Detachment Rear from the Order of March.

Gun Group Commander.	*Gun Captain.*
Detachment rear.	*About turn.* *Double march.* *Halt. Front.*

Nos. 2 and 3 close to the centre, and wheel to their left, marking time when opposite the off wheel and two yards from it; as soon as the detachment has closed up it is halted and turned to the front.

40-PR. R.B.L. GUN ON WOOD AND WROUGHT-IRON STANDING CARRIAGES.

A gun detachment consists of a Gun Captain, a Gun Layer, and five other gun numbers.

It falls in two deep, the Gun Captain being on the left of the front rank, and the Gun Layer covering him,

To Tell Off.

As at page 27.

To Prepare for Action.

Gun Group Commander.	*Gun Captain.*
—— *Group Prepare for Action.*	—— *Prepare for Action.*

At "*Prepare for action*" each number brings up his stores as follows:—

Gun Layer.—Sights, tubes, tube box, lanyard, 6-ft. handspike, and punch, and at drill a drill tube.

No. 2.—Side arms, 6-ft. handspike, tin cups (practice only) in pocket and tin cup extractor.

No. 3.—6-ft. handspike and primers in pocket.

No. 4.—Elevating screw and assists 2 with side arms.

No. 5.—Fuzes, fuze implements, piece of chalk, oil, waste, and, for drill, a drill shell.

No. 6.—Two cartridge cases, and brush. For drill, a drill cartridge.

The following additional stores are supplied, and should be distributed between the various groups of guns. Bits, vent, Armstrong, 1 to 4 guns. Cans, oil, lubricating, 1 per 2 guns or under. Hammers, 2 per battery. Spanners, McMahon, 1 per battery. Clinometers, 1 per work. Buckets, sponge, 1 per 2 guns.

The stores having been brought up, will be laid down as follows:—

Gun Layer receives the tubes from the shell store. He straps the tube box round his waist on right side, coils up the lanyard, and places it under the belt. He fixes sights, taking care that the fore sights fit correctly, and that the deflection leaves of the hind sights work easily. Places his handspike in rear of the carriage, bevel up, point to the front, clear of the recoil.

2 places the side arm on right of platform, parallel to gun, heads to the front, and in line with the breech when the gun is run up, rammer next gun. He places his handspike close to the carriage, point to the front, bevel up, point in line with the centre of the front axletree.

For drill or practice, he straps the tin cup pocket round his waist, and places the tin cup extractor in the loop on the carriage.

3 places his handspike close to the carriage, points to the front, bevel up, point in line with the centre of the front axletree, and straps

---

* The worsted end of the primer is inserted first.

† He will receive time fuzes from the Gun Captain ready bored.

the primer pocket round his waist. He removes breech and muzzle tampeons and breech apron, placing the apron as a support for the sponge head, and the tampeons on the right of his position when under cover.

4 places the elevating screw in rear of the carriage, and assists 2 to arrange side arms.

5 places the time fuzes, hook borer, and piece of chalk in a convenient position for the gun captain. At drill he places the drill shell outside the shell store.

6 places the sponge bucket* and brush near the sponge head, and takes the cartridge cases to the cartridge store.

The Gun Captain will now give the signal to "*Run Up,*" by raising both arms vertically above his head.

2 and 3 apply their handspikes, double manned by 4 and 5 where necessary, under and in rear of the front axletree arms. The Gun Layer applies his handspike under the rear axletree to guide the gun. When the front trucks nearly touch the hurter, the Gun Captain signals "*Halt*" by holding up his right hand. Gun Layer, 2 and 3 withdraw their handspikes and lay them down.

The Gun Captain will now see that the gun is properly examined by the numbers whose duty it is to do so, and that the fuzes and fuze implements have been brought up, and are ready to his hand, that the platform is clean, and that the breech fittings are properly put on, and well oiled.

He receives reports from the numbers of any irregularity or deficiency in connection with the gun, carriage, stores, &c.

He examines the indicator ring, and should it require adjusting, he adjusts it in the following manner:—

The vent piece is screwed home as for firing: 4 places a handspike in the breech; the Gun Layer knocks out the keep pins with a hammer and punch, the lever and tappet ring are then removed by 2 and 3, on to the handspike; the indicator ring is then passed over the octagonal part of the breech screw, so that the arrow marked on it, or raised line, will be to the left of the mark on the gun, as close as the feather on breech screw will permit. The tappet ring and lever are then replaced. These should be put on so that the lever ball will be on the right side of the gun, in a convenient position for 2 to give two taps after the breech is screwed up.

2 and 3 take a purchase with their handspikes over the cheeks and under the breech, the quoin is withdrawn and the elevating screw put in by 4, the Gun Layer holding up the stool-bed with his handspike applied over the bottom step of the carriage. The Gun Captain then gives the order, "*Come up,*" 2, 3, and Gun Layer withdraw their handspikes and lay them down, the latter placing his clear of the recoil.

2 and 3 now open the breech; 2 by taking the lever handle in his right hand, back up, and swinging it round a half circle towards him from cam to cam. This will strike a blow hard enough to move the screw, which is then unscrewed two turns, and the vent piece released; 2 and 3 then lift the vent piece out of the slot and lay it on the flat surface on the top of the breech coil. The Gun Captain looks through the bore: if it is clear he gives "*Clear.*"

If not clear, the Gun Captain gives "*Sponge out,*" 4 supplies 2

---

* When one bucket has to serve two guns it should be put in a convenient position for both Nos. 4.

with the sponge, 2 sponges out in two motions, withdraws the sponge, cleaning the chamber well, and hands it back to 4, who replaces it.

2 and 3 now drop in the vent piece, and the Gun Layer fires a tube to see that the vent is clear, 2 and 3 take out the vent piece again, 3 cleans and primes it.

In laying the gun after loading, no elevating of the breech with handspikes or movement of the quoin should be necessary. The quoin should be properly adjusted half way in, also the elevating screw run down till the gun is elevated 2 or 3 degrees when preparing for action. Afterwards all elevation should be done by the screw. Should any variation of elevation greater than that obtained by screw be required, quoins should be re-adjusted at the command "*With handspikes elevate,*" when 2 and 3 would apply their handspikes as before detailed.

After each number has completed his work as above he goes "*under cover.*"

The positions of the various numbers under cover are as follows. They should then, if possible, be sitting or lying down :—

Gun Captain.—Where he can best regain his position for superintending the working of the gun.

Gun Layer.—On the left of No. 4.

Nos. 2 and 4 on the right of the gun; 2 next the muzzle.

No. 3 on the left of the gun.

No. 5 outside the shell store.

No. 6 outside the cartridge store.

To Load.

Gun Group Commander.	*Gun Captain.*
—— *Group.*	—— *Gun.*
—— *Load.*	—— *Load.*

The Gun Layer hooks a tube to the lanyard.

2 and 3 place themselves in position for loading.

5 fixes percussion fuzes and time fuzes after they have been bored by the Gun Captain. He brings up the shell, point to his right, hands it to 3, returns to the shell store, and prepares another.

3 removes the safety-pin of the fuze, and introduces the shell its own length into the bore, point to the front.

4 lifts the rammer with his left hand, back under, turning to the right-about as he does so, and hands it to 2. 2 and 3 ram home the projectile, their outward hands back under inner hands back up.

6 brings up a cartridge in its case under his right arm. While the projectile is being rammed home, he uncovers the case, and as soon as 3 has withdrawn the cartridge he removes the empty case. 3 places the cartridge in the bore lubricator to the front; 2 presses the cartridge gently home, withdraws the rammer, and hands it to 4, who replaces it.

At practice 2 would now pass a tin cup down the slot, edge to the front, and press it into the bore. He is responsible that the cup fits the bore, is true in it, and home.

2 and 3 drop in the vent piece; 3 takes the lever handle in his

left hand, back up, and turning the handle towards him, screws up the breech screw until it is home, 2 (for additional security) placing both hands on the top of the lever ball and giving two smart taps. After the breech screw has been screwed home, the Gun Captain will make sure by observation that the vent piece is true in the chamber. 2 and 3 then take up their handspikes, and face to the rear, in line with the breech, holding their handspikes diagonally across the body, outward hands at the small end as high as the ear, inward hands resting on the handspike at the full extent of the arm, bevelled side of the handspike uppermost; 4 kneels on his left knee in rear of the right cheek ready to elevate.

To Lay and Fire.

As soon as the gun has been loaded the Gun Layer lays the lanyard over the gun, allowing the toggle to hang over the right side of the carriage. He then proceeds to lay his gun. See page 30.

At "*Trail Right*," 2 moves round on his right foot to the rear of the axletree arm, and applies his handspike under it to row; 3 stepping to his left takes a purchase under the rear of the cheek and stands ready to heave over the trail. They heave together until the order "*Halt*," and remain their steady until the next order is given.

"*Trail Left*" is the converse of the above.

NOTE.—If extreme traverse is required the Gun Captain will direct other gun numbers to assist the traversing numbers, as necessary.

To Run Up.

After the gun is fired, the Gun Captain gives the signal to "*Run up*," by raising both hands vertically above his head, and the gun is run up as before detailed.

2 then unscrews the breech screw and assists 3 to lift out the vent piece; 2 removes the old tin cup (if used); 3 cleans and primes the vent piece.

The Gun Captain will give the command "*Clear*" if the bore is clear, or "*Sponge out*," if necessary, when 4 will supply 2 with the sponge; 2 sponges out, 4 replaces the sponge.

To Run Back and Unload at Drill.*

To run back is the converse of running up. The gun is unloaded by the operation of sponging, 5 and 6 recovering the drill ammunition and returning it to the recesses or expense stores.

---

* If, at drill, the gun is run back after every round, the Gun Captain gives the signal to "Run up" before the gun is sponged out; it may be inconvenient to unload when the guns are run up, if so, the unloading should be done when the guns are run back.

To Cease Firing and Replace Stores.

Gun Group Commander.	*Gun Captain.*
—— *Group.*	—— *Gun.*
Cease firing and replace stores.	*Cease firing and replace stores.*

2 and 3 apply their handspikes under the breech and bear down, Gun Layer holds up stool bed, 4 takes out elevating screw and puts in quoins.

The Gun Captain sees that the gun is depressed to an angle of about 4 degrees. The stores are returned by the numbers who brought them up.

After replacing stores the detachment falls in two deep in rear of the gun as at first.

Drill with 40-pr. R.B.L. Guns on Wrought-iron Traversing Slides.

The drill is the same as with 40-pr. R.B.L. guns on standing carriages, except that the gun being on live rollers does not require to be run up.

The carriage is fitted with a hydraulic buffer; the Gun Captain will see that it is filled with the correct amount of oil.

In preparing for action the Gun Layer does not bring up a handspike, 2 and 3 bring up iron-shod levers instead of handspikes.

Drill with 40-pr. R.B.L. Guns on Wood Traversing Slides.

The drill is the same as with 40-pr. R.B.L. guns on standing carriage with the following exceptions:—

To Prepare for Action.

Gun Layer.—Sights, tubes, tube box, lanyard, and punch, and for drill, a drill tube.

No. 2.—Sidearms, handspike, iron shod lever, tin cups in pocket, when used, and tin cup extractor.

No. 3.—Handspike, iron shod lever, and primers in pocket.

No. 4.—Truck lever, elevating screw, and assist 2 with side arms.

No. 5.—Truck lever, fuzes, fuze and shell implements, piece of chalk, oil, waste, two sets of running-back tackle, and for drill, a drill shell.

No. 6.—Two cartridge cases, and brush. For drill a drill cartridge.

The handspikes and iron shod levers are laid down bevelled side uppermost, the handspikes next the gun, the truck levers between them, the whole with their points to the front.

The gun is run up and back as with 64-pr. R.M.L. on traversing slide.

40-pr. Side-closing R.B.L. Gun, mounted on 6-ft. Parapet Carriage, Mark I.

The drill is the same as that for 40-pr. R.B.L. on travelling carriage with the following exceptions:—

In all cases for "vent piece" read "breech block."

To Prepare for Action.

Gun Layer brings up a pricker and vent server. He drifts the vent and places the pricker in the loop on the side of the carriage, and the vent server in the vent.

3 does not bring up primers.

As soon as 2 has unscrewed the breech screw, he presses the catch of breech-block with his left hand, withdraws the breech-block with his right hand as far as the stop.

To Load.

As soon as 2 puts in the tin cup, he pushes home the breech-lock.

N.B.—The thumb-piece of the catch should fly up, and the stop on the handle of the breech-block should close in the angle of the upper bracket on the gun, when the breech-block is home.

To Run Up.

As soon as the breech-block is drawn out, the Gun Layer replaces the vent server.

Note.—As this gun is side vented, the firing number must stand well to the rear, and clear of the recoil, as otherwise the tube is liable to be jerked out of the vent when the lanyard is pulled.

To Shift a 40-pr. R.B.L. Gun, on Travelling Siege Carriage, from Travelling to Firing Trunnion Holes.

This must be done while the gun is limbered up.

Strength of Detachment.—One gun detachment.

Officer.	*No. 1.*
Shift from travelling to firing trunnion holes.	*Prepare to shift the gun.*
	Prepare to bear down.
	Bear down.
	Come up.
	Prepare to lift.
	Lift and heave.
	Prepare to bear down.
	Bear down.
	Come up.

"*Prepare to shift the gun.*"—2, 3, 4 and 5 cast loose side-arms and handspikes and unbuckle straps should the gun be so secured; 2 and 3 take off cap-squares; 4 and 5 scotch the gun wheels with handspikes, 4 in front, 5 in rear.

"*Prepare to bear down.*"—2 places his handspike in the bore; 4 passes a handspike across 2's to 5; 8 and 9 make fast two drag-ropes to the breech, and pass the ends towards the muzzle; 3, 8, and 9 then double man 2's handspike. A check rope should be made fast to the breech and axletree bed of limber by No. 9.

"*Bear down.*"—2, 3, 4, 5, 8, and 9 bear down; 6 hands the roller to No. 1, who places it as near as possible under the centre of gravity and gives

"*Come up.*"

"*Prepare to lift.*"—4 crosses his handspike under that in the bore to 5; 1, 6, and 7 man the ropes.

"*Lift and heave.*"—The bends of the arms are placed under the handspikes; the gun is raised out of the travelling holes and hauled forward until the trunnions fall into the firing holes. The handspike men should keep their eyes fixed on the gun so as to be prepared for its descent. As soon as the gun is in the trunnion holes the drag-ropes are cast off by 8 and 9.

"*Prepare to bear down.*"—4 reverses his handspike and places it over that of 2.

"*Bear down.*"—6 withdraws the roller, and straps it on the carriage: 1 and 7 put on the elevating gear.

"*Come up.*"—The handspikes are withdrawn and laid down.

To Shift from Firing to Travelling Trunnion Holes.

The operation of shifting from firing to travelling trunnion holes is the converse of the above, but the roller should be placed with its centre opposite the rear of the horns of the travelling trunnion holes. The breech can be raised with handspikes to enable the roller to be withdrawn. The gun is secured by straps to the carriage for travelling.

Mounting or Dismounting the Gun.

The gun can be mounted or dismounted by the detachment only, in a similar manner to that described at p. 229, G. A. Drill, Vol. II., for the 64-pr., except that, to dismount the gun the muzzle is borne down by 2, 3, 4, and 5. Skids, 14′ × 5½″ square, iron bound, are launched up under the gun by 6, 7, 8, and 9, and lashed through trail eye to gun wheel with a drag-rope, hook dropped over the hooks of the skid. A drag-rope is secured to the breech by 8. 2, 3, 4, 5, 8, and 9, lift at the muzzle, Gun Layer, 6, and 7, haul the gun down. When mounting, Gun Captain steadies the gun with a hand spike in the vent slot until it is fairly on the skids.

To Shift a 40-pr. R.B.L. (side closing) Gun on 6-ft. Parapet Carriage from Firing to Travelling Trunnion Holes.

Note.—This should be done while the gun is unlimbered, as if limbered up the gun is liable to come over the front when being raised out of the trunnion holes.

Strength of Detachment.—About 19 Nos; or, say, two gun detachments.

Stores required.—The stores required, in addition to those on the gun, are as follows, viz. :—

Drag-ropes, heavy	3
Luff tackles, complete	3
Selvagees	2

Gun Group Commander.	*Gun Captain.*
Shift from firing to travelling trunnion holes.	*Prepare to shift the gun.*
	Hook tackles.
	Prepare to bear down.
	Bear down.
	Come up.
	Prepare to lift.
	Lift and heave.
	Halt. Lower.
	Prepare to bear down.
	Bear down.
	Heave and ease off.
	Cast of tackles.

"*Prepare to shift the gun.*"—2, 3, 4, and 5 cast loose side-arms, handspikes, remove laying step, fittings, &c., and disconnect elevating screw from stool-bed, which is lowered and allowed to rest on axletree of carriage; 8 and 9 bearing down on a handspike, with drag-rope attached, placed in the bore; 2 and 3 remove capsquares; 4 scotches the wheel in front; 5 in rear.

Hook tackles.—Gun Captain places selvagee on breech lever; 4 and 5 hook the double blocks to it; 6 and 7 the single blocks to the loops on the brackets of carriage; they take in the slack, and stand ready for easing off, assisted by 4 and 5; 9 hooks the double block of tackle to selvagee on breech lever; 8 the single to trail plate eye, using a selvagee for this purpose, they take in the slack, and pass the fall to the rear.

Prepare to bear down.—2, 3, 8, and 9 man the handspike in the bore; 6 hands roller to Gun Captain.

"*Bear down.*"—2, 3, 8 and 9 bear down. Gun Captain places roller and gives

"*Come up.*"

"*Prepare to lift.*"—All the numbers above 9 man the breech tackle.

"*Lift and heave.*"—2, 3, 8 and 9 lift; 4, 5, 6 and 7 ease off a little, the remainder haul on breech tackle until the trunnions are over the flat part of the brackets; when Gun Captain gives "*Halt, Lower*"; 2, 3, 8 and 9 lower the trunnions on to the brackets, the breech-tackle Nos. easing off at the same time.

"*Bear down.*"—Gun Captain removes roller.

"*Heave and ease off.*"—4, 5, 6 and 7 ease off; 2, 3, 8 and 9 steady the muzzle; remainder haul on breech tackle.

"*Cast off tackles.*"—The tackles are cast off by the same numbers that hooked them; the gun is secured by straps to the carriage for travelling, and the fittings, &c., replaced by the Nos. that removed them.

The carriage can then be limbered up by using the limber as a lever, a drag-rope being made fast to the trail-plate eye, and the shafts of the limber being raised, two or three turns are taken round

the limber hook, and held on to. By lowering the shafts the trail is raised, and skidding is then inserted underneath it. This is repeated until the limber hook is entered into the trail eye.

To Shift from Travelling to Firing Trunnion Holes.

This may be done while the gun is limbered up or unlimbered. The operation of unlimbering being the converse of limbering up as detailed above :—

Gun Group Commander.	*Gun Captain.*
Shift from travelling to firing trunnion holes.	*Prepare to shift the gun.* *Hook tackles.* *Arrange muzzle handspike.* *Taut. Heave.* *Cast off tackles.*

Unlimbered.

Prepare to shift the gun.—2, 3, 4, and 5 cast loose side-arms, &c., and remove capsquares; 4 and 5 scotch the wheels.

Hook tackles.—As before.

Arrange muzzle handspike.—2 places a handspike in the bore with a drag-rope attached, double-manned by 3, 8, and 9.

"*Taut. Heave.*"—2, 3, 8 and 9 steady the muzzle; 19 eases off the check tackle, the remainder man the falls of the hauling tackle on their own sides; as soon as the trunnions rest on the flat part of the carriage brackets, 6 and 7 place points of handspikes in the trunnion holes to receive the gun.

Cast off tackles.—As before.

Limbered up.

Prepare to shift the gun.—8 and 9 lash trail eye to axletree bed of limber with a drag-rope. Remainder of detail as above.

Hook tackles.—As above, a turn being taken with running end of check tackle round the splinter bar of limber.

Arrange muzzle handspike.—As before.

Taut. Heave.—As before. If strength of detachment permits, it is advisable to place two numbers to hold up and steady the shafts.

Cast off tackles.—As before.

To Mount or Dismount the Gun on or from a 6-ft. Parapet Carriage.

(N.B.—These operations should always be performed by a gyn if possible.)

By long skids up or down the rear.

Strength of Detachment, about 19 Nos. (two gun detachments will suffice).

Stores Required.

Drag ropes, heavy	2
Handspikes, common, 6 ft.	5
Lashings, white or tarred, 1½-inch, 3 fms. each ..	4
Luff tackles, complete	2
Roller, ground, elm, 3′ × 6″	1
Scotches, of sorts	12
Selvagees	2
Skids,* oak, 14′ × 5½″ × 5½″	2
Skids,† oak, 3′ × 9″ × 6″	1
Skids, oak, 3′ × 4″ × 4″	1
Water bucket, filled, and brush	1

To Mount the Gun.

The ground roller should be placed under the gun, a little in front of the centre of gravity, the carriage at such a distance in front that when the long skids are in position the ground roller is equidistant from breech of gun and lower end of skids. The capsquares are removed by 2 and 3, and the wheels scotched by 4 and 5, for which purpose large scotches are to be preferred, though handspikes can be used for the purpose. The stoolbed is disconnected and removed by same numbers.

Place skids, hook tackles.
Taut. Heave.
Remove skids. Unhook tackles.
Replace fittings.

"*Place skids.*" "*Hook tackles.*"—8, 9, 10 and 11 place the skids, the lower ends bevel down resting on a 6″ × 9″ on its flat; the upper ends resting on a 4″ piece placed in the angle formed by the diagonal stays of carriage brackets, and close up to front stays of carriage.

The skids are cradled at both ends by scotches on the 4″ piece and on the 6″ × 9″; they are hooked together with the hooks back up and lashed back to the trail.

The tackles are then hooked; 12 and 13 hooking the double blocks to a strap round the breech, 10 and 11 the single to loops on the brackets of the carriage. The skids are then watered.

"*Taut.*" "*Heave.*"—The Nos. man the tackles on their own sides and haul the gun up the skids until the trunnions fall on the points of handspikes placed in the firing trunnion holes by 6 and 7.

"*Remove skids.*" "*Unhook tackles.*" "*Replace Fittings.*"—The muzzle is borne down, the skids and tackles cleared away by the Nos. who placed them, and the fittings of gun and carriage replaced by the Nos. that removed them.

---

* Weight 160 lbs., or, if strengthened with iron plates at the sides, 203 lbs.

† Two 3-inch planks, one on top of the other, may be used to support the lower ends of the long skids instead of a 6″ × 9″.

To Dismount the Gun.

To effect this the gun must first be raised out of the trunnion holes.

Raise the gun out of the trunnion holes.
Prepare to bear down.
Bear down.
Come up.
Prepare to lift.
Lift.
Lower.

"*Raise the gun out of the trunnion holes.*"—2 and 3 take off cap-squares and disconnect and remove stoolbed, 8 and 9 assisting by bearing down on a handspike placed in the bore; 4 and 5 scotch the wheels with large scotches or handspikes, 4 in front, 5 in rear; 10, 11, 12, and 13 hook tackles as detailed in mounting, 12 and 13 taking a turn round the axletree and holding on; 11 makes fast a drag-rope to breech.

"*Prepare to bear down.*"—2 places a handspike in the bore, double-manned by 3, 8, and 9.

"*Bear down.*"—The muzzle is borne down; No. 6 hands the roller to Gun Captain, who places it in the bearings on the brackets of carriage.

"*Come up.*"—The breech is allowed to rest on the roller.

"*Prepare to lift.*"—2, 3, 8 and 9 lift on handspike in the bore; 12 and 13 stand to ease off their tackles; remainder man breech drag-rope.

"*Lift.*"—The gun is lifted high enough to clear trunnion holes and hauled to the rear.

"*Lower.*"—The gun is lowered till the trunnions rest on the flat surface of brackets of carriage.

Prepare to bear down.
Bear down.
Place skids.
Come up.
Taut. Heave and ease off.

"*Prepare to bear down.*"—As before.

"*Bear down.*"—As before, the gun roller is removed by Gun Captain and handed to No. 6.

"*Place skids.*"—10, 11, 18 and 19 (or any of the higher Nos.) hook the skids together, hook back up, and place supports and cradle them, as in mounting; they then lash their lower ends to the trail.

"*Come up.*"—The breech is lowered on to the long skids; 2, 3, 8, and 9 man on their own sides the tackles with 12 and 13, the turn round axletree being taken off.

"*Taut.*" "*Heave and ease off.*"—The Nos. on the drag-rope heave, and the gun is hauled down the long skids, which should have been previously watered, on to the ground roller placed to receive the breech, being eased down by the Nos. manning the tackles.

Drill for 40-pr. R.B.L., on Travelling Siege Carriage, Wood, for Volunteer Batteries of Position.

The detachment consists of nine numbers, and falls in two deep (one pace between ranks), No. 1 on the right of the front rank.*

Section Gun Drill.

To Tell Off.

Section Commander.	*No.* 1.
Tell Off.	

At "*Tell off*" No. 1 numbers himself 1; the right hand man of the rear rank numbers 2; the right hand man front rank 3; the second man from the right of the rear rank 4; the man in his front 5, and so on.

Position of Detachment Rear.

Formed as above, in rear of the gun which is limbered up, three yards in rear of the gun wheels, No. 1 covering the off wheel.

Exercise with Drag-ropes.

When drag-ropes are used Nos. 2 and 3 hook them to the drag washers on their own sides. All available numbers man them on their own sides. The highest number is in the shafts. Nos. 6 and 7 hand the drag-ropes to 2 and 3, and bring them up if they are not on the footboard of the limber.

To advance without drag-ropes Nos. 2 and 3 between muzzle and wheel, push at the axletree, 4 and 5 man the gun wheels, highest number in the shafts, remaining numbers assist.

To Form Detachment Rear in Action.

Section Commander.	*No.* 1.
Detachment Rear.	*Double March.*

At the order from the section commander, No. 1 doubles to his place, three yards in rear of the right gun wheel, and gives the order "*Double march.*"

At the order from the No. 1, the numbers double into their places on the left of No. 1, each halting as he reaches his place.

---

* Should the detachment be marched to their guns unlimbered in the barrack square, they will be halted in line, facing the front and in rear of the trail, and told off. On the command from the officer "Take post" the No. 1 will order "Double march," and the men will double to their places in action.

To Take Post from Detachment Rear in Action.

Section Commander.	*No. 1.*
Take Post.	*Double March.*

At this order from the No. 1, all the numbers double to their places.

To Form the Order of March from Detachment Rear.

Section Commander.	*No. 1.*
Form the Order of March.	*Left turn.* *Double march.*

No. 1 heads the rear rank before giving "*Double march.*" The detachment proceeds direct, each number halting when at his post.

To Form Detachment Rear from the Order of March.

Section Commander.	*No. 1.*
Detachment Rear.	*About turn.* *Double march.* *Halt. Front.*

Nos. 2 and 3 close to the centre and wheel to their left, marking time when in their places in detachment rear; as soon as the detachment has closed up, it is halted and turned to the front by order of No. 1, who then changes his flank by the rear.

To Unlimber.*

This must be done when the gun is in the firing trunnion holes.

Section Commander.	*No. 1.*
Unlimber.	*Prepare to Unlimber.* *Lift.* *Limber drive on.* *Lower.*

"*Prepare to unlimber.*" No. 1 unkeys the keep chain, and with 2, 3, 4, 5, 6, and 7, stands to the trail, 2 and 3 nearest the gun.

If there are no horses, 9 goes to the shafts, and 8 to the point of the near shaft. As soon as the trail is lowered to the ground, 7 goes to the point of the off shaft, and 6 in rear of the limber.

At "*Lift,*" the trail is lifted clear of the pintail; at "*Limber*

* Volunteer batteries of position, armed with 40-pr. R.B.L. guns, always come into "Action rear" and limber up to the rear.

drive on" the limber moves on, and at "*Lower,*" the trail is lowered to the ground, and the numbers take post as detailed. The limber moves forward one yard, inclines to the left and then reverses to the right, and halts 10 yards from the trail-eye covering the gun. The wagon inclines to the left, moves to the rear, and forms up four yards in rear of the limber.

No. 1 should see that his gun is correctly dressed when it comes into action, as far as the nature of the ground permits.

To Limber Up.

Section Commander.	*No. 1.*
Limber up.	*Prepare to limber up.* *Lift.* *Halt, limber up.*

The several numbers place themselves as for unlimbering, and at "*Lift,*" lift the trail until the muzzle rests on the ground; they then close in towards the breech. When the limber is in position for limbering up, No. 1 gives "*Halt, limber up,*" the trail is hauled down, and No. 1 keys up, and the whole form the order of march. The limber inclines to the right and reverses to the left. The wagon* will incline to the right, reverse to the left, and form up in front of the gun.

Wagon Supply.

If wagon supply is ordered, one wagon for each section is brought up as detailed in "Field Artillery Drill."

The numbers on the off side of the wagon prepare and supply ammunition to the right gun, those on the near side to the left gun.

Limber Supply.

At limber supply the wagons under the Captain follow as far as possible the instructions laid down in "Field Artillery Drill."

Position of Numbers after Unlimbering.

No. 1 stands in rear of the trail-eye.
No. 2 stands close to and facing the breech on the right side.
No. 3 stands close to and facing the breech on the left side.
No. 4 stands in line with the trail-eye covering the right wheel.
No. 5 stands in line with the trail-eye covering the left wheel.
No. 6 stands in rear of the off limber wheel.
No. 7 stands in rear of the near limber wheel.
Nos. 8 and 9 stand in rear of the limber boxes.

No. 1 is responsible for the correctness of the gun and its equipment, he will see that the stores, fittings, ammunition, &c., are com-

* These are merely parade movements. In action the wagons would probably not be close to the guns.

plete and ready for instant action before leaving the gun park; also, that the drill vent piece and drill ammunition are ready for use when required.

Drill with reduced Numbers.

6 Nos.

Nos. 1, 2, 3, and 4 as with a full detachment.
No. 5 performs No. 7's duties in addition to his own.
No. 6 performs Nos. 8 and 9's duties in addition to his own.

7 Nos.

No. 6 performs No. 8's duties in addition to his own.
No. 7 performs No. 9's duties in addition to his own.

8 Nos.

No. 8 performs No. 9's duties in addition to his own.

The gun having been unlimbered—

Action.

Section Commander,	*No. 1,*
Action.	*Action,*

At "*Action*," each number takes his stores as follows:—

No. 1.—Handspike, sights, a piece of chalk, file for vent-piece, hammer and punch, tubes in pocket, lanyard, and for drill, a drill tube. If the No. 1 is not a Gun Layer he hands the tube pocket and lanyard to No. 5.

No. 2.—Handspike, side-arms, tin cups in pocket, tin cup extractor, and for drill a drill vent-piece.

No. 3.—Handspike, primers in pocket, oil can, and hemp, and removes the tampoons and apron, placing the latter as a support for the sponge head.

No. 4.—Handspike, elevating screw, and assist 2 with side-arms.

No. 5.—Handspike.

No. 6.—Two cartridge cases, bucket filled, and brush, and for drill, two drill cartridges.

No. 7.—Fuzes, fuze and shell implements, and for drill, a drill shell.

No. 8.—Lubricators.

No. 9.—A brush for cleaning shell.

The handspikes are laid down bevels up, two on each side, close to the carriage, points to the front, those of 2 and 3 outside and about 2 feet in advance of those of 4 and 5. No. 1 places his handspike parallel to the others in rear of the trail. The side-arms are laid down to the right of the gun and parallel to it, heads to the front in line with the breech, resting on the apron or other support, sponge next the gun. The sponge bucket is placed near the sponge head.

No. 1 straps on the tube pocket, takes out the lanyard and places

it round his neck, hook end hanging down on the right side,* and sees that the gun and its fittings are in good working order.

No. 2 straps on the tin cup pocket and places the extractor in a loop on the carriage.

No. 3 removes the tampeons and apron, placing the latter as a support for the sponge head, straps on the primer pocket, and places the oil can and hemp in a convenient position for use.

No. 4 moves the elevating screw handle until the axis of the gun is horizontal; 2 then opens the breech by taking the lever handle in his right hand, back up, and swinging it round a half-circle towards him from cam to cam; this will strike a blow hard enough to move the screw, which is then unscrewed two turns and the vent-piece is released;† 2 and 3 then lift out the vent-piece and lay it on the flat surface on the top of the breech coil; 1 looks through the bore, if it is clear he gives the word "clear"; if not clear he gives the word "sponge out," when 2 takes a side pace to the left and places himself in a convenient position for sponging out, 4 takes up the sponge with his left hand, back under, turning to the right-about as he does so, and hands it to 2; 2 sponges out in two motions, withdraws the sponge, cleaning the chamber well, and hands it back to 4, who replaces it, 2 and 3 then drop in the vent-piece, and 1 fires a tube to see that the vent is clear, and hangs the lanyard round his neck, 2 and 3 again lift out the vent-piece, 3 cleans and primes it.

Nos. 8 and 9 prepare to issue ammunition.

NOTE.—Should the indicator ring require adjustment, No. 1 adjusts it in the following manner:—The vent-piece is screwed home as for firing; 4 places a handspike in the breech; No. 1 knocks out the keep-pins with a hammer and punch; the lever and tappet ring are then removed by 2 and 3 on to the handspike; the indicator ring is then passed over the octagonal part of the breech screw, so that the arrow marked on it, or raised line, will be to the left of the mark on the gun as close as the feather on breech screw will permit. The tappet ring and lever are then replaced. These should be put on so that the lever ball will be on the right side of the gun in a convenient position for 2 to give two taps after the breech is screwed up.

To Load.

Section Commander.	*No. 1.*
—— *Section, Shrapnel Fuze* ——, *Load.*‡	*No.* —— *Shrapnel Fuze* ——, *Load* ‡

At "*Load*," No. 1 communicates to No. 7 the nature of the shell and fuze required, fixes his tangent sight at the elevation and deflection ordered, places himself where he can best superintend the service of the gun and prepares a tube.*

No. 2 receives the rammer from 4 and stands ready to ram home.

No. 3 receives the projectile from 7 and inserts it in the bore after

---

* See footnote (*) on page 50.

† If any force should be required to unscrew the breech-screw, the lever must be struck on the ball, not on the handle.

‡ "Percussion Shrapnel Load," or "Segment, Fuze .... Load," or "Common Load." A percussion fuze is always used with common unless otherwise ordered.

removing the safety-pin, 2 and 3 then ram home, outward hands back under, inner hands back up, 2 then springs the rammer; 3 receives the cartridge from 6 and places it in the bore, lubricator to the front, 2 presses it into the powder chamber, withdraws the rammer and hands it to 4, who replaces it. 2 then presses a tin cup into the bore rim to the front, and 2 and 3 drop in the vent-piece, 3 takes the lever handle in his left hand, back up, and turning the handle towards him screws up the breech screw until it is home, 2 for additional security placing both hands on the ball and giving two smart taps. 2 and 3 then pick up their handspikes, place themselves about two yards on either side of the trail facing the front, holding their handspikes diagonally across the body, points resting on the ground, outer hands back down as high as the ear, inner hands back up and resting on the handspike at the full extent of the arm.

No. 4 takes up the rammer, as he did the sponge, and hands it to 2. As soon as the gun is loaded he receives the rammer from 2, replaces it, and stands ready to elevate.

No. 5 doubles to the limber and assists 7 when necessary.*

No. 6 brings up a cartridge in its case under his right arm, as soon as the projectile has been rammed home he uncovers the case and tilts the cartridge into 3's hands, to prevent his pulling off the lubricator, and returns with the empty case to the limber.

No. 7, having fixed the fuze, brings up a shell and hands it to 3 (if a time fuze he shows it to No. 1 before fixing it). He then doubles back to the limber.†

No. 8 issues a cartridge to 6 with lubricator attached.

No. 9 issues a shell to 7.

NOTE.—At drill the cartridge of the preceding round should be forced out of the bore in ramming home the projectile. If properly rammed home, the drill shell should have been forced through the bore in the act of loading.

To Lay and Fire.

No. 1 or the trained gun layer looks over the sights, steadying himself by leaning on the lever, 2 and 3 traverse with their handspikes as directed, taking care to move the gun little or much as indicated by No. 1's or the Gun Layer's right hand; these numbers should frequently be exercised in traversing.

At the signal "*Trail right*" (No. 1's or the Gun Layer's hand extended in that direction), 3 heaves over the trail until the signal "*Halt*" (No. 1 or the Gun Layer striking his thigh) is given, at the signal "*Trail left*" 2 heaves it over.

No. 4 elevates as directed by No. 1 by word of command. He also works the traversing screw as directed by No. 1, if required.

(No gun is ever to be fired without the order of the No. 1.)

Section Commander.	*No. 1.*
Fire No. —— Gun.	*Points to the vent.* *No. —— Fire.*

* If No. 1 is not a trained Gun Layer, No. 5 will lay and make ready; No. 8 assisting 7 at the limber in place of No. 5.

† Time fuzes, after being bored at the limber, are placed loosely in the shell. No. 7 takes them out to show them to No. 1. After No. 1 has examined the fuzes No. 7 fixes them.

At "*Fire No.——gun,*" No. 1 places a tube in the vent, and throws the lanyard over the right side of the gun, he then steps clear of the recoil to the left, and points to the vent with his right hand.

No. 4 steps in, seizes the lanyard in his right hand, steps outside the wheel, and stands facing the front, holding the lanyard taut with his right hand, the right elbow being so bent that the hand is level with the vent. 2 and 3 lay down their handspikes and, with 5, step clear of the wheels.

"*No.——Fire.*"—No. 4 slews his body smartly to the right, and thus fires the gun. In the event of a missfire, No. 1 will drop in a tube, keeping as clear of the wheel as possible, and 4 will resume the position of "*Ready.*" At practice, in the event of several tubes failing, and it being necessary to take out the vent-piece, five minutes should be allowed to elapse before the breech-screw is unscrewed, and then the vent-piece is removed as quickly as possible.

As soon as the gun is fired, No. 4 hands the lanyard to No. 1, who replaces it round his neck; the gun is then run up without further order, 2, 3, 4 and 5 take up their handspikes at the centre, with the hands next the muzzle backs up, the other hands at the small ends backs down; 2 and 3 apply their handspikes, bevel down, horizontally over the spokes of the wheels in front, under the brackets, close to the breast, and bear down; 4 and 5 use their handspikes as levers of the second order under the rear part of the wheels; all the numbers facing to the rear; No. 1 applies his handspike under the trail-eye, and guides the gun into the line of fire. As soon as the gun is sufficiently run up No. 1 gives "*Halt,*" slides his right hand, back up, to the centre of the handspike, and throws it to the rear. 2, 3, 4 and 5 withdraw their handspikes, turn inwards, and lay them down. 2 and 3 remove the vent-piece, 3 cleans and primes it, 2 removes the tin cup. No. 1 gives "*Sponge out*" (as already detailed for "*Action*").

To Cease Firing and Replace Stores.

Section Commander.	*No. 1.*
Cease Firing. (*Fire No. —— Gun.*)	(*No. —— Fire.*)

The stores are replaced by the numbers who brought them up; 2 and 3 replacing the vent piece and screwing up the breech screw.

If any time fuzes have been bored they should be destroyed, as also any percussion fuzes the safety pins of which cannot be replaced.

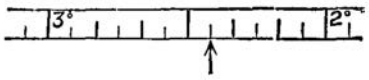
All guns fully loaded must be fired at the command "*Cease firing.*"

"*Stand fast.*"—If the firing is only to be stopped for a time "*Stand fast*" should be given, on which each number stands fast (but should the tube be in the vent it is to be removed by No. 1). On the word "*Go on,*" the service of the gun continues, and on "*Cease firing*" the detachment proceeds as above.

Instructions for using Watkin's Clinometer.*

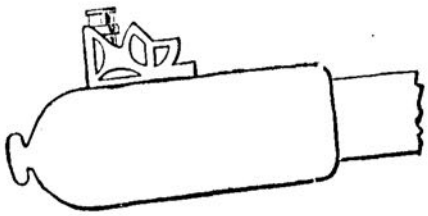
To read the angles marked on the drum.—The brass drum is marked in degrees, commencing at 0° on the top to 45° at the bottom. Each degree is subdivided into twelve parts; each small division therefore represents angles of 5 minutes.

The scale is read from right to left, thus: –



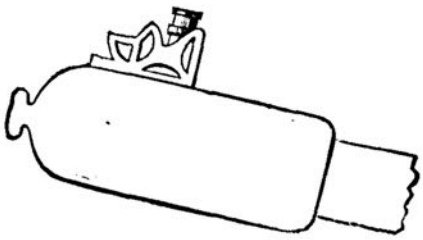
the reading opposite the arrow would indicate an angle of 2° 25″.

To lay a gun at any angle up to 45°.—Unscrew the drum until the ⅄ points to the elevation required, place the clinometer, thus—



on the plane surface cut on the breech.

For angles of depression.—Proceed as above, but reverse the direction of the instrument, placing it thus on the breech of the gun—



For angles of elevation greater than 45°.—Subtract the angle of elevation required from 90°, unscrew the drum to this reading;

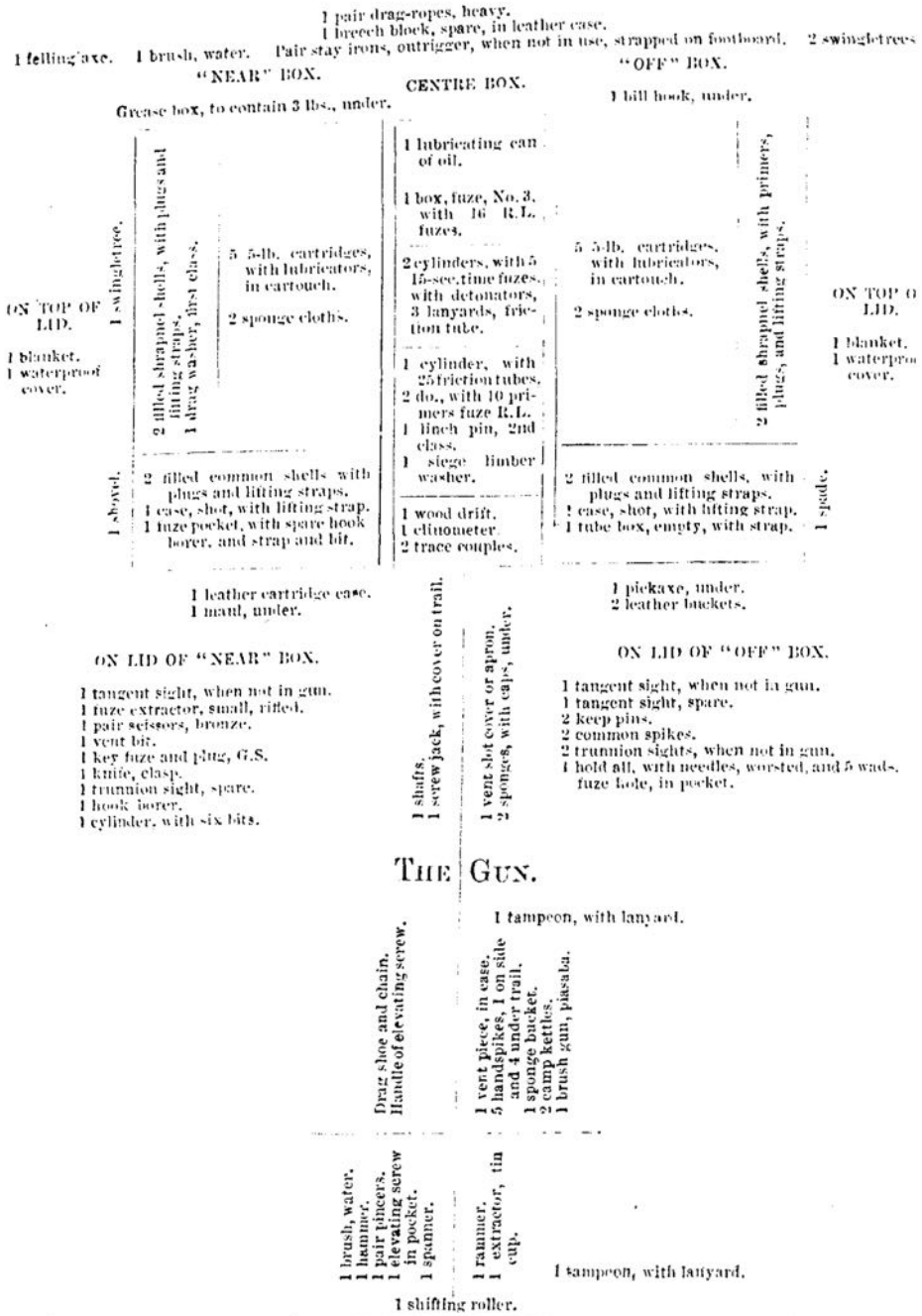
---

* Not issued as an article of equipment for these guns.

thus, for 60°, unscrew the drum to 30°, and place the instrument on the breech of the gun thus—

40-PR. R.B.L. CARRIAGE AND LIMBER (WOOD).
(MOVABLE ARMAMENT.)

LIMBER.

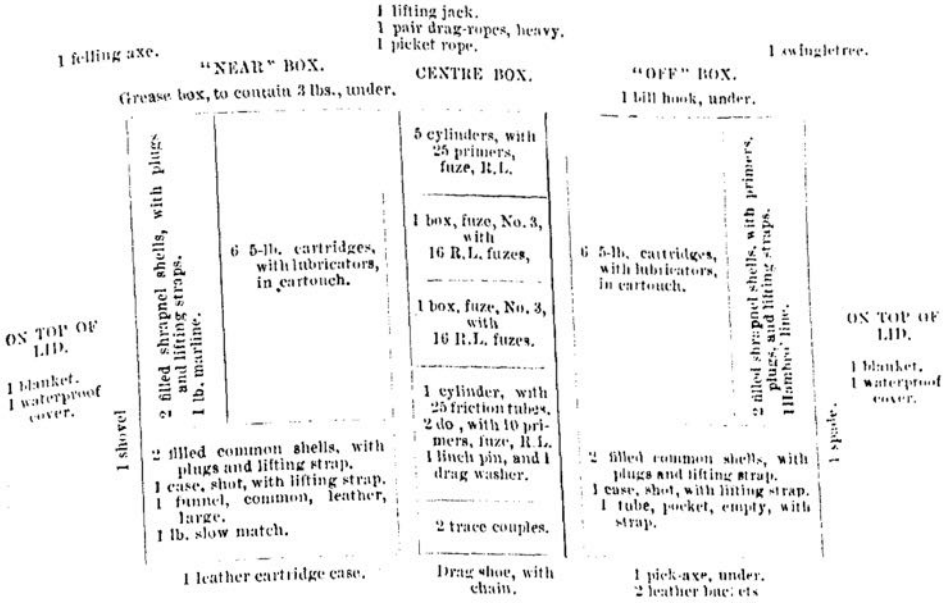


THE GUN.

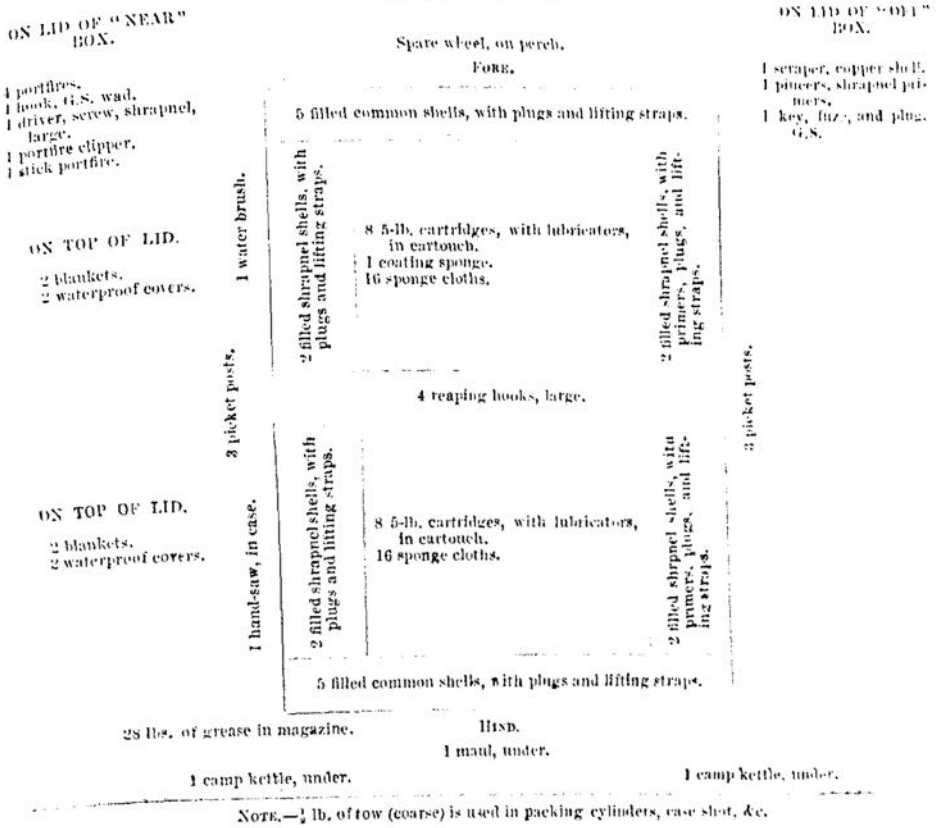
NOTE.—½ lb. tow (coarse) is used in packing cylinders, case shot, &c.

40-PR. R.B.L. WAGON AND LIMBER.
(MOVABLE ARMAMENT.)

LIMBER.



WAGON BODY.



NOTE.—½ lb. of tow (coarse) is used in packing cylinders, case shot, &c.

Gun Carriage, 6 feet Parapet, and Limber.

Limber.

UNDER.

1 felling axe.
1 grease box, 3 lbs.
1 swingletree.
1 shovel.
1 maul.
1 drag washer, 1st class.
1 cavalry bucket.
1 brush, water.

ON FOOTBOARD.

1 pair drag ropes, heavy.
1 lifting jack, "Clerk's."
1 swingletree.

UNDER.

1 swingletree.
1 bill hook.
1 spade.
1 drag washer, 2nd class.
1 pickaxe.
1 bucket, water.

"NEAR" BOX.

2 filled shrapnel shells, with plugs and lifting straps.
1 drag washer, 1st class.

5 5-lb. cartridges, with lubricator, in cartouch.

2 sponge cloths.

2 filled common shells, with plugs and lifting straps.
1 case, shot, with lifting strap.
1 fuze pocket.

CENTRE BOX.

1 lubricating can of oil.

1 box, fuze, No. 3, with 16 R.L. fuzes.

2 cylinders, with 10 15-sec. time fuzes with detonators.
3 lanyards, friction tube.

1 cylinder, with 25 friction tubes.
3 do., with 15 primers, fuze, R.L.
1 linch pin, 2nd class.
1 siege limber washer.

1 wood drift.
1 clinometer (1 per battery).
2 trace couples.

"OFF" BOX.

5 5-lb. cartridges, with lubricator, in cartouch.

2 sponge cloths.

2 filled shrapnel shells, with primers, plugs and lifting straps.

2 filled common shells, with plugs, and lifting straps.
1 case, shot, with lifting strap.
1 tube box, empty, with strap.
1 extractor, tin cup.*

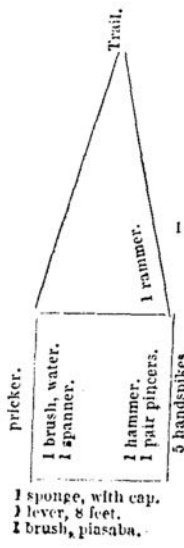
* Carried loose behind the shell, resting on the lifting straps.

ON LID OF "NEAR" BOX.

1 fuze extractor.
1 tangent sight (when not in gun).
1 pair scissors, magazine.
1 vent bit.
1 key fuze and plug, G.S.
1 cylinder with 6 bits.
1 hook borer.
1 knife, clasp.
1 trunnion sight, spare.

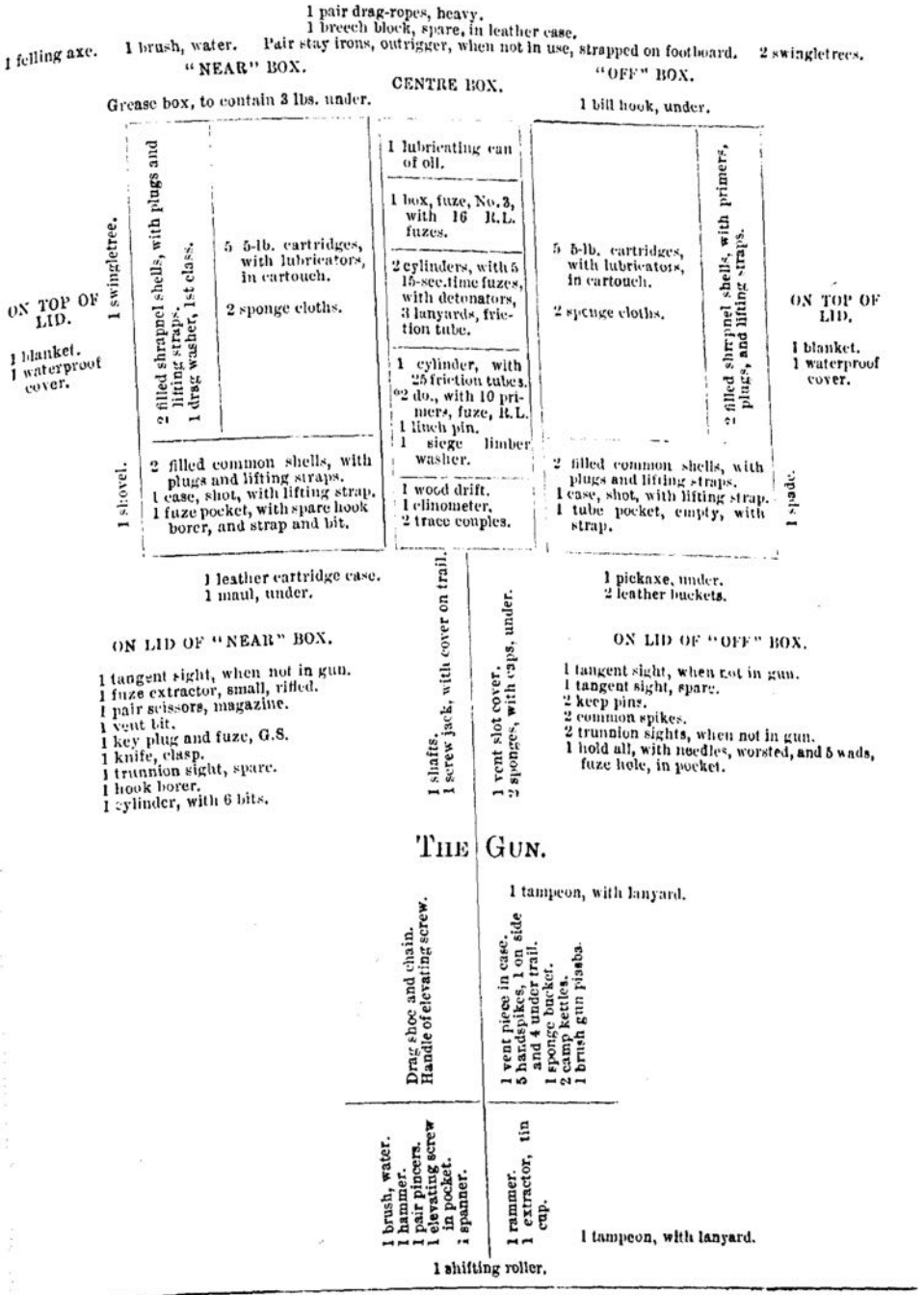
ON LID OF "OFF" BOX.

1 tangent sight, when not in gun).
2 common spikes.
2 keep-pins.
1 tangent sight (spare).
2 trunnion sights.
1 holdall, with needles, worsted, and 5 wads, fuze hole, in pocket.



40-PR. R.B.L. CARRIAGE AND LIMBER (WOOD).
(BATTERIES OF POSITION, VOLUNTEER ARTILLERY.)

LIMBER.

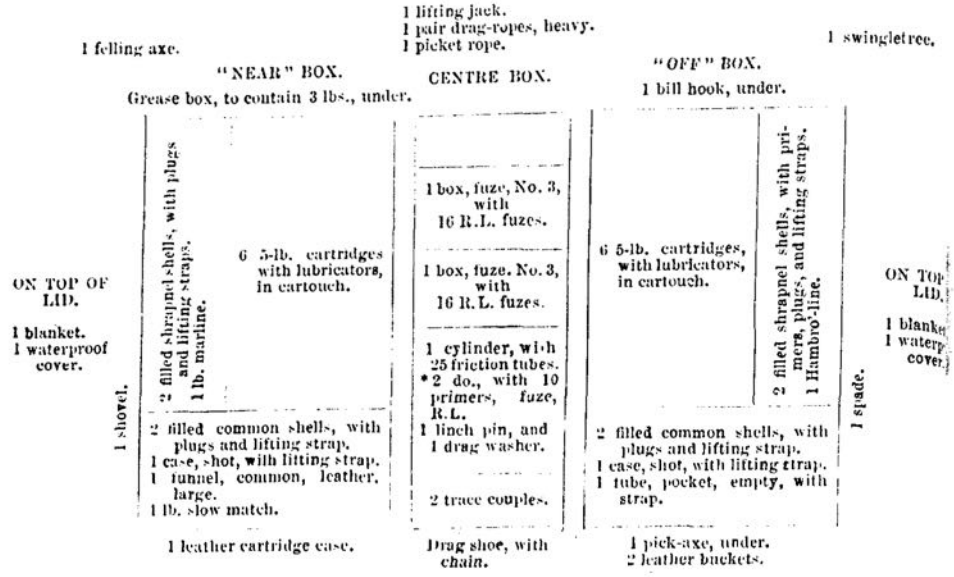


THE GUN.

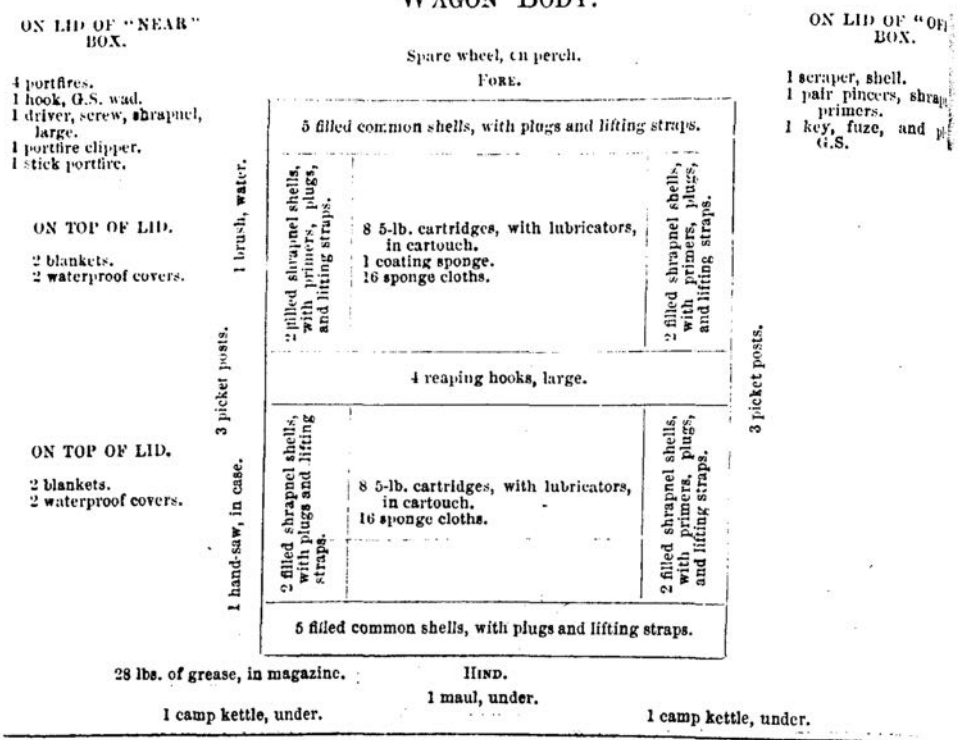
NOTES.—½ lb. tow (coarse) is used in packing cylinders, case shot, &c.
In batteries having *six* ammunition wagons, *two* cylinders with 5 time fuzes each will be carried in No. 1 subdivision, carriage limber.
In batteries having *four* ammunition wagons, *three* cylinders with 5 time fuzes each will be carried in No. 1 subdivision, carriage limber.
Two cylinders of 10 fuzes will be carried in each wagon limber in both six- and four-wagon batteries.
* 3 cylinders to be carried in wagon limber of four-wagon batteries.

40-PR. R.B.L. WAGON AND LIMBER (BATTERIES OF POSITION, VOLUNTEER ARTILLERY).

LIMBER.



WAGON BODY.



NOTES.—½ lb. tow (coarse) is used in packing cylinders, case shot, &c.

In batteries having *six* ammunition wagons, *two* cylinders, with five time fuzes each, will be carried in No. 1 ammunition division, carriage limber.

In batteries having *four* ammunition wagons, *three* cylinders, with 5 time fuzes each, will be carried in No. 1 ammunition division, carriage limber.

Two cylinders of 10 fuzes will be carried in each wagon limber in both six- and four-wagon batteries.

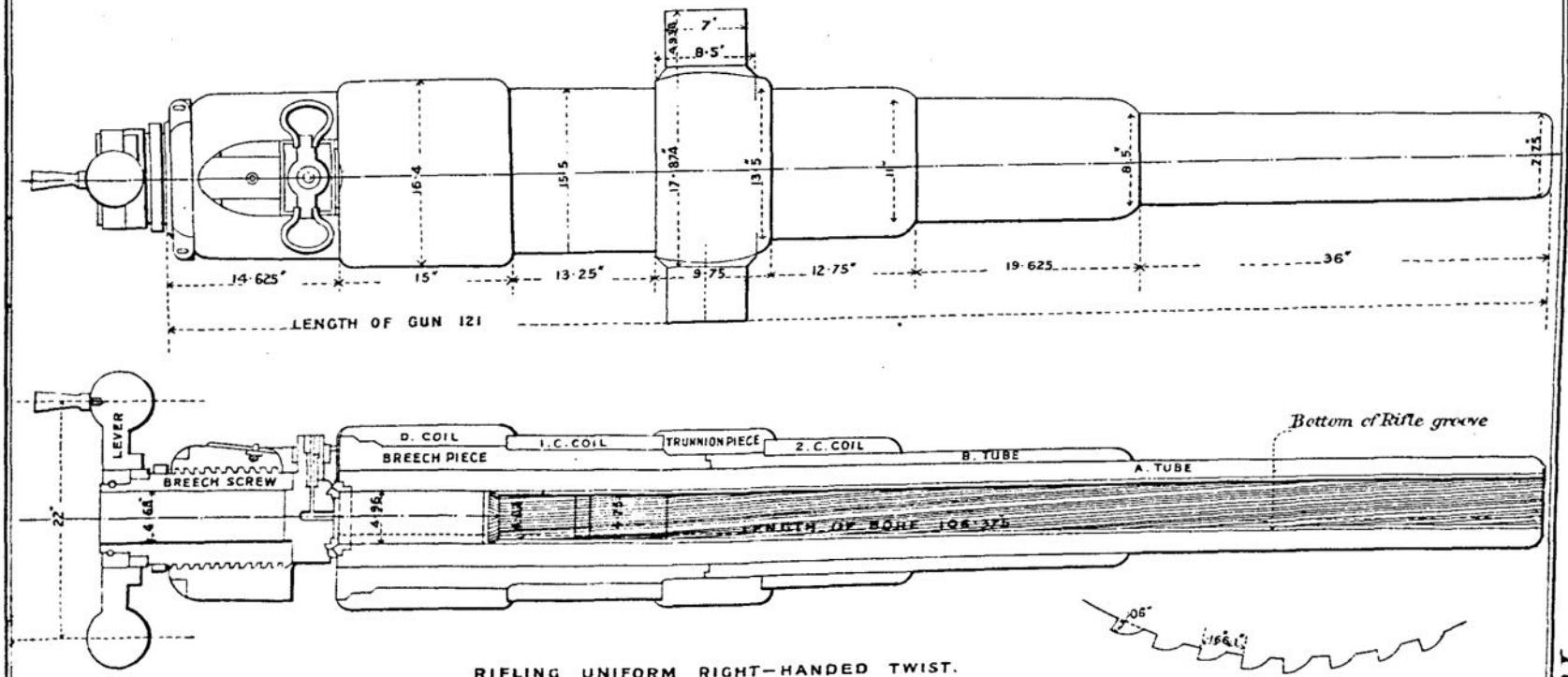
* 3 cylinders to be carried in wagon limber of four-wagon batteries.

LONDON:
Printed for Her Majesty's Stationery Office,
By HARRISON and SONS, St. Martin's Lane,
Printers in Ordinary to Her Majesty.

(Wt. 29289 2500 3 | 99—H & S 2725)

ORDNANCE, R. B. L., 40 PR., 35 CWT.

SCALE 1/18 TH



RIFLING UNIFORM RIGHT-HANDED TWIST.
OF 1 TURN IN 38½ CALIBRES.

SECTION OF RIFLING. (FULL SIZE.)
56 GROOVES

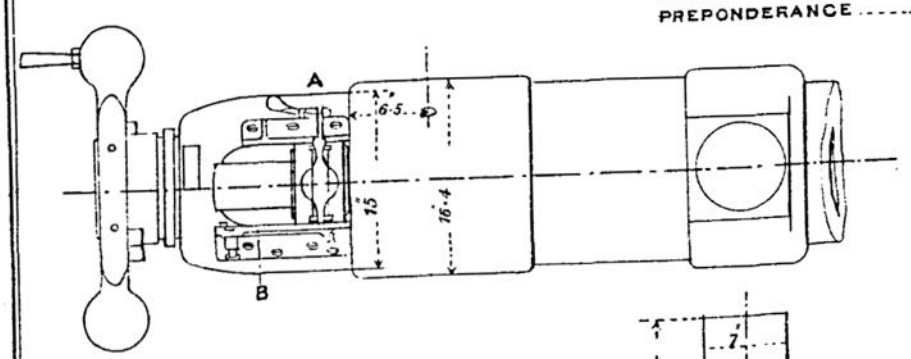
Plate I

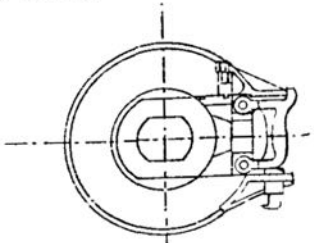
Wyman & Sons, Ltd. Lith. 3009 8.96

ORDNANCE, R.B-L.,40 PR, SIDE CLOSING.

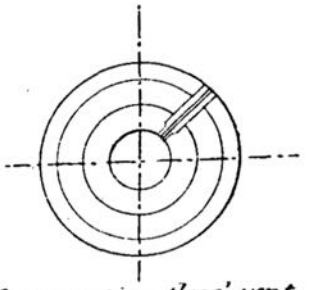
CONVERTED 35 CWT SCREW GUN.

	CWT	QRS.	LB.
WEIGHT	35	3	10
PREPONDERANCE	4	3	24

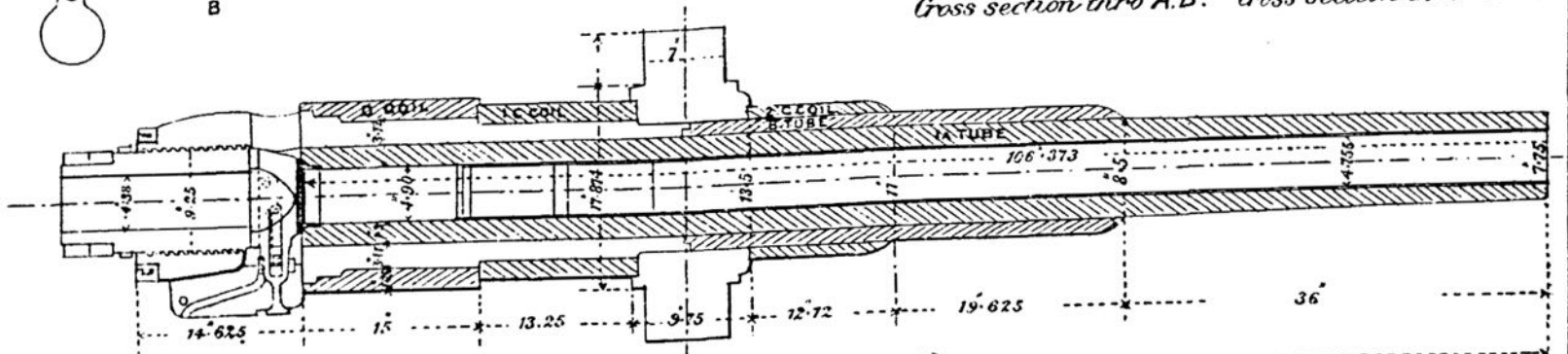




Gross section thro' A.B.

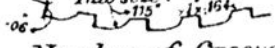


Gross section thro' vent.



SECTION OF GROOVE.

Full size.



Number of Grooves 56.

Rifling an uniform twist of 1 turn in 36·5 Calibres.

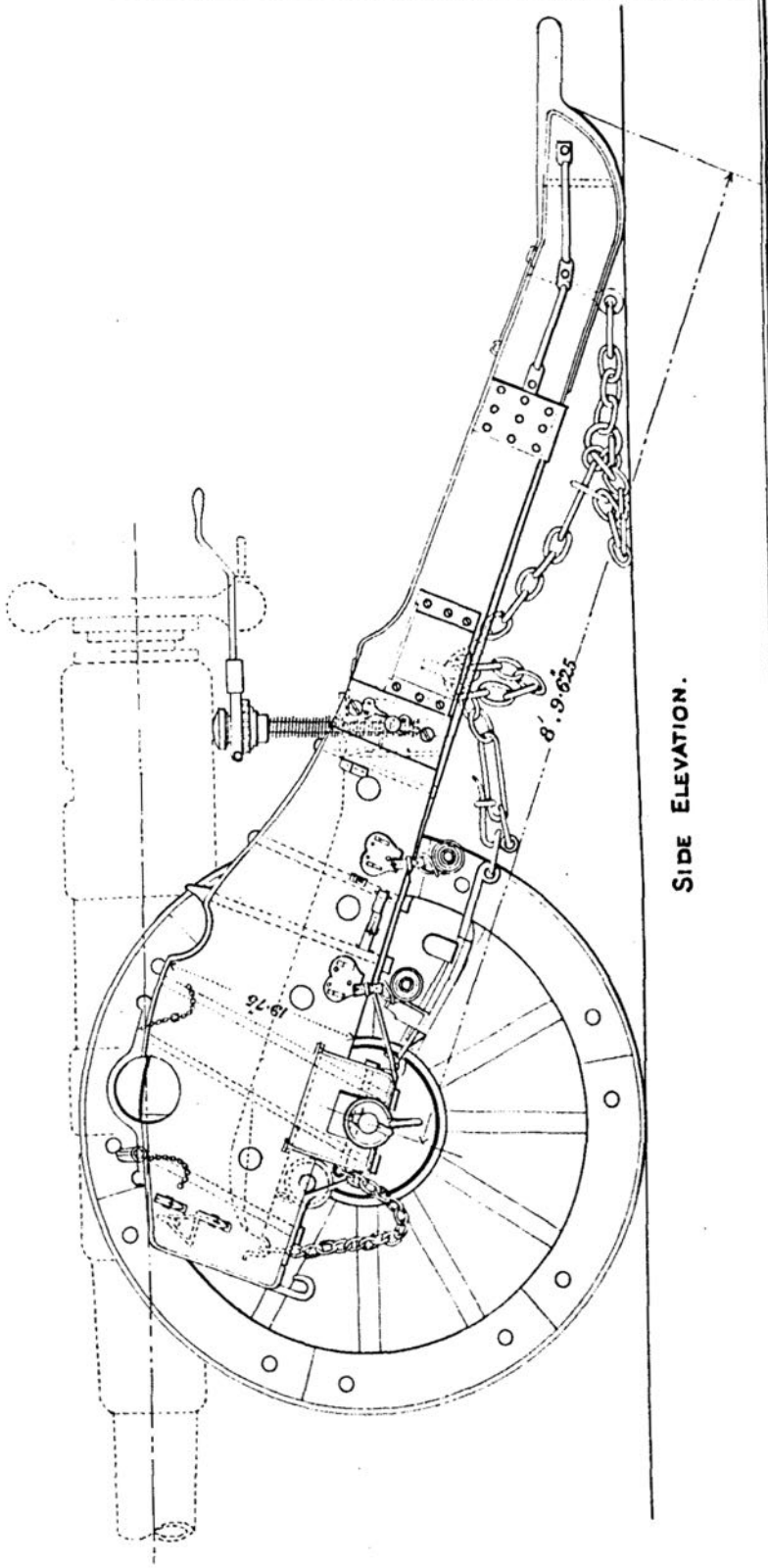
Wyman & Sons, Ltd. Lith. 3009.

Plate II.

Plate III.

CARRIAGE, SIEGE, R.B.L., 40 PR., WOOD.

WITHOUT LIMBER, WITH SHIFTING ROLLER.



SIDE ELEVATION.

Wyman & Sons, Ltd., Lith., 1909. 9.38

CARRIAGE, (TRAVELLING COMPLETE, WROUGHT IRON), SIEGE. R. B. L., 40-Pr., 6 Ft PARAPET, MARK I.

Scale $\frac{1}{32}$ full size.

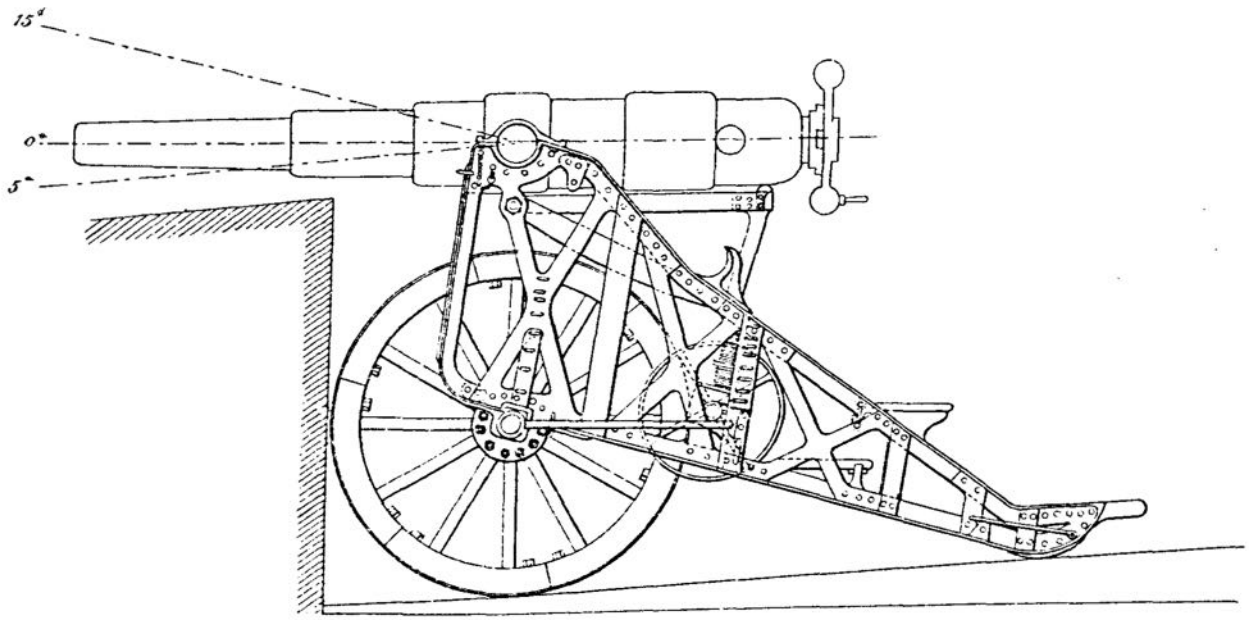
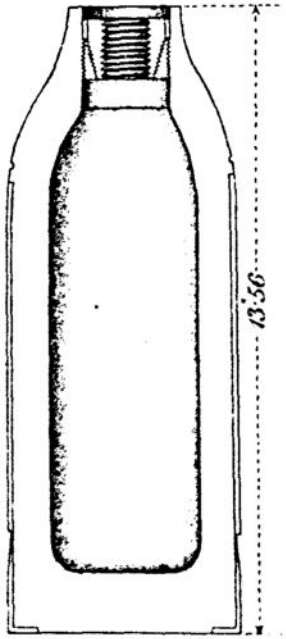


Plate IV.

Wyman & Sons, Lith. 3009. 9. 33.

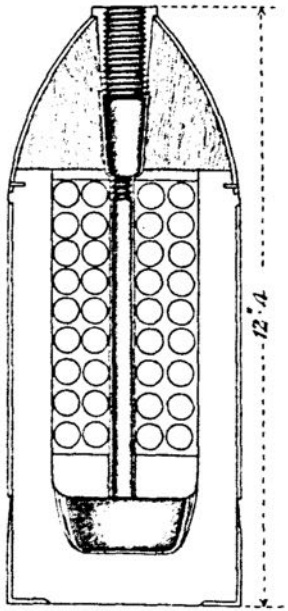
PROJECTILES, R.B.L., 40 PR

COMMON SHELL, MARK II.



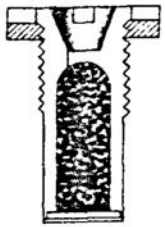
Mean Weight empty 38lbs.5ozs.
Capacity for bursting charge
2lbs. 4ozs.

SHRAPNEL SHELL, MARK I.



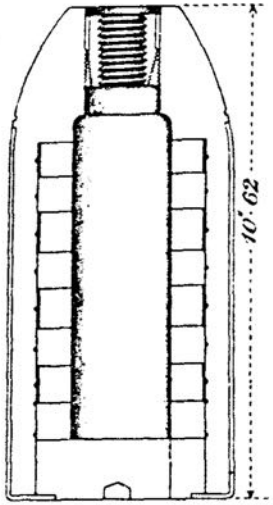
Mean Weight empty 39 lbs.
Bullets 162, 16 to the lb.
Capacity for bursting charge
3 ozs.

PRIMER
FOR SHRAPNEL SHELL
MARK III



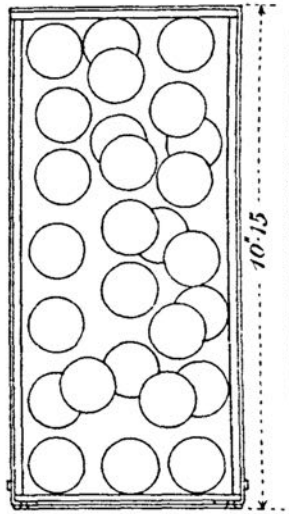
Full size

SEGMENT SHELL, MARK I.



Mean Weight empty 38lbs10ozs.
No of Segments 72
Capacity for bursting charge
13 oz.

CASE SHOT, MARK II.



Contents 35 8 oz.
Sand Shot.
Weight 31 lbs. 8 oz.

Scale ¼

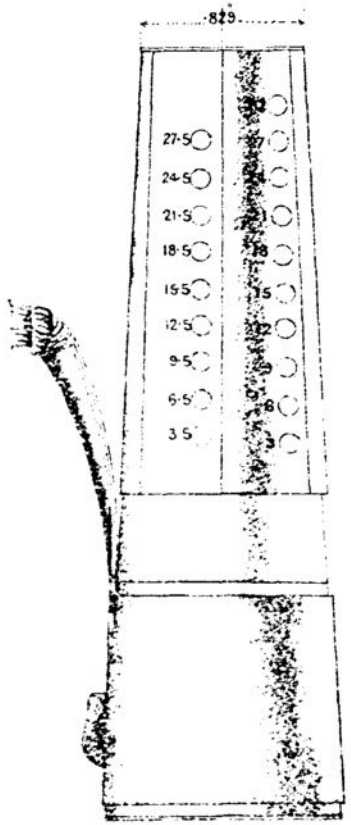
Plate V.

Wyman & Sons, Lt.Lith.

FUZE, TIME, 15 SECONDS, WITH DETONATOR, No 43, MARK III.

WOOD, 5 IN A TIN CYLINDER.

FULL SIZE.



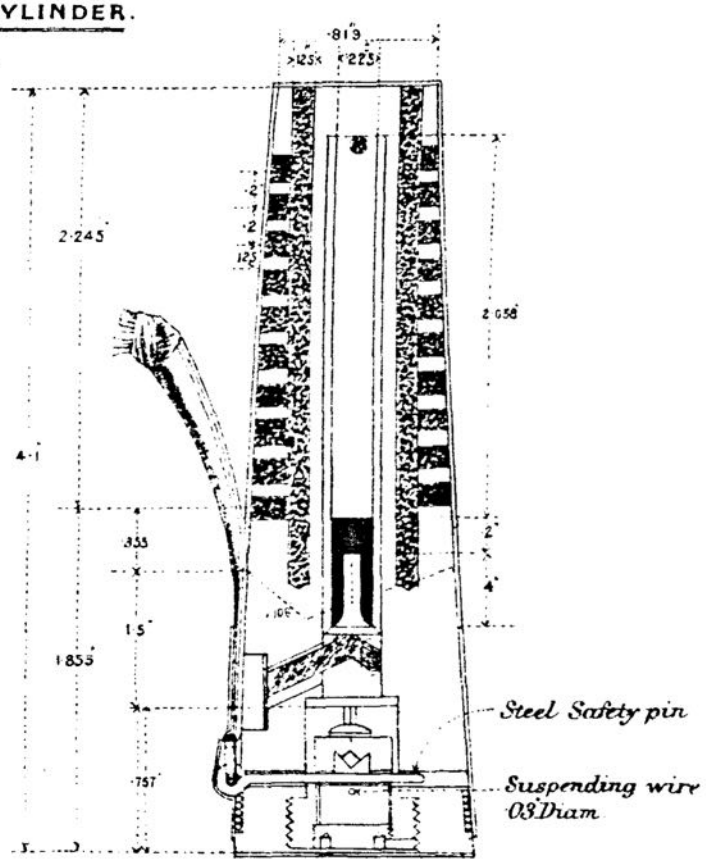


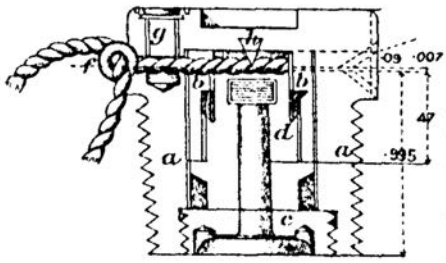
Plate VI.

Wyman & Sons, Lith. London

FUZE PERCUSSION, R.L., No 7, MARK II & III.

FULL SIZE.

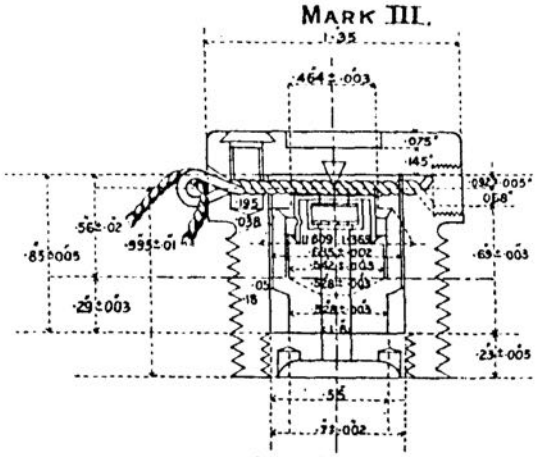
MARK II.



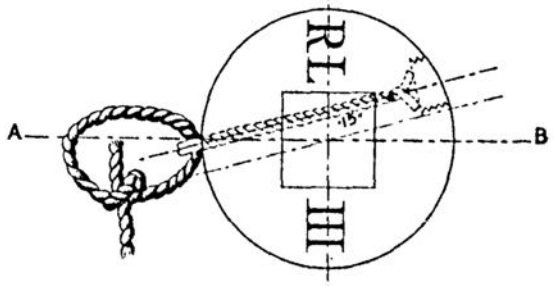
a. *Body*
b. *Guard*
c. *Bottom plug*
d. *Pellet*
e. *Cup*
f. *Safety pin*
g. *Lead plug*
h. *Needle point*

SECTION

MARK III.



SECTION AT A.B



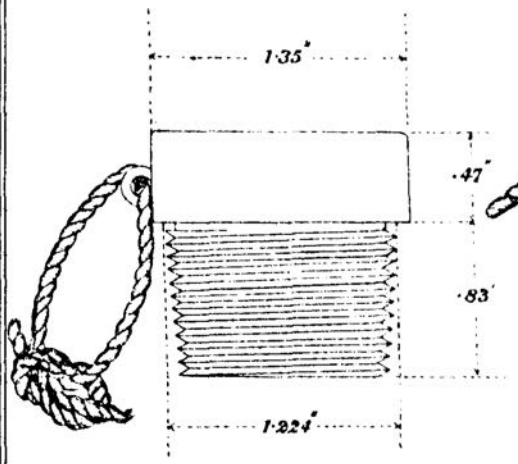
PLAN

Wyman & Sons, Ltd., Lith.

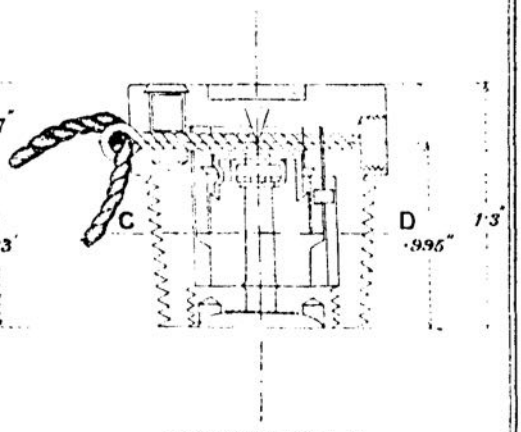
FUZE, PERCUSSION, R.L, Nº 7, MARK IV.

METAL; 5 IN A TIN CYLINDER.

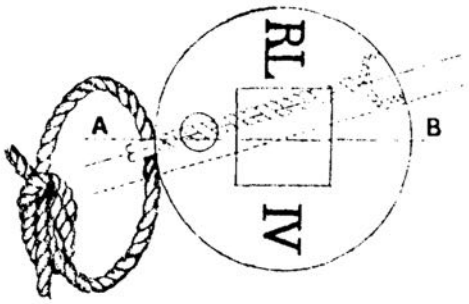
FULL SIZE.



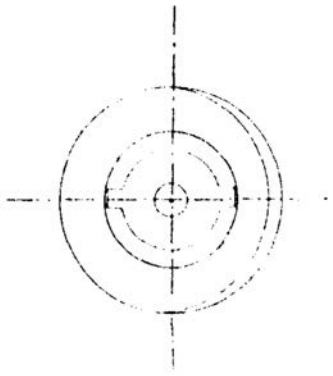
ELEVATION.



SECTION AT A.B.



PLAN.

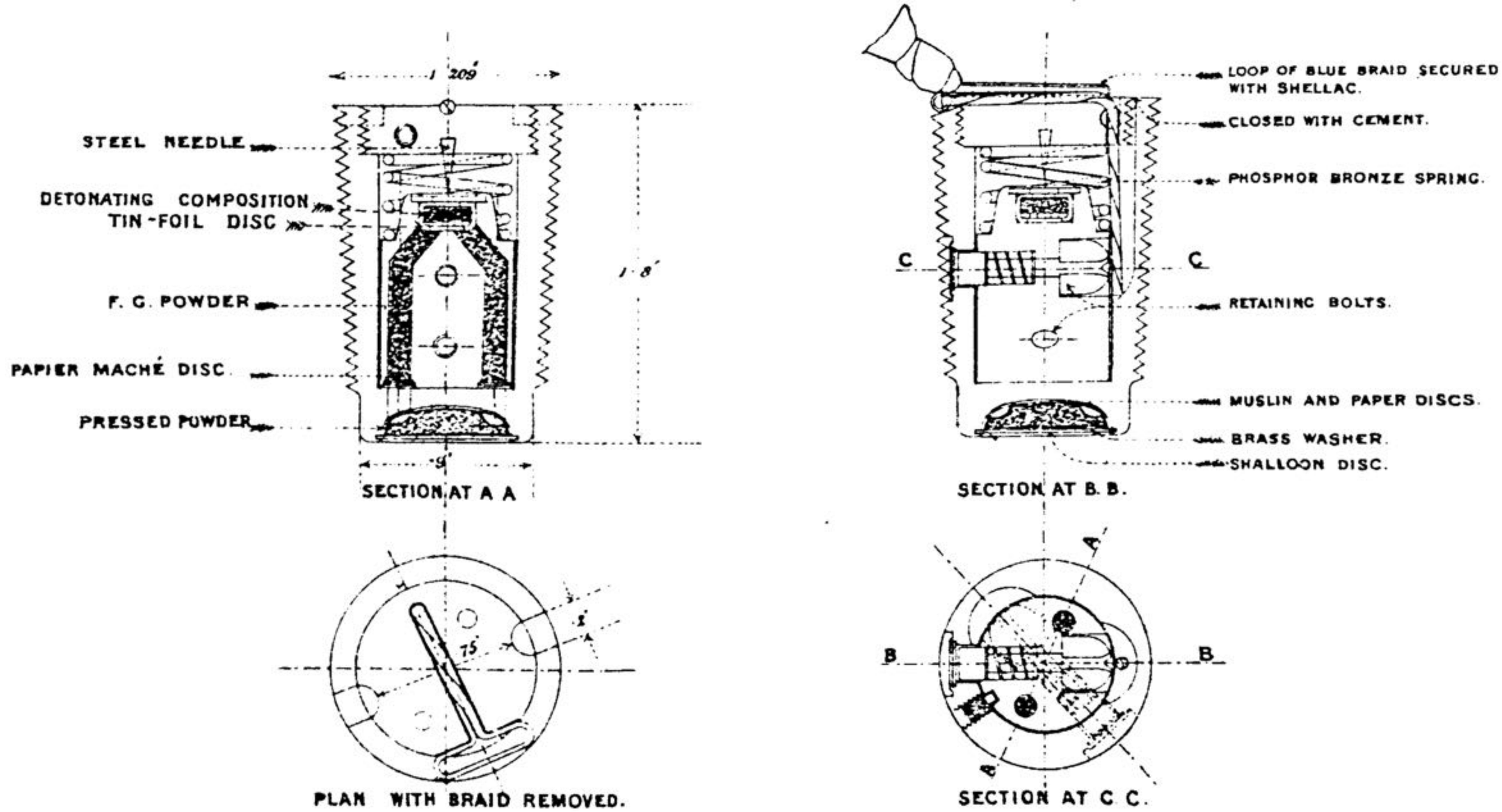


SECTION AT C.D.

Wyman & Sons, Ltd. Lith. 3002.1.99.

FUZE, PERCUSSION, SMALL, No. 8, MARK IV.

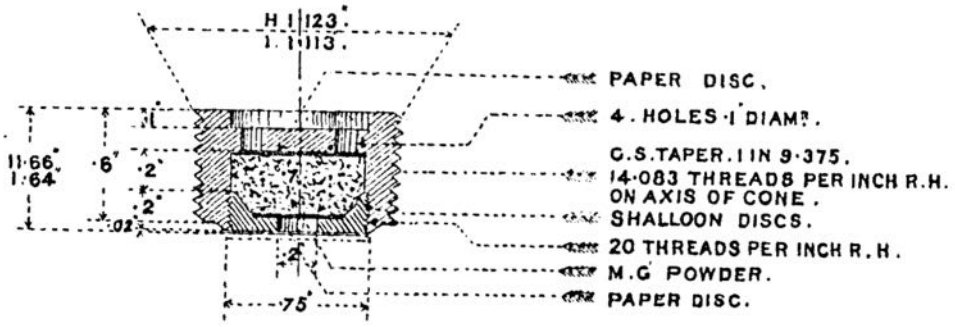
Full Size.



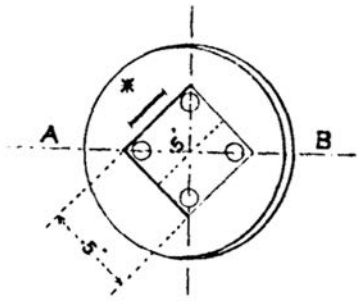
Wyman & Sons, Ltd., Lith. J008.1.99.

PRIMER, FUZE, PERCUSSION, R.L., N° 7, (MARK I) L.

SCALE 1.



SECTION AT A.B.



PLAN.

Wyman & Sons Lt. Lith. 1003-9-88.