12

HANDBOOK

FOR THE

13-PR. RIFLED M.L. GUN OF 8 CWT.

(LAND SERVICE).

1884.

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1884.

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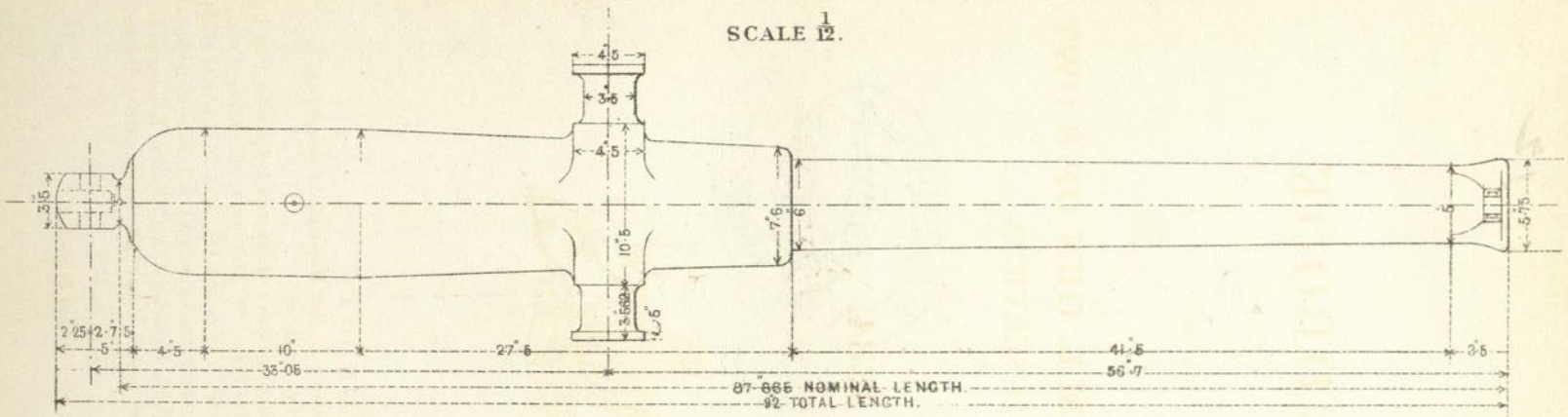
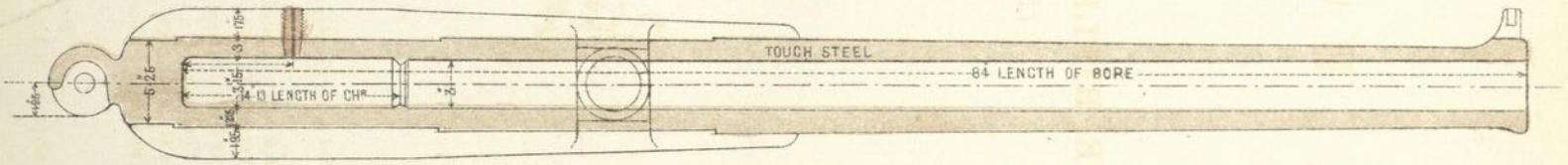
Frontispiece.

ORDNANCE, WROT. IRON, R.M-L. 13 PR. 8 CWT. MARK I.

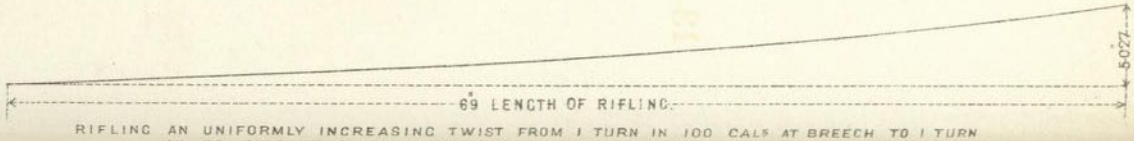
SCALE $\frac{1}{12}$.





Nº OF GROOVES 10.

SECTION OF RIFLING.
FULL SIZE.



RIFLING AN UNIFORMLY INCREASING TWIST FROM 1 TURN IN 100 CALS AT BREECH TO 1 TURN IN 30 CALS AT 9 INS. FROM MUZZLE THE REMAINING 9 INS BEING AN UNIFORM

CONTENTS.

PLATES.

MEMO.

This handbook is correct up to December, 1883.

DESCRIPTION.

GUN, MARK I.

Frontispiece.

Material	exterior	Wrought iron.
	tube	Steel.
Length	nominal	87·865 inches.
	total	92 inches.
Weight, nominal		8 cwt.
Preponderance		11 lb.
Bore	calibre	3 inches.
	length	84 inches.
	capacity, including chamber	617·8 cubic inches.
	area of section, including rifling	7·29 square inches.
Chamber	diameter	3.15 inches.
	length	14·13 inches.
	capacity	110·38 cubic inches.
Rifling	system	Modern polygroove.
	twist	Uniformly increasing from 1 turn in 100 calibres at breech to 1 turn in 30 at 9 inches from muzzle, the remaining 9 inches being a uniform twist of 1 in 30 calibres.
	length	5 feet 9 inches.
	grooves: number	10.
	grooves: depth	0·05 inches.
	grooves: width	0·509 inches.
Means of rotation		Copper gas-check, without projections.
Vent of hardened copper		7 inches from end of bore.

The gun is vented at 7 inches from the end of the bore, to enable the cartridge to be ignited near the centre, which increases the muzzle velocity of the projectile.

The forward vent causes a certain deposit of *debris* from the cartridge, and the enlarged chamber and choke prevent a thorough action of the sponge. Great care should therefore be taken with these guns to ensure its removal.

Wet sponges should on no account be employed, as the amount of *debris* of cartridge is thereby increased.

The gun should be frequently searched.

SIGHTS.

Plate I.

The gun is central sighted only :—

Two tangent scale sights (viz., one long and one short), and is provided with the former graduated to 12°, the latter to 5°.

These sights are placed in the gun at an angle of 1°30′.

The tangent scale sight is made of steel with a head forged solid with the bar, having a bronze sliding leaf worked by a deflection screw with a milled

head. The leaf is fitted for the purposes of rough laying with a notch ·06 inch deep, protected by rising planes on each side. Below this is a cupped recess having in its centre a small hole ·05 inch in diameter, to be used for fine sighting at long ranges.

The muzzle sight is a bronze block with keep-pin fitted into a slot in the dispart patch. This block is furnished on its upper surface with a small bronze conical sight, for use in conjunction with the notch of the tangent scale sight for rough laying, and below with a reading window and cross wires for use with the small hole of the tangent scale sight when fine laying is required.

When the sights are not in use the sight block is removed from dispart patch by withdrawing the keep-pin, and a preserving block is substituted and retained in position by the same keep-pin.

CARRIAGE, LIMBER, AND WAGON.

(List of Changes, § 4237).

CARRIAGE, TRAVELLING, STEEL, FIELD, R.M.L., 13-PR. (WITHOUT LIMBER), MARK I.

Plate II.

The carriage consists of two bracket sides, connected by transoms, bolts, and trail eye, and an axletree bed with axletree.

The brackets are constructed of steel plate, rivetted inside the flange of an angle iron frame. The trail eye, of wrought iron, has a loop forged on it for the hook of the dray chain, and is fitted with a moveable steel.

The axletree bed, which is of light steel plate, constitutes, with the steel axletree, a bowstring girder.

The *axletree arms* are 2nd class, and will take any 2nd class metal-naved wheel, but special 13-pr. wheels are supplied.

The *wheel* is 5 feet diameter, having a tire 3 inches wide by ·75 inch thick, with the edges rounded. The tire is secured by six bolts, with nuts and washers, one at the middle of each felloe.

The *nave* is in three pieces, viz., an inner and outer flange of gun metal and a pipe of phosphor bronze. The inner flange has six strengthening ribs cast on it, while the outer flange has a grease chamber, with three filling holes, closed with gun-metal plugs, fitted to take the general service plug key. The flanges are connected together by twelve triangular bolts with nuts.

The wheel has a dish of 2 inches and strut of ·75 inch. It is interchangeable with R.M.L. 9 or 16-pr. wheels.

The *elevating gear* (Plate V, fig. 2) consists of an arc, *B*, attached to the cascable of the gun, having teeth on the rear edge, in gear with a pinion, *C*, on the same spindle as a worm-wheel, *D*, which is driven with a worm, *F*, by a hand-wheel, placed on the inside of the right bracket of the carriage. The arc is kept in gear by the bracket *K*.

The pinion has a projection on it, *E*, which forms a friction cone to the worm-wheel, and, to regulate the friction between them, two nuts, *G*, *H*, are placed on the spindle. An indiarubber pad, *L*, is placed on the rear transom for the gun to rest on in travelling.

The carriage is furnished with axletree seats (Plate V, fig. 1), having sliding foot rests. The seats are supported on six spiral springs, *A*, *A*, and have guard irons and back straps.

An additional hand strap, besides that on the advance ring, is attached to the guard iron on the inner side.

A wrought iron bucket, lined with leather, is fitted under the trail to receive

the jointed ends of the sponge and piasaba brush. There are fittings on the brackets for a long and a short tangent scale, each carried in a leather case, and also iron loops for leather cases, in which two case shot and two cartridges can be carried when going into action. On the trail, besides the cases for the tube and fuze pockets, there is an additional leather case, in which a cylinder of time fuzes can be carried when going into action.

There are mud scrapers placed over the inner flange of the wheel naves.

A special handspike is used with this carriage. It is made straight and has a square point. It fits into a socket between the brackets of the carriages, and is secured by a pin.

The sponge has a head coated with wool, and has a rammer head on the same stave. The latter is not recessed for the point of the projectile, but has a wrought iron nut let into the centre to receive the worm wadhook.

A sponge, wood stave, jointed, differing from the above only in having the stave made in two pieces, connected by a folding metal joint, and kept rigid, when required, by a phosphor bronze collar sliding over the joint, is intended to be carried as spare under the carriage, where the space does not admit of the long stave.

Limber, Wrought Iron, Field, R.M.L. 13-pr., Mark I.

Plate III.

The limber consists of an iron axletree bed with steel axletree; four tee iron futchells, a wrought iron splinter bar, two tensile stays, a limber hook, a platform board, footboard, and slat. The axletree and bed form a bowstring girder, similar to that in the carriage. The axletree is interchangeable with that of the carriage or wagon.

The limber hook, attached to the two centre futchells and the axletree, is fitted with a moveable steel and has a steel key, but with the arm at right angles to the feathers. A leather case for the grease-tin and oil-can is placed in front of the limber hook. Mud scrapers are fitted over naves of the wheels, and iron bands, with a leather lining for the shovel and spade, are placed under the footboard.

The limber boxes are arranged to open towards the rear by the side folding down, the side being supported when open by jointed stays. Each box is fastened when closed by an improved lock and two tumbuckles and hasps. The guard irons are made 4 inches higher than those of the R.M.L. 9-pr.

Each box is constructed to carry eighteen cartridges in a cartouche, and is fitted with five steel trays, in which may be carried eighteen projectiles, with a proportion of small stores, fuzes, and friction tubes.

The projectiles lie horizontally in the trays, with their bases outwards, and each tray is secured by a spring catch.

The near and off boxes are similar, except that their fittings are reversed.

Each box is secured to the limber by two clips at the rear, and a nib iron with a screwed pin at the front.

There being no centre box, each gun and wagon limber box carries a percussion fuze box for R.L. fuzes. The box is arranged to hold eighteen, and is fitted with a wood block. The lid of the box is hinged and lined with leather, to press on the top of the fuzes and hold them securely. The box stands on the hinged side, and has two clips on the opposite side to secure the lid, as well as a loop for lifting the box from the tray.

			ft.	in.
Height to centre of gun			3	7
Length of carriage	with wheels		8	4
	without wheels		7	3
axletree....			6	3½
carriage and limber	without gun		19	7
	with gun		22	8½

						ft.	in.
Minimum space through which carriage can turn						26	8
Angle of trail					30°		
Maximum elevation					16°		
„ depression					5°		
Wheels	track					5	2
	diameter....					5	0
						cwt.	qrs. lb.
Weight empty	carriage					11	3 1
	limber					11	3 3
						23	2 4

WAGON, WROUGHT IRON, AMMUNITION, R.M.L., 13-PR. (WITHOUT LIMBER), MARK I.

Plate IV.

The wagon body consists of a perch formed of two channel irons, joined by collar bolts, and an iron perch eye, two angle iron sides, with stays connecting them to the axletree arms, two platform plates, two platforms, and two footboards. The platform and footboard at the rear of the wagon are fixed on brackets, prolonging the perch and sides, but below the level of the body. This is to allow the rear boxes to open.

The axletree is interchangeable with that of the carriage or limber. It is connected with the perch by a metal bracket.

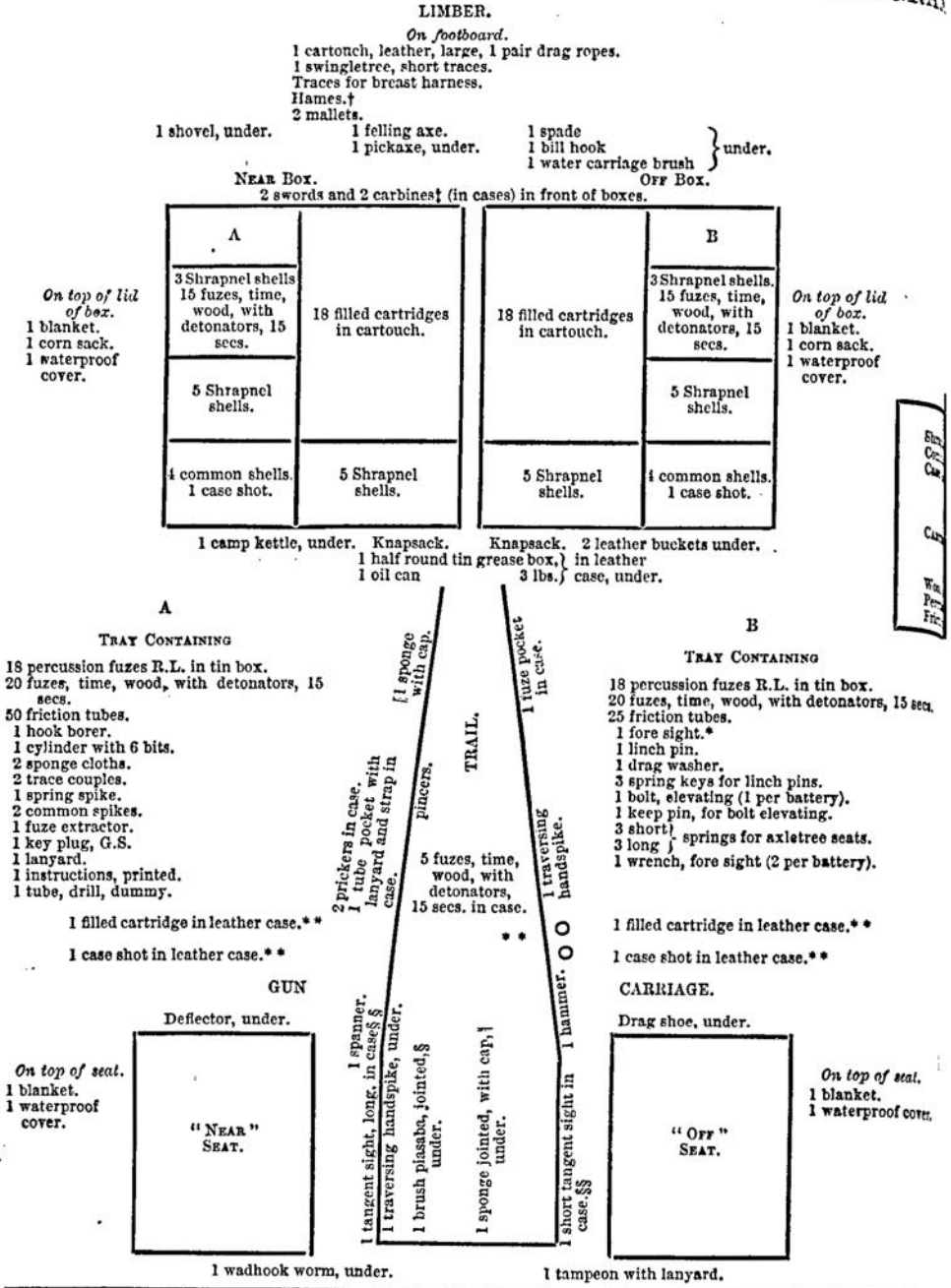
The wagon is fitted with a wrought iron arm for the spare wheel, two under boxes, iron loops under the front for the pickets, and has fittings for a dray shoe. Mud scrapers are placed over the naves of the wheels. The four ammunition boxes which stand on the platform plates are secured by their nib irons to recesses in the plate of the axlebed.

The wagon fore boxes are, in general construction, similar to those for the R.M.L. 9-pr., but the guard irons are of increased height. Each box is arranged to carry seventeen projectiles in a vertical position, and seventeen cartridges in a canvas cartouche. The boxes have the improved lock, and are secured to the wagon by a nib iron and leather strap in the usual manner.

The two hind boxes are similar to those for the limber.

						ft.	in.
Maximum	length					20	11
	width					6	3½
Minimum space through which wagon can turn						28	11
						cwt.	qrs. lbs.
Weight, empty	wagon					15	2 11
	limber					11	2 14
						26	0 25

DIAGRA

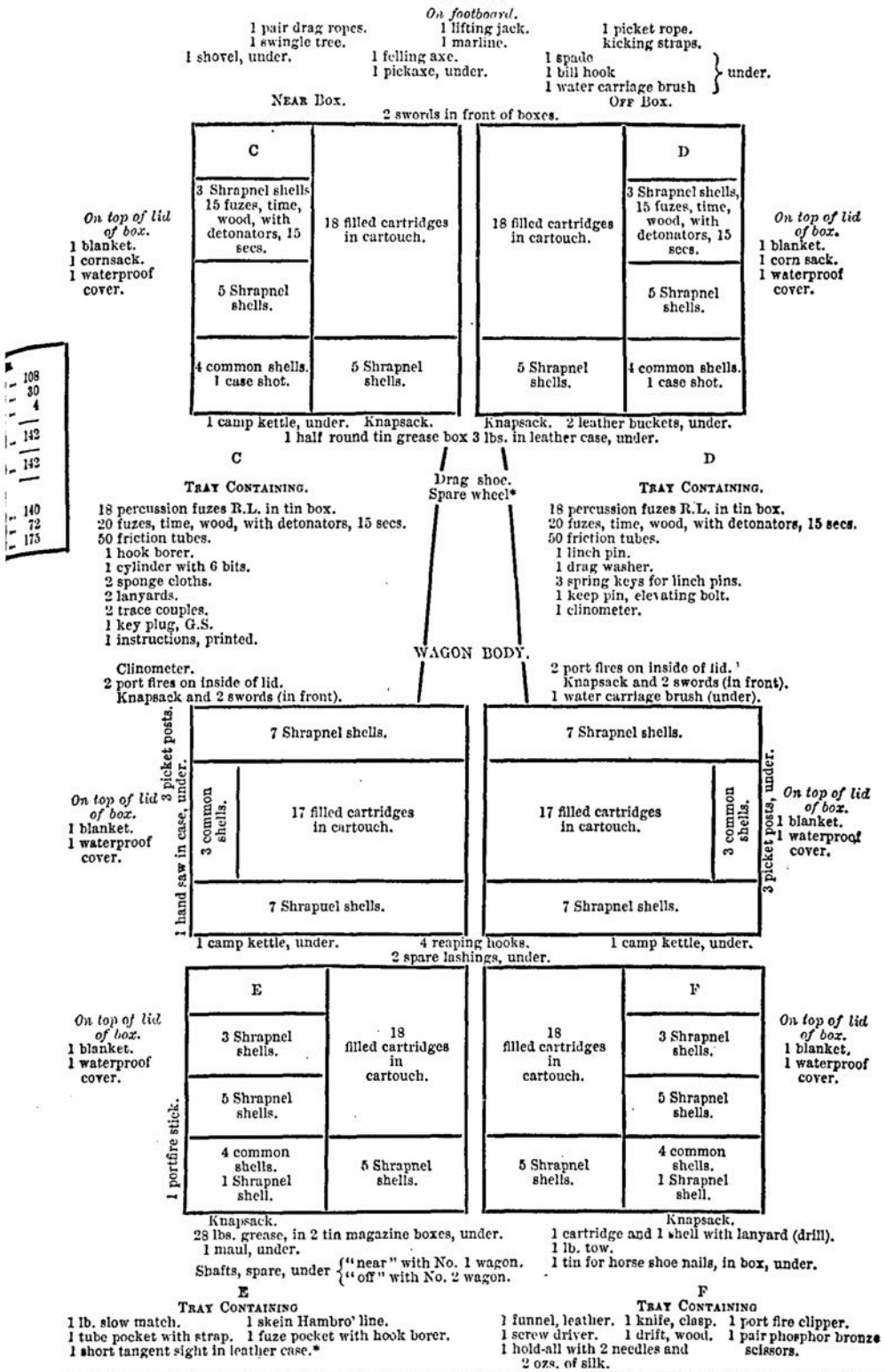


† 1 pair on Nos. 1, 3 & 5 gun limbers, 1 per division.
‡ M.H. carbines are carried in leather buckets attached to the boxes.
** Carried on the carriage only when going into action.
§ With No. 1 gun.
§§ When not in use in gun.

Note.—The packing of the gun and wagon limbers is made nearly identical to facilitate the supply of ammunition in action by replacing one by the other. Valises are carried on two of the ammunition boxes of horse batteries, attached to the guard irons. Waterproof covers are issued additional for camp equipment, and for batteries on a war establishment. Knapsacks are not carried by R.H.A.

Weight, packed without personal equipment		cwts.	qrs.	lbs.
	Carriage and Gun	20	0	22
	Limber	18	0	12
	Total ...	38	1	6

PACKING.



* 1 per division, with 1, 3 and 5 wagons.

		cwts.	qrs.	lbs.
Weight, packed without personal equipment	Wagon	26	2	0
	Limber	18	1	0
	Total ...	44	3	0

PROJECTILES.

List of Changes, § 4060.

Common Shell.

Plate IX.

The body of the shell is made of cast-iron, unturned, the base to a length of ·5 inch is reduced to 1·87 inch diameter, and cast with a circular groove for attaching a gas-check, and twenty radial grooves, by which the gas-check imparts rotation to the shell.

The head is struck with a radius of 1·5 diameters, the point is truncated, bored out, and tapped to G.S. fuze-hole guage.

The interior of the shell is ltned with a composition of resin, 12 lb.; Spanish brown, 2 lb.; plaster of paris, 1 lb.; turpentine, ½ pint.

The shell is fitted with a gas-check, made of an alloy of 100 parts copper to 3 parts zinc.

The dimensions of the finished shell are as follows :—

Diameter over body	2·97 inches	± ·01	inch.
Length	10·57 „	± ·086	„
Length, total over gas-check	10·64 „	± ·086	„
Thickness at base	1·25 „	± ·05	„
Thickness at side	·6 „	± ·05	„

The total weight of the finished shell with bursting charge is 13 lbs. ± 1·5 per cent., and when fuzed with percussion fuze 13 lb. 6¼ oz. Shell, empty, 12 lb.; bursting charge, 10 oz; gas-check, 6¼ oz.

Shrapnel Shell.

Plate X.

The body of the shell is made of cast-iron, unturned, the base to a length of ·5 inch is reduced to 1·87 inch diameter, and cast with a circular groove for attaching a gas-check, and twenty radial grooves, by which the gas-check imparts rotation to the shell.

The head is made of charcoal iron or Bessemer metal, ·148 inch thick, struck with a radius of 1·2 inch diameter, the top being truncated to receive a gun metal socket, the socket is screwed to G.S. fuze-hole gauge, and attached to the head by soft solder.

The head is fitted with a wood block and attached to the body of the shell by four steel screws, and four steel pins, No. 10 B.W.G. in diameter, are also inserted to prevent the head from twisting.

The shell is fitted with a gas-check, made ofan alloy of 100 parts copper to 3 parts zinc.

The shell contains 116 bullets, at 34 per lb., the interstices being filled up with resin.

The dimensions of the finished shell are to be as follows :—

Diameter over body	2·97 inches	± ·01	inch.
Length	10·1 „	± ·084	„
Length, total over gas-check	10·17 „	± ·084	„
Thickness at base	1·28 „	± ·05	„
Thickness at side	·375 „	± ·05	„

The total weight of the finished shell with bursting charge is 13lb. 0 oz. ± 1·5 per cent. and when fuzed with time fuze 13 lb. 2½ oz. Body, 7 lb. 3 oz.; bursting charge, ¾ oz.; gas-check 6¼ oz.

Case Shot.

Plate XI.

The case is made of XX single tin.

The top of the case is made of sheet iron, No. 18 B.W.G. thick, and fixed to the case by turning the notched ends of the case over and soldering with soft solder. A ring of sheet iron, No. 12 B.W.G. thick, is riveted on the outside bottom of case. The inside bottom is made of sheet iron, No. 12 B.W.G. thick, and is laid in loose inside.

The case is to have an inside lining of sheet iron No. 14 B.W.G. in 3 segments, and contains 340 mixed metal bullets, 34 per lb. = 10 lb. 1½ oz., the interstices being filled up with clay and sand.

The dimensions of the finished case are as follows :—

Diameter over case	2·96 inches	± ·015 inch.
Length of finished case	9 inches	± ·1 inch.

The total weight of finished case filled is 13 lb. 7½ oz.

FUZES.

Plate XII.

Percussion, R.L. Mark II, for use with common shell, intended to burst on impact or on graze. (*List of Changes*, § 2621.)

Time, wood, with detonator, 15 seconds, for use with shrapnel shell, and if required, for common shell. (*List of Changes*, § 4045.)

In general construction this fuze is similar to the 9-seconds B.L. fuze. It is, however, charged with a slower burning composition, and, in order to obtain the same divisions of time as are obtained in the 5-seconds and 9-seconds fuzes, this fuze is made with six powder channels.

The marking of the divisions of the fuze in nominal tenths and half tenths of fuze, representing half seconds and quarter seconds of time, is effected by the side holes being numbered consecutively in a spiral direction, 1, 1·5, 2, 2·5, &c., to 30, the figures 1 to 10, or to 20, giving the same times of burning as are obtained from the same figures on the 5-seconds and 9-seconds fuzes. This fuze, when burnt at rest, will burn about 15 seconds, but when fired from this gun it burns about 13. It may be used in place of either 5-seconds or 9-seconds fuzes, which it is intended eventually to supersede.

When reference is made to the divisions of the fuze in teaching, it is far simpler to call them simply divisions, without any reference to either tenths of inch of length or seconds of burning. Both are only nominal, and simply confuse the learner. To say that for a certain number of yards of range, a certain number of divisions of the fuze are required, is all that can be necessary.

This fuze is fitted with the B.L. detonating arrangement, as it is found that the escape of powder gas past the gas-check of the shell will not ensure the ignition of the priming of the M.L. fuze.

Stars, Incendiary, for Shells.

These stars are intended for filling common shells which are to be used for incendiary purposes. Each star consists of a hollow paper cylinder about 2 inches in length, 0·7 inch in external diameter, and 0·5 inch in internal diameter, soaked in paraffin wax, and filled with the following composition, viz. :—

India-rubber solution	2 oz.
Powder, mealed	5 „
Saltpetre, ground	1 „
Paraffin wax	0¼ „
Napthaline	0¼ „
Coal tar	1 „

Each end of the star is primed with quickmatch.

A common shell holds about 12 stars and a bursting charge of about 3 oz.

The stars will be tied up in paper bundles of eight each, and packed in quarter metal-lined cases. The case will hold 400 stars; or if for siege train, will be packed with a certain number of proportions for the nature of shells for which the stars are intended.

INSTRUCTIONS FOR PREPARATION OF SHELLS AND FUZES, AND THE EXAMINATION OF FILLED SHELLS.

(*See Clause* 160, *Army Circulars* 1881.)

Filling and Securing Shells.

Shells, R.M.L., Common.

Remove the plug from the fuze-hole, insert the leather funnel and pour in the bursting charge; the shell should be tapped with a mallet or a piece of wood to ensure its being completely filled, just leaving room for the fuze if it is to be fuzed with a time-fuze, this can be ascertained by inserting a piece of wood the same size as the fuze; after filling the shell carefully wipe every portion of powder from the fuze-hole, then fix the fuze or plug as may be required.

In shells that are liable to be moved, or that are not required for immediate use, and in shells for use in the field service, insert the wad, papier mâché, G.S., with the side on which the shalloon is cemented downwards, *i.e.*, next the powder; drive it in with the "Drift, wood, G.S.," as far as the shoulder on the drift will allow, and then screw in the fuze or plug, as may be required.

Common Shells for Incendiary Purposes.

The shell to be prepared for incendiary purposes, if already filled with the bursting charge, will be emptied, and then filled up as far as possible with incendiary stars. The shell should be tilted to one side, and the stars put in gradually, and occasionally "set" or shaken down, so as to bed themselves evenly together, powder being introduced from time to time to fill up spaces between the cylinders. (A small wooden stick will be found of assistance in getting the stars well in.) When no more stars can be inserted, and the shell is tightly filled, the fuze or plug will be inserted, as may be required.

Before using a shell, it should be ascertained that there is powder close to the fuze-hole. These shells are fuzed with percussion fuzes.

Shells, R.M.L., Shrapnel.

Remove the plug from the fuze-hole, and after seeing that the fuze-hole is clear of any dirt, &c., insert the leather funnel and pour in the bursting-charge. This must be done gradually, for if the whole of the powder is put in at once the tube will probably become choked. Shake the shell from side to side on its base, until the whole of the bursting-charge has passed down the tube, taking care that none of the powder is left at the bottom of the socket. Drop in the metal primer, and by means of the large diaphragm Shrapnel screw-driver, screw it tightly into the tube, and then screw in the fuze or plug, as may be required.

Fixing Plugs and Fuzes.

When plugs or metal fuzes are screwed into shells, they will be lubricated with Field's grease, No. 3, and in warm climates Price's composite grease.

Distinguishing Marks.

All filled shells must be marked with the word "Filled" and date, and also 'Bag" if a bag is used. The colour of the paint will be red on a black ground, or black on a red ground. At stations where means are available the monogram is to be painted.

Preparing Fuzes.

Fuzes, Time, Wood, Boxer, M.L.

These 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, screwing up until the bit has entered as far as the borer will allow, taking care to press the fuze with the fingers so as to ensure its bedding fairly in the hook.

Unscrew, and, when the bit is quite clear, remove the fuze from the hook. 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 Fuzes.

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, iron, plug, G.S."

The safety-pin will not be withdrawn until after entering the shell into the muzzle.

Fuze, Time, Wood, Boxer, M.L.

These fuzes are fixed in the fuze-hole by screwing the fuze round by hand until it is held firmly in the fuze-hole, or by giving the head of the fuze two or three smart taps with a mallet, or suitable piece of wood, or by striking them against the gun-carriage or boat's thwart, if more convenient; this operation should be performed fairly, and not so as to split or injure the top of the fuze: the fuze must not be uncapped until the shell is placed in the muzzle of the gun. These fuzes are "uncapped" by taking hold of the small end of the copper band, which is left exposed, and unwinding from left to right smartly, so as to thoroughly detach the band from the head of the fuze and to leave the priming fully exposed.

When firing at high angles of elevation with reduced charges, uncap the fuze as above, open out the priming, and wind about 10 inches of the guncotton

round it, bringing the ends of the priming between the strands of guncotton; tie the two ends of the latter together, leaving about two inches loose, then fix the whole firmly by tying over it a piece of silk.

Wad, Papier Mâché, in Fuze-hole.

When fixing fuzes in shells having a wad in the fuze-hole, it is not necessary to remove the wad, as the explosion of the fuze is sufficient to force it into the shell, if using percussion fuzes; and, if using wood time fuzes, the wad is driven into the shell in the operation of fixing the fuze.

EXTRACTING WOOD FUZES.

Apply the fuze-extractor to the head of the fuze and unscrew.

EXAMINATION OF FILLED SHELLS.

Whenever it may be considered necessary to examine the interior of filled shells for rifled ordnance. and it is found that the powder is caked from the effects of damp, the shells, with the exception of the Shrapnel, will be emptied, cleaned out, and re-filled; the Shrapnel will be exchanged.

Shells, Common, filled with Loose Powder.

Remove the fuze-hole plug, pass the "metal hook for removing wads" through the hole in the centre of the wad, and draw the wad out of the fuze-hole; if the powder charge is in a serviceable condition, insert a new papier-mâché wad, and replug the shell as directed in instructions for filling. If the powder charge is found to be caked from the effects of damp, empty the shell and clean it out, using a "copper scraper for shells" to remove any grains of powder that may be adhering to the sides of the shell, and refill with serviceable powder.

Shells, Shrapnel.

Remove the fuze-hole plug, unscrew the primer with the "large screw-driver," and lift out the primer with the "metal pincers for removing primers"; turn the shell nose downwards, and if the powder charge flows out and is serviceable, refill and replace primer and plug; the shell should be well shaken if the powder does not come out quite freely, as a portion of the powder may possibly be jammed in the tube; if the powder cannot be extracted as above, being caked from the effects of damp, &c., the primer and plug will be replaced, and steps taken for the exchange of the shell.

CHARGES.

(*List of Changes*, §§ 4060 *and* 4172.)

Service, silk cloth, 3 lb. 2 oz. R.L.G.*
Saluting, „ 1 lb. 12 oz. Blank L.G. or R.L.G.

DIRECTIONS FOR MAKING UP CARTRIDGES.*

(See Appendix to Clause 155 A.C., 1883.)

Filling.

Care will be taken to see that the cartridge bags are properly dry before being filled, and the proper charge will be carefully weighed out and inserted in the bag by means of the "Funnel, copper, cartridge." Cartridges will be

* Cartridges for field guns will be supplied filled (Equipment Regulation § 249, 1881).

choked by drawing together the mouth of the cartridge into several pleats with a brass needle, threaded with doubled silk twist; after drawing together the mouth of the cartridge, three turns will be taken round the pleats, and the choke thus formed will be further secured by passing the needle three times through it, alternately above and below the turns, thereby stitching down the turns round the choke at two points equi-distant from each other.

Hooping.

The cartridges will be made up to their proper lengths and diameters by means of hoops, which should be drawn tight so as to make a firm cartridge.

1st. With braid hoops.—Draw the braid through the serge or silk cloth until the knot of the loop comes home to the serge or silk cloth, the single end being already passed through the loop from underneath; pass the single end to one side of and under the loop, then draw the hoop tight and keep it so by placing the forefinger of the left hand firmly on the loop; bring the running end between itself and the loop, and draw tight the single bend thus formed, *taking care that the bend bites on the loop and not on the single end*, otherwise the knot will slip. The maintenance of the proper form of the cartridge depends on the hooping being thus secured.

2nd. With worsted or silk twist.—After making the last stitch in choking the needle will be turned downwards and carried through the powder and out at the seam in the line for the front hoop, the worsted or silk twist will then be carried tightly round the cartridge so as to form a hoop, and will be stitched to the cartridge at two or three points in the same way as the turns at the choke were secured, and the remainder of the hoops will then be similarly formed.

Finished Cartridges.

All cartridges will be very carefully examined and gauged as to length and diameter previous to packing.

Dimensions.

			inches.
Service cartridge, filled	length	15·25 to 15·75
	diameter	2·73
Saluting „ „	length	8·75 to 9·25
	diameter	2·73

RANGE TABLE.

Charge, 3 lb. 2 oz. R.L.G.^{2} Projectile, common or Shrapnel, 13 lb. 4 oz.
Muzzle Velocity = 1595 f. s.
Based on practice of 14. 2. 79; 18. 3. 79; 27. 3. 79; 28. 3. 79.

Range.	Drift, right.	Elevation.	Deflection, left.	Time of flight.	Angle of descent. (approximate.)	Remaining velocity.	5 minutes elevation increases or decreases range by	5 minutes will alter the point of impact, vertically or laterally, at each range.	50 per cent. of rounds fired should fall within *			Fuze scale.		Increments due to divisions of fuze.
									Length.	Breadth.	Height.	Range.	Length of fuze.	
yds.	yds.	° ′	mins.	secs.	° ′	f. s.	yards.	yards.	yards.	yards.	yards.	yards.		yds.
250	—	P.B.	—	0·65	0 23	1482	83·3	0·36	0·45	0·02	0·01	120	0·5	120
300	—	0 3	—	0·78	0 28	1460	62·5	0·43	0·90	0·06	0·02	240	1·0	—
400	0·4	0 11	—	1·03	0 39	1417	62·5	0·58	2·85	0·19	0·04	360	1·5	—
500	0·08	0 19	1	1·28	0 51	1376	55·5	0·72	4·79	0·30	0·06	480	2·0	—
600	0·12	0 28	1	1·53	1 3	1336	55·5	0·87	6·35	0·41	0·09	580	2·5	100
700	0·16	0 37	1	1·78	1 16	1298	55·5	1·01	7·95	0·51	0·12	680	3·0	—
800	0·22	0 46	1	2·04	1 30	1262	50·0	1·16	9·45	0·60	0·18	780	3·5	—
900	0·30	0 56	1	2·30	1 44	1228	50·0	1·31	10·80	0·69	0·26	870	4·0	90
1000	0·40	1 6	1	2·56	1 59	1195	50·0	1·45	12·15	0·77	0·36	960	4·5	—
1100	0·52	1 16	2	2·82	2 14	1164	45·4	1·60	13·50	0·85	0·48	1050	5·0	—
1200	0·66	1 27	2	3·08	2 30	1135	45·4	1·74	14·70	0·93	0·60	1140	5·5	—
1300	0·83	1 38	2	3·34	2 46	1108	41·6	1·89	15·90	1·00	0·73	1230	6·0	—
1400	1·02	1 50	2	3·60	3 3	1083	41·6	2·03	16·95	1·07	0·86	1310	6·5	80
1500	1·22	2 2	3	3·87	3 21	1060	41·6	2·18	18·00	1·14	1·02	1390	7·0	—
1600	1·43	2 14	3	4·14	3 40	1039	41·6	2·32	19·05	1·20	1·20	1470	7·5	—
1700	1·65	2 26	3	4·42	4 0	1020	38·4	2·47	20·10	1·26	1·40	1550	8·0	—
1800	1·90	2 39	4	4·71	4 20	1003	38·4	2·61	21·15	1·32	1·60	1630	8·5	—
1900	2·17	2 52	4	5·00	4 40	988	35·7	2·76	22·20	1·38	1·82	1710	9·0	—
2000	2·45	3 6	4	5·30	5 1	974	35·7	2·91	23·25	1·44	2·05	1780	9·5	70
2100	2·75	3 20	5	5·60	5 23	961	33·3	3·05	24·15	1·49	2·30	1850	10·0	—
2200	3·07	3 35	5	5·91	5 46	949	33·3	3·20	25·05	1·54	2·56	1920	10·5	—
2300	3·42	3 50	5	6·23	6 10	937	31·2	3·34	25·95	1·59	2·84	1990	11·0	—
2400	3·80	4 6	5	6·56	6 35	925	31·2	3·49	26·85	1·64	3·14	2060	11·5	—
2500	4·20	4 22	6	6·90	7 1	914	29·4	3·63	27·75	1·69	3·45	2120	12·0	60
2600	4·60	4 39	6	7·25	7 27	903	29·4	3·78	28·65	1·74	3·78	2190	12·5	—
2700	5·05	4 56	6	7·61	7 54	892	29·4	3·92	29·55	1·79	4·13	2250	13·0	—
2800	5·55	5 13	7	7·99	8 22	882	29·4	4·07	30·45	1·84	4·50	2320	13·5	—
2900	6·10	5 30	7	8·38	8 51	872	29·4	4·21	31·20	1·88	4·90	2380	14·0	—
3000	6·70	5 47	8	8·78	9 21	862	29·4	4·36	31·95	1·92	5·30	2440	14·5	—
3100	7·30	6 4	8	9·19	9 52	852	27·7	4·51	32·70	1·96	5·73	2500	15·0	—
3200	7·95	6 22	9	9·61	10 24	843	27·7	4·65	33·45	2·00	6·18	2560	15·5	—
3300	8·65	6 40	9	10·03	10 57	834	26·3	4·80	34·20	2·04	6·63	2620	16·0	—
3400	9·40	6 59	10	10·45	11 31	825	26·3	4·94	34·80	2·08	7·10	2670	16·5	50
3500	10·30	7 18	10	10·87	12 6	816	25·0	5·09	35·40	2·12	7·60	2730	17·0	—
3600	11·20	7 38	11	11·30	12 42	807	25·0	5·23	36·00	2·16	8·15	2780	17·5	—
3700	12·30	7 58	11	11·75	13 18	798	25·0	5·38	36·60	2·19	8·70	2830	18·0	—
3800	13·50	8 18	12	12·20	13 54	790	23·8	5·52	37·20	2·22	9·25	2880	18·5	—
3900	14·90	8 39	13	12·65	14 30	782	23·8	5·67	38·80	2·25	9·82	2930	19·0	—
4000	16·45	9 0	14	13·10	15 6	774	23·8	5·81	38·40	2·28	10·40	2980	19·5	—
4100	18·00	9 21	15	13·55	15 44	766	23·8	5·96	39·00	2·32		3030	20·0	—
4200	20·00	9 42	16	14·00	16 24	758	22·7	6·11	39·80	2·36		3080	20·5	—
4300	22·00	10 4	18	14·45	17 6	751	21·7	6·25	40·60	2·40		3130	21·0	—
4400	24·20	10 27	19	14·90	17 48	744	20·8	6·40	41·50	2·44		3180	21·5	—
4500	26·50	10 51	20	15·40	18 30	737	20·8	6·54	42·40	2·48		3230	22·0	—
4600	28·90	11 15	22	15·90	19 12	730	20·0	6·69	43·30	2·52		3280	22·5	—
4700	31·40	11 40	23	16·40	19 54	723	19·2	6·83	44·20	2·56		3320	23·0	40
4800	34·00	12 6	24	16·90	20 39	716	18·5	6·98	45·10	2·60		3370	23·5	50
4900	36·70	12 33	26	17·40	21 24	709	17·8	7·13	46·00	2·65		3410	24·0	40
5000	39·70	13 1	27	17·92	22 10	703	17·2	7·27	46·94	2·69		3460	24·5	50
5100	43·00	13 30	29	18·44	22 57	697	16·6	7·42	47·88	2·74		3500	25·0	40
5200	46·50	14 0	31	18·96	23 45	691	16·1	7·56	48·88	2·78		3540	25·5	—
5300	50·50	14 31	33	19·50	24 33	685	15·6	7·71	49·88	2·83		3580	26·0	—
5400	55·00	15 3	35	20·04	25 21	679	15·1	7·85	50·88	2·87		3620	26·5	—
5500	60·50	15 36	38	20·60	26 9	673	13·9	8·00	51·90	2·92		3660	27·0	—
5600	66·00	16 12	41	21·16	27 0	667	12·8	8·14	52·96	2·96		3700	27·5	—
5700	73·50	16 51	44	21·76	27 51	661	11·9	8·29	54·04	3·01		3740	28·0	—
5800	82·50	17 33	49	22·36	28 42	655	11·1	8·43	55·14	3·05		3780	28·5	—
5900	93·00	18 18	54	23·00	29 36	649	10·4	8·58	56·26	3·10		3820	29·0	—
6000	107·50	19 6	1° 2′	23·70	30 42	644	9·8	8·73	57·44	3·15		3860	29·5	—
6100	127·00	19 57	1° 12′	24·44	31 30	639	9·2	8·87	58·65	3·20		3900	30·0	—

* Four times these dimensions will give the spaces (longitudinal, lateral, or vertical) in which the whole of the rounds should strike. Any two multiplied together will give the area in which 25 per cent. should strike. The calculations are based on the supposition that the mean point of impact is in the centre of the figure.

DRILL.

The detachment consists of nine members, and falls in two deep in rear of the gun, which is limbered up.

To Tell Off.

Officer.	*No* 1.
Tell off.	

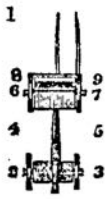
At "*Tell off*," No 1 (who is on the left of the detachment in field battery, and on the right in horse artillery battery) takes a pace to his front, turns to his right (left, in horse artillery battery), and numbers himself 1 ; the right-hand man of the rear rank numbers 2 ; the right-hand man of front rank 3 ; the second man from the right of the rear rank 4 ; the man in his front 5 ; and so on. After the detachment is told off, No. 1 falls in again on the left (right, in horse artillery battery) of the front rank.

No 1 then straps on the fuze pocket on his right side, and 5 the tube pocket.

The front is that direction in which the gun is pointed when unlimbered, or to which, when limbered up, the horses' heads are turned.

Position of Detachment when Limbered up.

In Order of March.



No. 1 in line with the point of the near shaft and two yards on the left of it.
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 axetree of the limber.
Nos. 8 and 9 in line with the splinter bar.
The Nos. stand covering, one yard from the wheels. (Fig. 1.)

In Front.

Two deep, two yards in front of the shafts, or leaders' heads.

In Rear.

Two deep, two yards in rear of the muzzle of the gun.

Right or Left.

Two deep, in line with the gun axletree, one yard to the right or left of the wheel.

Mounted.

(*Battery of Field Artillery.*)

No. 1 on his horse ; 4 and 5 on the gun limber ; 2 and 3 on the wagon limber ; 6 and 7 in front of, and 8 and 9 in rear of, the wagon body ; 2, 4, 6, 8, on the near ; 3, 5, 7, 9, on the off side.

When the gun is not accompainied by its wagon, Nos. 2 and 3 on the axle-tree seats, 6 between 4 and 5 on the gun limber.

(*Battery of Horse Artillery*).

Nos 4 and 5 on the gun limber; 4 on near, 5 on off box.

With detachments of 8,	front rank 2.	12.*	3	1.		
	rear rank 7.	13.*	6.	11.*		
With detachments of 10,	front rank 2.	12.*	3.	10.	1.	
	rear rank 7.	13.*	6.	14*.	11.*	

To Mount.

(*Battery of Field Artillery.*)

Officer.	*No.* 1.
Prepare to mount.	*Prepare to mount.*
Mount.	*Mount.*

"*Prepare to mount.*"—No. 1 runs to his horse, the other Nos. to their places, 2 and 3 to the wagon limber, 4 and 5 to the gun limber, 6 and 7 the front of wagon body, 8 and 9 to the rear of the wagon body; 3, 4, 7, and 8 lay hold of the guard irons with their left hands; 2, 5, 6, and 9 with their right; 4 places his right and 5 his left foot on the trail handle; 2, 6, and 9 their right, and 3, 7, and 8 their left feet on the spokes of the wheels.

"*Mount.*"—The whole spring into their places (the Nos. on the gun limbers facing to the rear, but turning round to the front, lifting their feet close together, and throwing them over the guard irons); and when seated lay hold of the hand straps with both h ds, and sit upright.

In passing over rough groud the gunners should lay hold of the guard irons with their outward hands and slightly raise themselves from their seats to avoid being jolted.

"*Sit at ease.*"—Drop the hand straps and sit well back, both hands remaining between the thighs.

To Mount.

(*Battery of Horse Artillery.*)

Officer.	*No.* 1.
Prepare to mount.	*Prepare to mount.*
Mount.	*Mount.*

At "*Prepare to mount,*" Nos. 1, 2, 3, 6, and 7 run to their horses' heads by the front, Nos. 1 and 3 by the right of the gun horses, Nos. 2, 6, and 7 by the left; 4 and 5 to the gun limber; 8 and 9 to the wagon limber; 4 and 9 lay hold of the guard irons with their left hands; 5 and 8 with their right; 4 places his right, and 5 his left foot on the trail handle; 9 his right, and 8 his left foot on spokes of wheels.

"*Mount.*"—The whole spring into their places; the numbers on the limbers facing to the rear, but immediately afterwards turning round to the front, by lifting their feet close together, and throwing them over the guard irons.

To Dismount.

(*Battery of Field Artillery.*)

Officer.	*No.* 1.
Prepare to dismount.	*Prepare to dismount.*
Dismount.	*Dismount.*

* This mark denotes horseholders.

"*Prepare to dismount.*"—Nos. 4 and 5, throwing their legs over the guard irons, turn to the rear, the other Nos. stand up, keeping their outward hands on the guard irons.

"*Dismount.*"—The whole jump off and form the order of march, but for action they go to their posts at the gun.

To Dismount.

(*Battery of Horse Artillery.*)

Officer.	*No. 1.*
Prepare to dismount.	*Prepare to dismount.*
Dismount.	*Dismount.*

"*Prepare to dismount.*"—The Nos. 4 and 5, throwing their legs over the guard irons, turn to the rear, 8 and 9 stand up, keeping their outward hands on the guard irons.

"*Dismount.*"—The whole dismount and stand at attention.

If for "*Action,*" the horseholders do not dismount, the other numbers take their posts at the gun, the mounted numbers leaving their horses by the rear; when the detachment is in rear of the gun, they leave their horses by the front.

To Mount and Dismount on Axletree Seats.

"*Prepare to mount.*"—Nos. 2 and 3 lay hold of the guard irons, No. 2 with the right, 3 with the left hand; No. 2 places his right, and No. 3 his left foot on the foot rests.

"*Mount.*"—Nos. 2 and 3 spring up, and turning outwards, place themselves on the axletree seats, and lay hold of the hand straps with the inward, and guard irons with the outward hands.

"*Prepare to dismount.*"—Nos. 2 and 3 drop the hand straps and place their inward hands on the gun, and their feet in front of the foot rests.

"*Dismount.*"—Both spring to the ground.

Exercise with Drag Ropes.

When drag ropes are used, Nos. 6 and 7 pass them towards 2 and 3, who hook them to the drag washers of the gun on their own side. The number manning them on their own sides. No. 9 is in the shafts.

To Advance without Drag Ropes.

Nos. 2 and 3, between muzzle and wheel, push at the axletree boxes, 4 and 5 man the gun wheels, 6 and 7 the splinter bar, 8 and 9 assist at the points of the shafts.

Change of Position of Detachments.

To form the Order of March from Detachment Front.

Officer.	*No. 1.*
Form the order of March.	*Right turn, double march.*

"*Right turn, double march.*"—No. 1 turns with the detachment; 2 and 3 wheel to their right and open out. Each number halts when at his post; they turn to the front together, looking to No. 2, who turns about immediately he arrives at his station.

To form the Order of March from Detachment Rear, Right, or Left.

Officer.	*No.* 1.
Form the order of march.	*Left turn, double march.*

When the detachments are in rear, or on the right, they proceed direct; but when on the left they countermarch to the left. No. 1 heads the rear rank. Each number halts when at his post.

To Change from Front to Rear.

Officer.	*No.* 1.
Detachment, rear.	*Right turn, double march.* *Rear turn.* *Right turn, halt, front.*

When the detachment is clear of the gun it turns to the rear; when in line with the position of "*Detachment, rear,*" it turns to the right, and when in rear of the muzzle it halts and fronts.

To change from Rear to Front.

Officer.	*No.* 1.
Detachment, front.	*Right turn, double march* *Front turn.* *Left turn, halt, front.*

When the detachment is clear of the gun it turns to its front; when in line with the position of "*Detachment, front,*" it turns to its left, and when in front of the leading horses it halts and fronts.

To Change from Rear to Right or Left.

Officer.	*No.* 1.
Detachment, right (left).	*Right (left) turn, double march.* *Front turn, halt,*

The detachment turns to its front when one yard clear of the gun wheel, and halts when in line with the axletree.

To form Detachment Rear from the Order of March.

Officer.	*No.* 1.
Detachment, rear.	*Right 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.

To form Detachment Front from the Order of March.

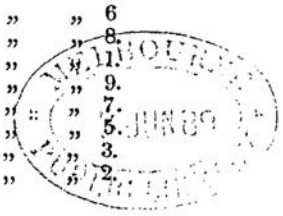
Officer.	*No.* 1.
Detchment, front.	*Double march.* *Halt, front.*

No. 1 doubles out two yards in front of the near shaft, turns to his right, and gives the order "*Double march.*" Nos. 8 and 9, followed by the other Nos., double out. As soon as 8 is clear of the shafts he inclines towards 9. When 8 and 9 arrive in line with No. 1 they wheel to their left and mark time; when the detachment is closed up, No. 1 gives "*Halt, front,*" turning himself to the front at the same time.

To change Rounds when the Gun is Limbered up.

The detachment being at the "Order of March" in changing rounds.

No. 2 becomes No. 4.
" 4 " " 6
" 6 " " 8.
" 8 " " 11.
" 1 " " 9.
" 9 " " 7.
" 7 " " 5.
" 5 " " 3.
" 3 " " 2.



To Unlimber.

Officer.	*No.* 1.
Action, front.	*Action, front.*
" (*right*).	" (*right*).
" (*left*).	" (*left*).
" (*rear*).	" (*rear*).

"*Action, front.*"—No. 5 unkeys; Nos. 1, 4, and 5 lift the trail; 1 and 5 at the trail eye, 4 on the right of 1; 2 and 3 man the wheels. When the trail is clear, No. 5 gives "*Limber—Drive on.*" The limber moves forward a yard, then reverses to the right, and the trail is carried round a half circle to the left, 1 and 4 shifting round the trail, as soon as the limber makes room, to avoid walking backwards. The numbers then place themselves as detailed for "*Action.*" When the limber is sufficiently to the rear, it reverses to the right, and halts 10 yards in rear of the trail eye, covering the gun. The wagon reverses to the right, and when sufficiently to the rear reverses to the right again, and halts four yards in rear of, covering the limber.

"*Action, rear.*"—The gun is unlimbered by the same Nos. as in "*Action, front,*" but the trail is not thrown round; the limber moves forward one yard, inclines to its left, and then reverses to its 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.

"*Action, right.*"—Is the same as "*Action, front,*" but the trail is carried round a quarter of a circle only, the limber drives on one yard, then takes ground to its left and reverses to its left. The wagon the same as the limber.

"*Action, left.*"—The trail is taken to the right, No. 5 shifting round the end as soon as the limber makes room.

The limber takes ground to its right, and reverses to its right, the wagon the same as the limber.

In all unlimbering, except for "*Action, left,*" 1 and 4 should shift round the trail as soon as it is unhooked, so as to avoid walking backwards—at "*Action, left,*" 5 must do so.

When there are no horses, 6, 7, 8, and 9 attend to the limber, No. 9 is between the shafts, 8 at the point of the near shaft, 7 at the point of the off shaft, and 6 in rear of the limber.

No 1 is responsible for the correct dressing of his gun when it comes into action.

Position and General Duties,

No 1 ships and unships the handspike, stands at the end of it, commands, bores and fixes fuzes when the shells are fuzed at the gun, and hands them to 3, lays, and lifts at the end of the handspike in running up and back.

Nos. 2 and 3 stand outside and in line with the front of the wheels.

No. 2 sponges, rams home, and mans the right wheel.

No. 3 loads, removes safety pin from the fuze when in the bore, serves ammunition from the leather cases on carriage, and mans the left wheel.

Nos. 4 and 5 stand in line with the breech, outside the wheels.

No. 4 supplies 2 with sponge, and replaces it on the trail, attends to vent, traverses at the end of the handspike, and mans the right wheel.

No. 5 makes ready, fires, and mans the left wheel.

No. 6 stands five yards in rear of the left wheel, supplies 3 with ammunition, hands shell to No. 1 when fuzed at the gun, lifts at the end of the handspike in running up or back, when necessary.

No. 7 stands in rear of the off limber box, supplies cartridges and projectiles to 8, fixes percussion fuzes at the limber, and, when ordered, bores and fixes time fuzes.

No. 8 stands in rear of the near limber box, supplies 6 with ammunition, and assists 7.

No. 9 attends to the ammunition wagon, and refills the gun limber from it when necessary. (Fig. 2.)

General Duties with Reduced Nos.

3 *Nos.*

No. 1 commands, attends to vent, lays, makes ready and fires; 2 sponges and rams home; 3 loads and traverses.

4 *Nos.*

No. 1 commands, attends to vent, lays, makes ready and fires; 2 sponges, rams home, and traverses; 3 loads and supplies himself with ammunition from 4; 4 stands in rear of the limber and supplies ammunition.

5 *Nos.*

No. 1 commands and lays; 2 sponges and rams home; 3 loads and supplies himself with ammunition from 5; 4 attends to vent, traverses, makes ready and fires; 5 stands in rear of the limber and supplies ammunition.

6 *Nos.*

No. 1 commands and lays; 2 sponges and rams home; 3 loads and supplies himself with ammunition from 6; 4 attends to vent and traverses; 5 makes ready and fires; 6 stands in rear of the limber and supplies ammunition.

After loading, 3 gets another round from the No. at the limber, and remains 5 yards in rear of the left wheel till the gun is fired.

7 *Nos.*

No. 7 supplies ammunition to 6. The other Nos. as before.

Action.

Officer.	*No.* 1.
Action.	*Action.*

The gun being unlimbered at the word

"*Action.*"—No. 1 ships the handspike, satisfies himself that the gun and its fittings are in good working order, and that the bore and vent are clear.

No. 2 turns to his left, receives the sponge from 4, and remains facing the gun with the sponge stave in his right hand, sloping at 45°, rammer head on the ground to the rear.

No. 3 turns to his right.

No. 4 turns to his left, steps in, unbuckles the sponge, and throws it over to 2, steps out again, and remains facing the gun.

No. 5 turns to his right, takes the lanyard out of his tube pocket, which is on his right side, and puts it under his belt.

No. 6 remains steady.

No. 7 prepares to issue ammunition.

No. 8 assists 7.

Load.

Officer.	*No.* 1.
Range—Yards. *With—Load.*	*With—Load.*

"*Load.*"—No. 1 communicates the directions which he receives from the officer as to the nature of projectile to be fired to 6 and 7, and when a time fuze is prepared at the gun (as is generally the case), he bores it and places it in the shell. He adjusts the scale of elevation and deflection, and as soon as the gun is loaded, lays it as laid down at page 20. If the shell is fuzed at the gun he receives it from 6 and hands it to 3.

No. 2 takes an oblique pace to the right with the right foot, then an oblique pace to the left with his left, then a side pace of 30 inches to his right; he then enters the sponge head into the bore, shifts his left hand, back under, to the right, straightens right knee, forces the sponge up the bore until his hands meet the face of the piece, shifts his hands to the rammer head, and forces the sponge hard home, bending over the left knee. He then gives the sponge two half turns by first lowering his wrist and then raising it, at the same time pressing the sponge against the bottom of the bore He next draws the sponge out about half its length, at the same time straightening the left knee and bending over on his right; then again bending over the left knee, and shifting his hands to the centre of the stave, he bends outwards, withdrawing the sponge, and, with the left hand close to the head, turns the sponge, keeping the right hand fast, but turning the wrist, and throwing the sponge head upwards with the left hand, with which he seizes the stave at the rammer head. When No. 3 has put in the charge and removed the safety pin, 2 introduces the rammer head, brings his hands to the sponge head, and forces the charge home *in two motions*, throwing in the weight of his body, both arms extended as far as possible so as to keep his body clear of the muzzle.* The charge is pressed home at the second motion with as much force as possible. Directly the charge is home he springs the sponge by jerking it out with his right hand, allowing the stave to slide through his hand; he then grasps it firmly in the middle with the right hand, and at the rammer head with the left, both knees straight, steps back outside the wheel, first with his right foot, then with his left, and brings the right heel to the left; he brings the sponge stave to the slope, and the left hand to the side in the first motion of stepping back, and remains facing the gun.

* N.B.—The mark on the rammer flush with the muzzle denotes when the charge is home.

No. 3 slews his body to the right, and brings his hands together to receive the ammunition from 6, the cartridge in his right, the projectile in his left hand, backs of both hands down. As soon as the sponge is withdrawn he steps up to the muzzle and puts in the ammunition, taking care that the choked end of the cartridge is next the projectile, and that the seam does not come under the vent; he then steps back to his former position. If firing shell he removes the safety pin when the shell is in the bore. When shells are fuzed at the gun he receives them from No. 1.

No. 4 steps in, turns to his right, and places his left thumb on the vent, keeping his elbow raised, and his fingers on the left side of the gun. As soon as No. 2 has sprung the rammer, he places himself at once at the end of the handspike, and stands ready to traverse.

No. 5 takes the lanyard from his belt, and hooks a tube to it, holding the lanyard in the left, the tube in his right hand.

No. 6 doubles and gets a round of ammunition from 8, taking the projectile in his right and the cartridge in his left hand, back of both hands up, the cartridge covered by the right arm, choke to the right. When time fuzes are bored at the gun he hands the shell to No. 1 to insert the fuze, and hands th charge to 3. He then returns to 8 for another round, and halts, at his own station till the gun is fired.

No. 7 attends at the limber and issues ammunition. When firing shells to be fuzed at the gun, he loosens the plug; if the shell is fuzed at the limber he prepares and fixes the fuze. He should take care that the limber box is open as short a time as possible.

No. 8 assists 7 and issues ammunition to 6, which he gets from 7, holding the cartridge in his right and the projectile in his left hand, backs of both hands down, choke end of cartridge against base of projectile.

To Lay the Gun.

Officer.	*No.* 1.
	Trail, right.
	" (*left*).
	Halt.

No. 1, looking over the sights, gives the necessary elevation with the elevating screw, and "*Trail right,* or *left,*" as required, then lowers the tangent scale.

No. 4 traverses with the handspike as directed.

If no order to fire should be given, No. 1 gives "*Take post,*" when the Nos. take post as detailed for "*Action.*"

To Make Ready and Fire.

Officer.	*No.* 1.
Fire one round.	*No.—Ready.*
	No.—Fire.
	Run up, or *back.*
	Halt.

At "*Fire one round,*" No. 1 gives the number of his gun and "*Ready,*" and steps clear of the wheel to that side where he can best observe the effect of his shot; 5 steps to the gun, and presses the tube into the vent with his right thumb; steps outside the wheel, shifts the lanyard to his right hand, and extends it, looking to No. 1, keeping his hand level with the vent.

No. 4 resumes his position outside the wheel.

"*Fire.*"—No. 5 draws the lanyard strongly towards his body without a jerk, and replaces it under his belt.

In the event of a miss-fire, No. 5 will go round to the front of the axletree on his own side, and from there drop in another tube, keeping clear of the muzzle, resuming the position of "*Ready.*"

No. 4, after the gun has been fired, steps in and clears the vent.

As soon as the gun is fired, No. 1, if necessary, gives the order "*Run up.*" Nos. 2, 3, 4, and 5 man the wheels facing them, and turning them by means of the spokes, No. 1 lifting at the handspike, assisted by 6 if necessary, who places the projectile on the ground, and the cartridge under his right arm. Should it be necessary to run the gun back, No. 1 gives "*Run back,*" when the same numbers move the gun. At "*Halt,*" each number returns to his place.

To Unload.

Officer.	*No. 1.*
	Unload

At drill, as soon as the gun is fired, No. 1 gives "*Unload.*"

Nos. 2 and 3 man the wheels.

Nos. 1, 4, and 5 raise the trail until the drill ammunition falls out.

No. 6 takes back the ammunition to the limber.

When using a shell with lanyard, No. 3 hauls out the projectile and then mans the wheel.

To Cease Firing.

Officer.	*No. 1.*
Cease firing.	*Cease firing.*

"*Cease firing.*"—No. 1 unships the handspike and buckles it on the trail, setting the scales at zero.

No. 2 throws the sponge over to 4, and turns to his right.

No. 3 turns to his left.

No. 4 receives the sponge from 2, putting the rammer head through the iron loop, and buckles the stave on the trail, and resumes his position outside the wheel, turning to the front.

No. 5 turns to his left, and replaces the lanyard in the tube pocket.

No. 6 gives his ammunition to 8, and falls into his place.

No. 7 replaces ammunition. If shells have been prepared, he removes the fuzes, screws in plugs, reinserts the safety pin in the case of a percussion fuze, and replaces them in the boxes.

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

No. 8 assists 7.

To Change Rounds in Action.

Officer.	*No. 1.*
Change rounds.	*Change rounds.*

In changing rounds, No. 2 becomes 4; 4, 9; 9, 7; 7, 8; 8, 6; 6, 1; 1, 5; 5, 3; 3, 2.

To Limber Up.

Officer.	*No. 1.*
Front, limber up.	*Front, limber up.*
(*Right*) ,,	(*Right*) ,,
(*Left*) ,,	(*Left*) ,,
(*Rear*) ,,	(*Rear*) ,,
	Halt, limber up.

Limbering up may be done either to the front, rear, right, or left.

"*Front, limber up.*"—No. 4 places himself at the trail eye, No. 1 on his left, 5 on the left of No. 1; they lift the end of the trail, carry it round a half circle to the right, and lower it gently to the ground. Nos. 2 and 3 man the wheels, if necessary assisted by 6 and 7. As soon as the trail is round, Nos. 2 and 3 get under cover between the muzzle and the wheels; 4 and 5 between the breech and the wheels; 6 and 7 in front of 2 and 3; 1 in front of 4; the whole with their backs to the axletree. The limber comes up on the right of the gun, and when it is square No. 1 gives *Halt, limber up,*" 4 and 5 lift the trail by the handles; 2, 3, 6, and 7 man the wheels. When the trail is on the hook, No. 5 keys, and the detachment forms the order of march.

"*Rear, limber up.*"—The numbers perform the same duties, but the limber reverses to the left as soon as it arrives at the trail, which is not thrown round. "*Right, limber up,*" is the same as "*Front, limber up,*" except that the trail is only carried round a quarter circle.

"*Left, limber up.*"—No. 5 places himself at the trail eye, No. 1 on his right, 4 on the right of No. 1; the trail is carried round a quarter circle to the left.

Instructions for the Hasty Disablement of Field Guns.

(*See Clause* 200, *Army Circular*, 1882.)

The Hasty Disablement of Field Guns will be carried out by the Royal Horse Artillery.

Stores Required.

The following stores will be carried by each battery of Royal Horse Artillery:—

Six leather cases, each containing a slab of guncotton 6 × 6⅛" × 1" cut in two pieces.

These slabs are issued wet, and are so kept in store; but it is immaterial whether they are wet or dry when required for use.

Three "cylinders, tin, for detonators (No. 8), with two feet of safety-fuze attached (to hold 4)."

Three "cases, leather, brown," cylindrical, for cylinder, tin, for detonators and primers.

Three pouches, leather, brown," with strap, each containing a box, metal, vesuvian, matches, and a twist of twine.

Three cylinders, tin, for dry guncotton primers.

These stores will only be issued in time of war. The guncotton and detonators will be carried by the Ammunition Reserve Column till active operations are impending; and, when required in the field, the supply of guncotton (both slabs and primers) will be replenished from the Royal Engineer Field Park.

The stores will be carried by horse-holders of Nos. 1, 3, and 5 subdivisions, one set in each subdivision, as follows:—

The cases for guncotton slabs—one on front of each wallet, fastened by a strap going round the wallets, passing through the staple, and then through two loops attached to the ends of the guncotton cases. (The slabs can be withdrawn without removing the sheepskin.)

The case, leather, containing the detonators and primers—under the picket-peg, in rear of the valise, the top opening on the near side, the sheepskin covering the whole.

The pouch, leather, for vesuvian matches, and twist of twine—on the waist-belt.

Instructions for carrying out the Operations.

With field guns only one slab of guncotton need be used.

Insert a detonator into a dry primer.

On no account should a detonator be twisted or roughly forced into a primer.

Insert the dry primer fitted with detonator into the perforation in the slab, pushing it gently in until the hole in the slab is quite filled by it.

Tie a piece of twine round the detonator, pass the ends round the slab, and then tie them together; the object being to prevent the primer slipping out of the slab.

Place the slab lengthways on the chase, about a foot from the muzzle. Tie it on tightly with twine to prevent it slipping from wind or other disturbing cause.

The exact position must depend on the form of the gun. The great thing is to have as much of the surface of the cotton *in actual contact* with the gun as possible. Hence the slab should not ride on an astragal or moulding, but should always be placed on a plain part of the chase.

Observe the direction of the wind, and arrange the slab containing the detonator so that the tail of the safety-fuze is away from the slab and to leeward of it. This is to lessen the chance of a spark igniting the cotton before the detonator is fired, in which case, in all probability, no effect whatever would be produced on the gun.

If projectiles belonging to the gun are available, and time allows, it is advisable to ram one up the bore; so that when the gun is dented by the explosion it may be imprisoned there and prevent the gun from being used even to fire a bag of bullets.

Tear or cut the little calico cap off the end of the safety fuze and ignite the fuze by the apparatus provided, or other convenient means. An ordinary flame does not readily ignite it. The fuze ignites most easily when cut obliquely with a sharp knife.

Retire to a safe distance (say 50 yards) and await the explosion. The length of safety-fuze will burn about 45 seconds.

Should circumstances permit, the effect of the detonation will be increased by placing a filled sand bag or a sod of turf on the guncotton, when lashed in position on the chase. Great care should be taken in this operation not to strike or bend the detonater.

It is also advisable, after the explosion, to try if the gun is so dented as to prevent loading. If the dent is not sufficient, the operation should be repeated, putting the fresh slabs in the same place as the first.

Caution.

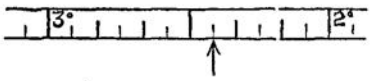
Never roughly bend or kink the safety fuze. If it has apparently gone out without firing the detonator, allow at least half-an-hour to elapse before meddling with it, if time will admit, but if not, the greatest care must be taken in touching it, to avoid accident by a "hang fire."

NOTE.—The above instructions have been prepared with special reference to the disablement or destruction of muzzle-loading guns. Breech-loading guns can generally be temporarily disabled by the removal or destruction of portions of the breech apparatus. In destroying such guns, or rendering them permanently disabled, Officers will, while being guided generally by these instructions, use their discretion as to to the application of the charges in such positions as may appear most suitable, according to the particular construction of the gun to be operated upon.

INSTRUCTIONS FOR USING WATKIN'S CLINOMETER.

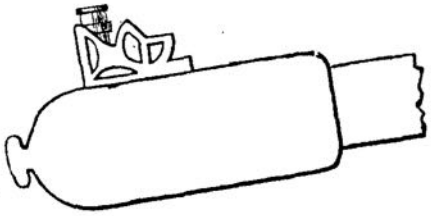
To read the angles marked on the drum.—The brass drum is marked n degrees, commencing at 0° on the top to 45° at the bottom. Each degree is subdivided into twelve parts; each small division therefore represents angles of 5 minutes.

The scale is read from right to left, thus—

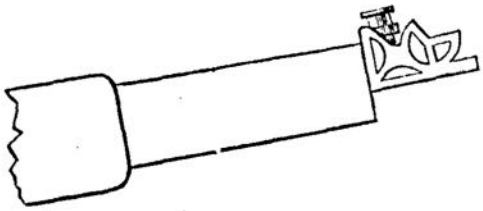


the reading opposite the arrow would indicate an angle of 2° 25′.

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

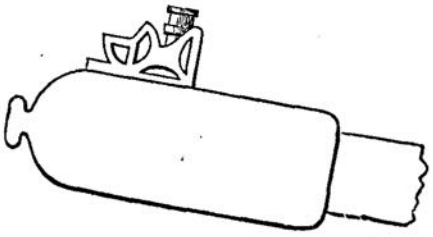


on the plane surface cut on the breech, or against the muzzle, thus—

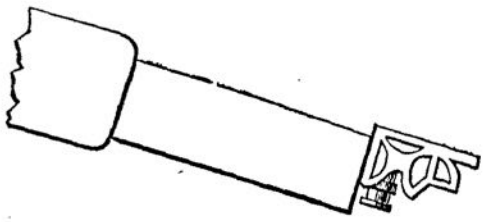


and elevate the piece until the bubble of the spirit-level is in the centre of the tube.

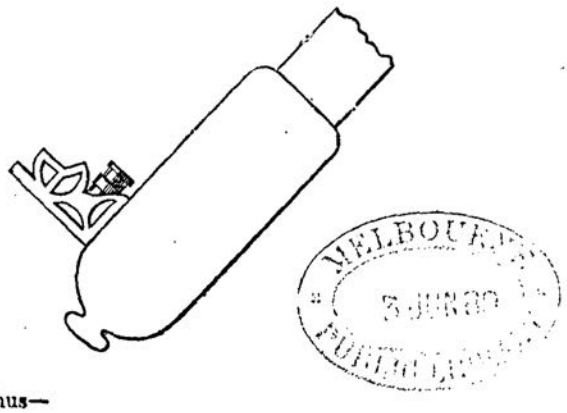
For angles of depression.—Proceed as above, but reverse the direction of the instrument, placing it thus on the breech of the gun—



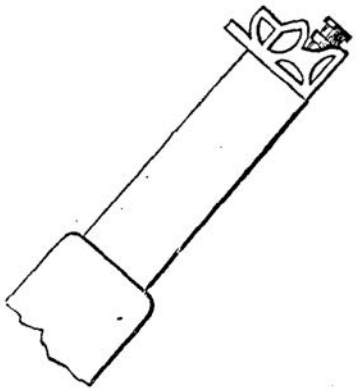
and thus on the muzzle—



For angles of elevation greater than 45°.—Subtract the angle of eleva ion required from 90°, unscrew the drum to this reading ; thus, for 60°, unscrew the drum to 30°, and place the instrument on the breech of the gun, thus—



or on the muzzle, thus—



and elevate until the bubble is in the centre of its run.

Copies of the above instructions will be issued with the instruments.

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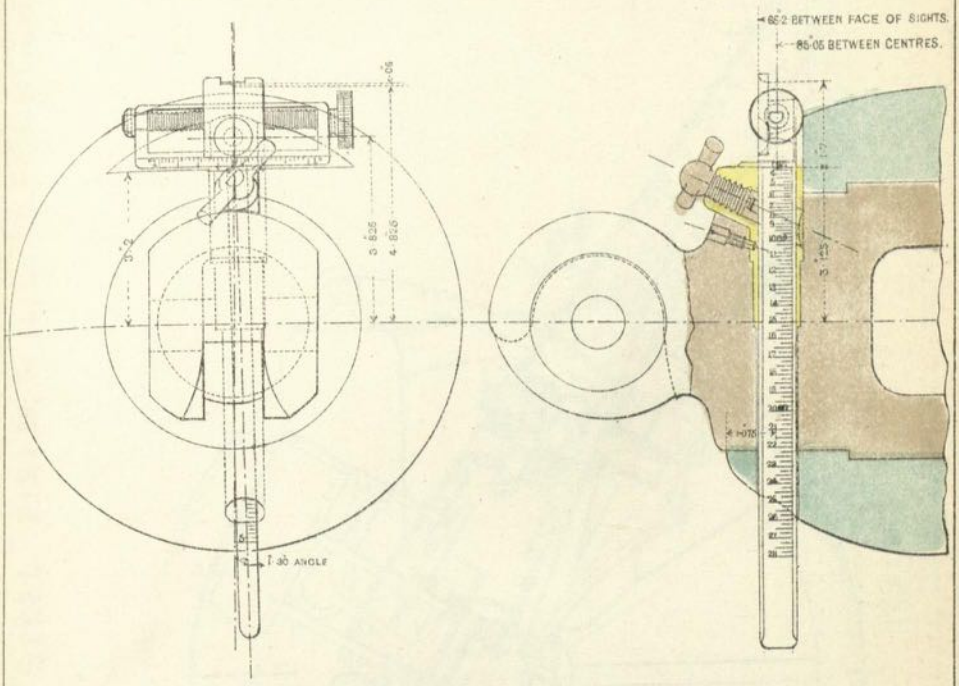
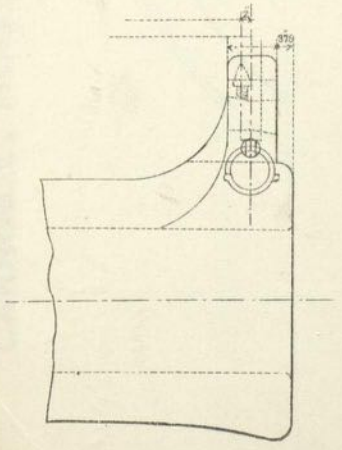
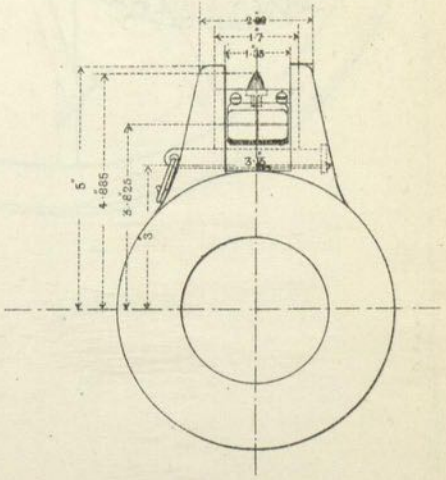
SIGHTING.

ORDNANCE, WROT. IRON, R.M.L.13 PR. 8 CWT. MARK I.

SCALE ½.

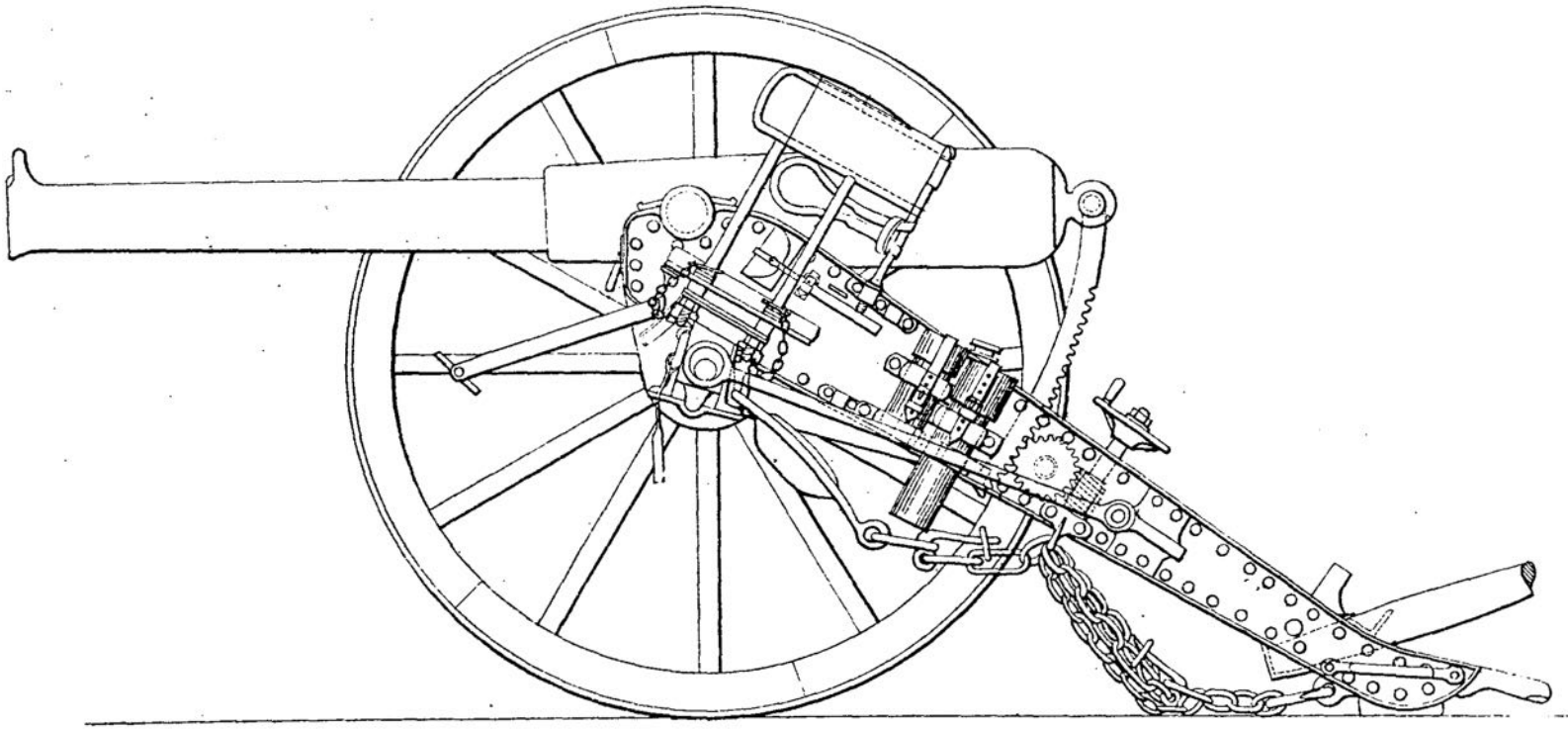




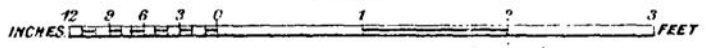


DANGERFIELD, LITH. 22, BEDFORD ST. COVENT GARDEN.

CARRIAGE, TRAVELLING, STEEL, FIELD, R.M.L. 13 POUNDER.



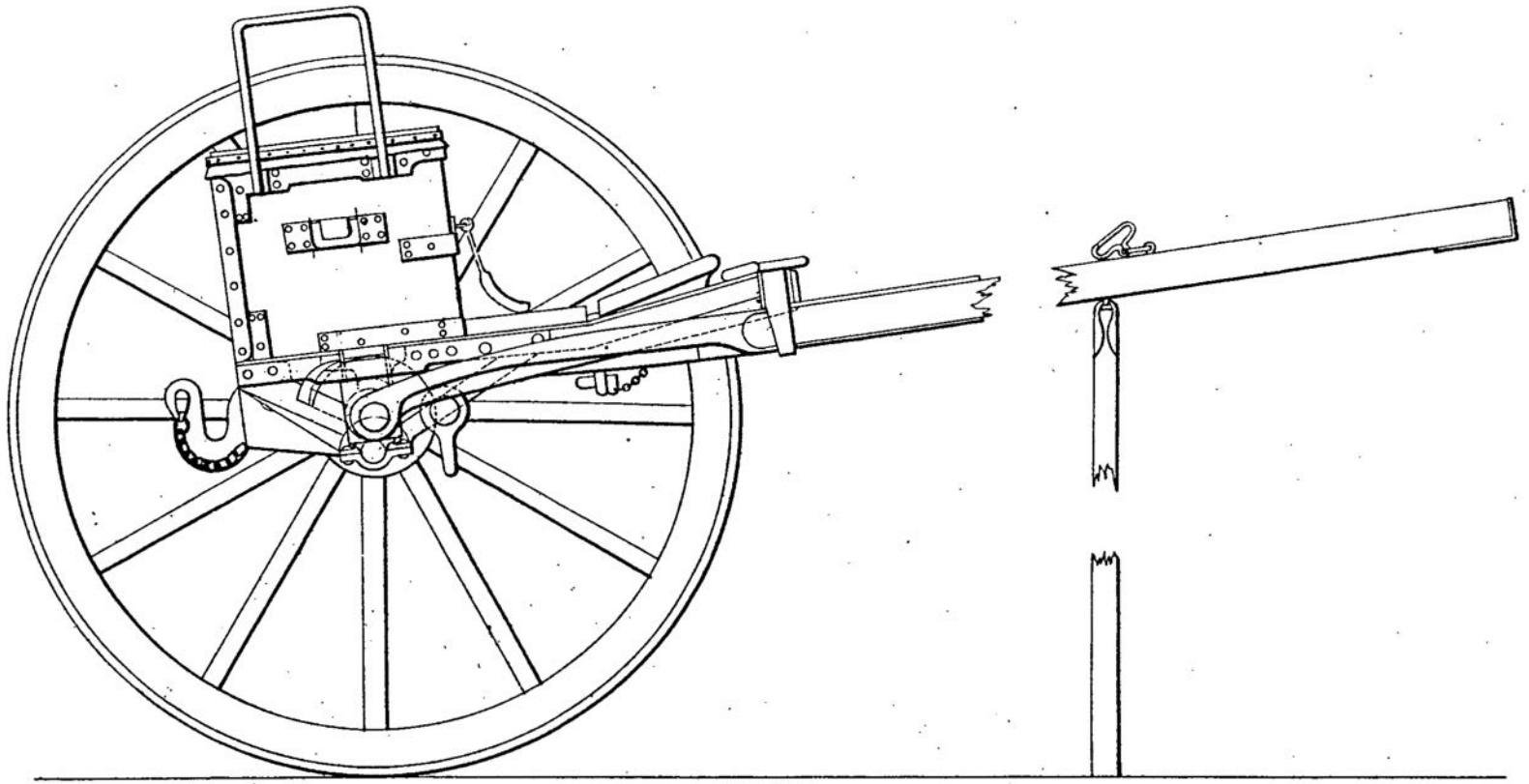
SCALE.



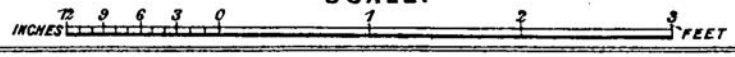
4189

DANGERFIELD. LITH. 22. BEDFORD ST. COVENT GARDEN

LIMBER, WROUGHT-IRON, FIELD, R.M.L. 13 POUNDER.



SCALE.



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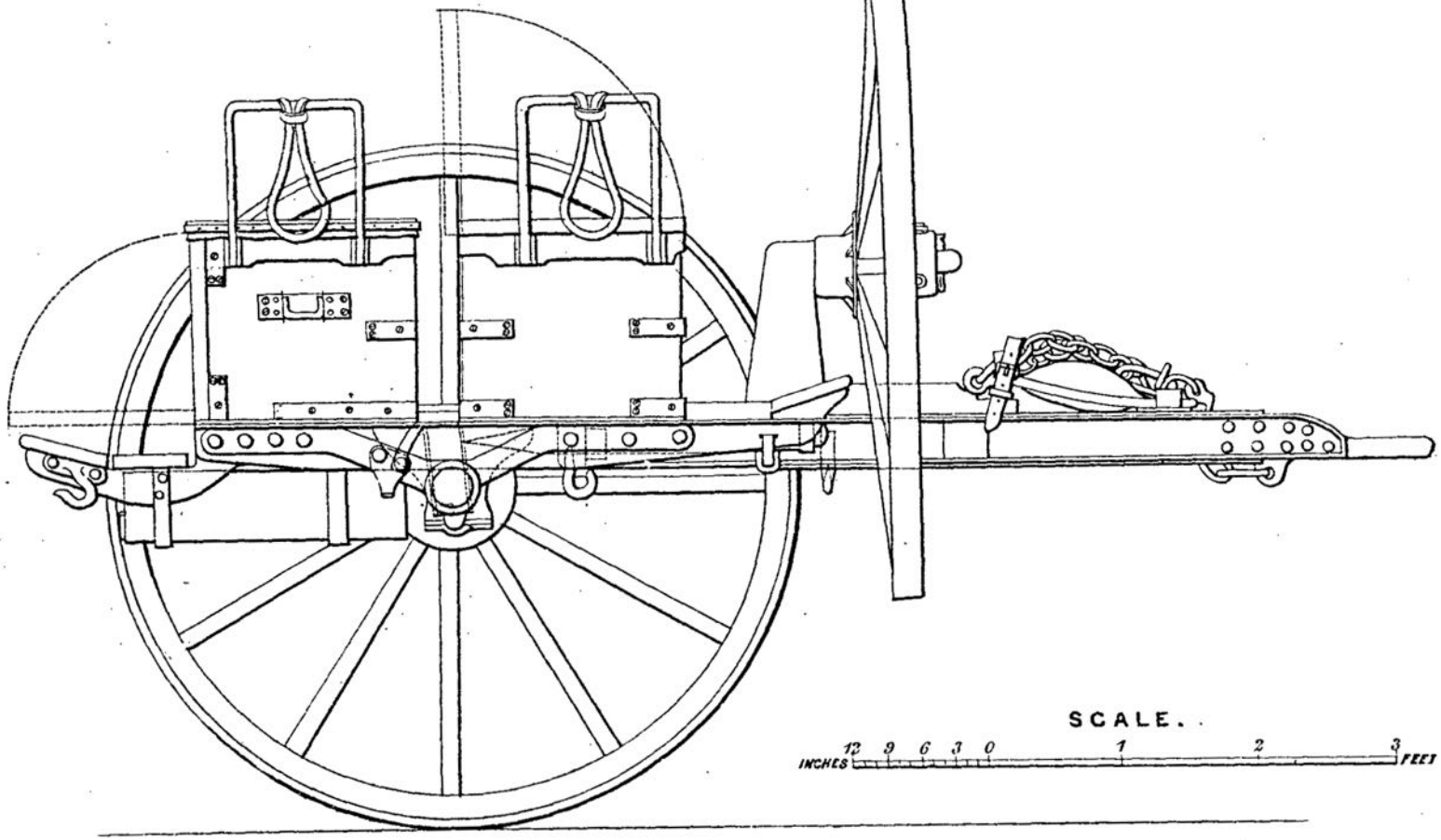
DANGERFIELD, LITH. 22, BEDFORD ST. COVENT GARDEN.

WAGON, WROUGHT-IRON, AMMUNITION, R.M.L. 13 POUNDER.



SCALE.

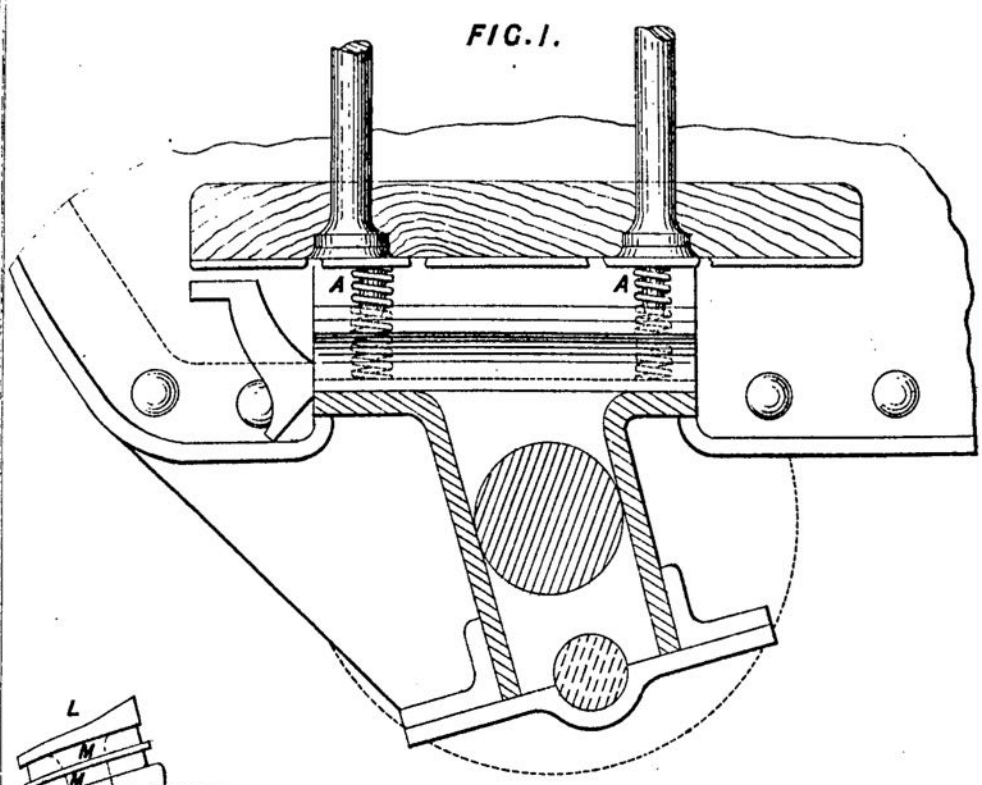
INCHES 12 9 6 3 0 1 2 3 FEET

4188.

DANGERFIELD, LITH. 22, BEDFORD ST. COVENT GARDEN

PECULIAR FEATURES OF 13 PR. EQUIPMENT.

FIG. 1.



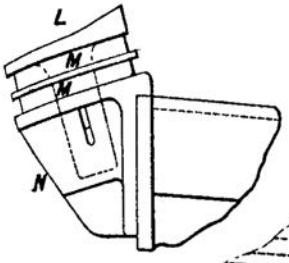
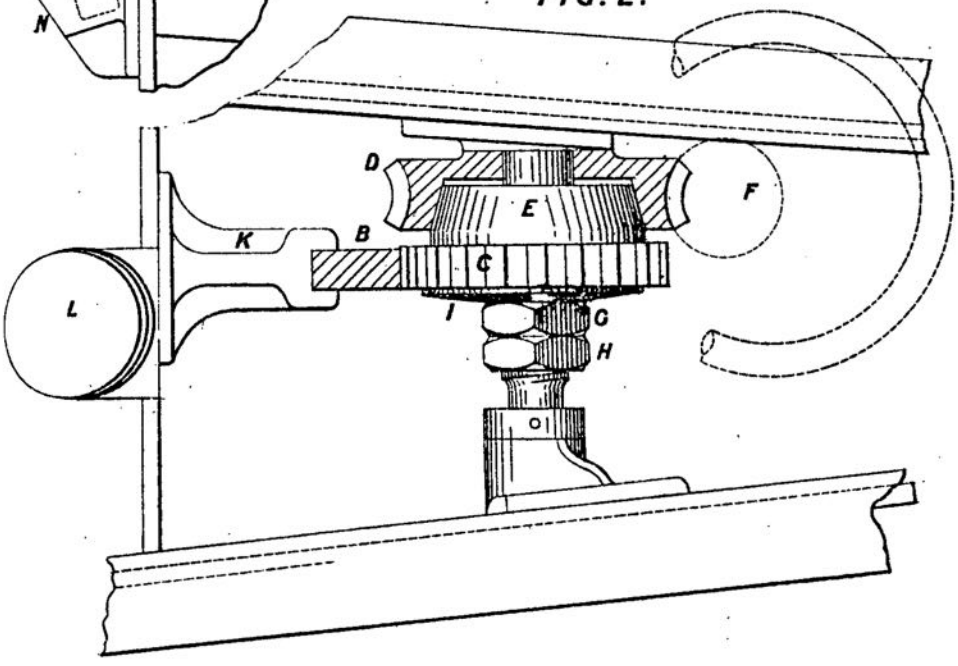


FIG. 2.



4188

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

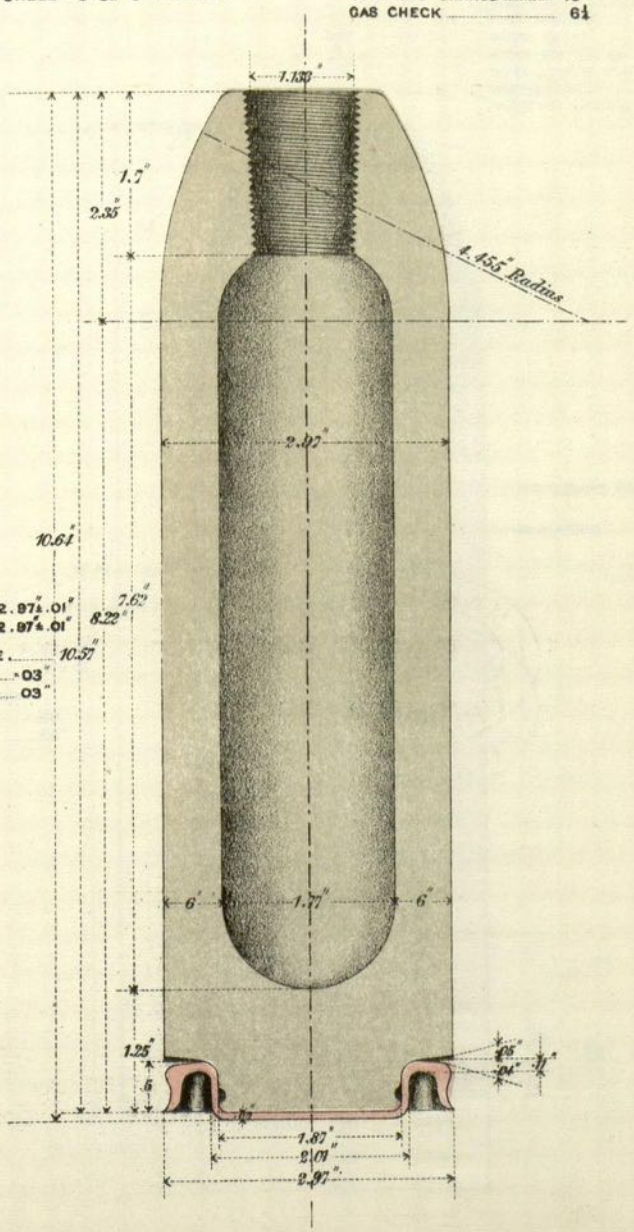
Nº 1890 $\frac{13\ Pr.}{2}$ REDUCED.

ROYAL LABORATORY DEPARTMENT.

SHELL R. M. L. GUN COMMON 13 PR.
MARK I.

SCALE 6" = 1 FOOT.
RADIUS OF HEAD — 1.5 DIAMETERS.
LENGTH OF SHELL — 3.52 CALIBRES.

AVERAGE TOTAL WEIGHT — lbs. 13 oz. 0 ± 1.5 P.C.
SHELL EMPTY ..... 12 - 0
BURSTING CHARGE ..... - 10
GAS CHECK 6¼



DIAMETERS.
OVER BODY ..... 2.97" ± .01"
OVER GAS CHECK ... 2.97" ± .01"
MEAN WINDAGE .....
OVER BODY ..... .03"
OVER GAS CHECK ..... .03"

DANGERFIELD, LITH 22, BEDFORD ST COVENT GARDEN 1889.

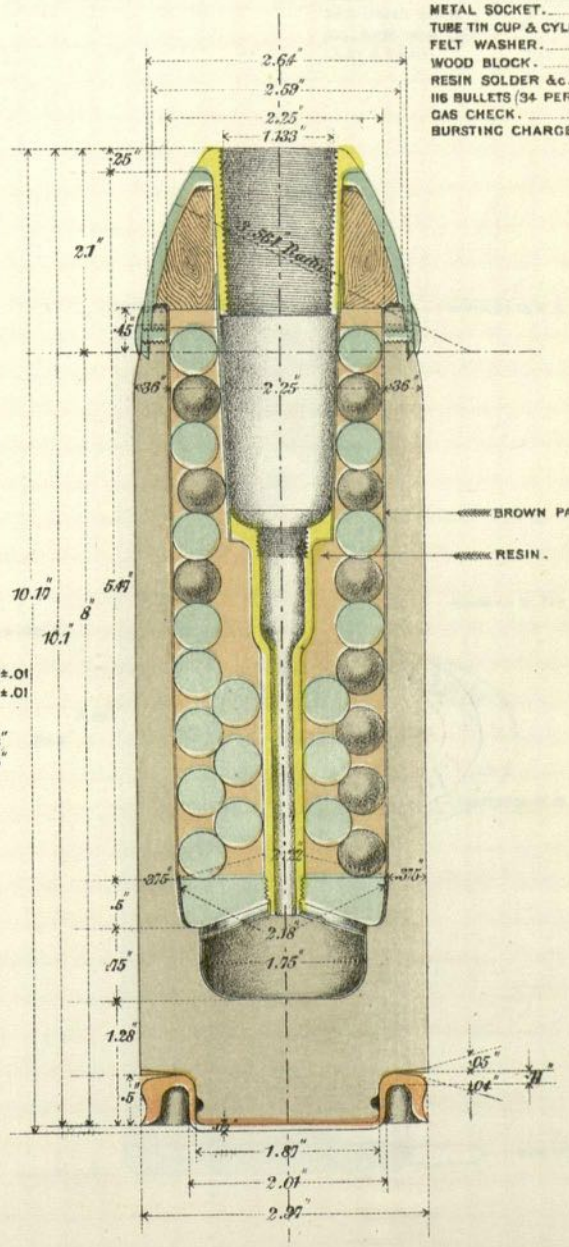
Nº 1872 $\frac{13\text{ PR}}{1}$ REDUCED.

ROYAL LABORATORY DEPARTMENT.

SHELL R. M. L. GUN SHRAPNEL 13 PR.
MARK I.

SCALE 6" = 1 FOOT.
RADIUS OF HEAD = 1.2 DIAMETERS.
LENGTH OF SHELL = 3.36 CALIBRES.

AVERAGE TOTAL WEIGHT,	lbs 13 ± 1.5 %
SHELL EMPTY.	7. 3
DISC WROUGHT IRON.	- 6½
HEAD.	- 8½
METAL SOCKET.	- 3½
TUBE TIN CUP & CYLINDER.	- 5
FELT WASHER.	- 0½
WOOD BLOCK.	- 1½
RESIN SOLDER &c.	- 8½
116 BULLETS (34 PER LB.)	3 - 6½
GAS CHECK.	- 6½
BURSTING CHARGE.	- 0½



DIAMETERS.

OVER BODY.	2.97±.01
OVER GAS CHECK.	2.97±.01

MEAN WINDAGE.

OVER BODY.	.03"
OVER GAS CHECK.	.03"

DANGERFIELD LITH. 22. BEDFORD ST. COVENT GARDEN. 3660.

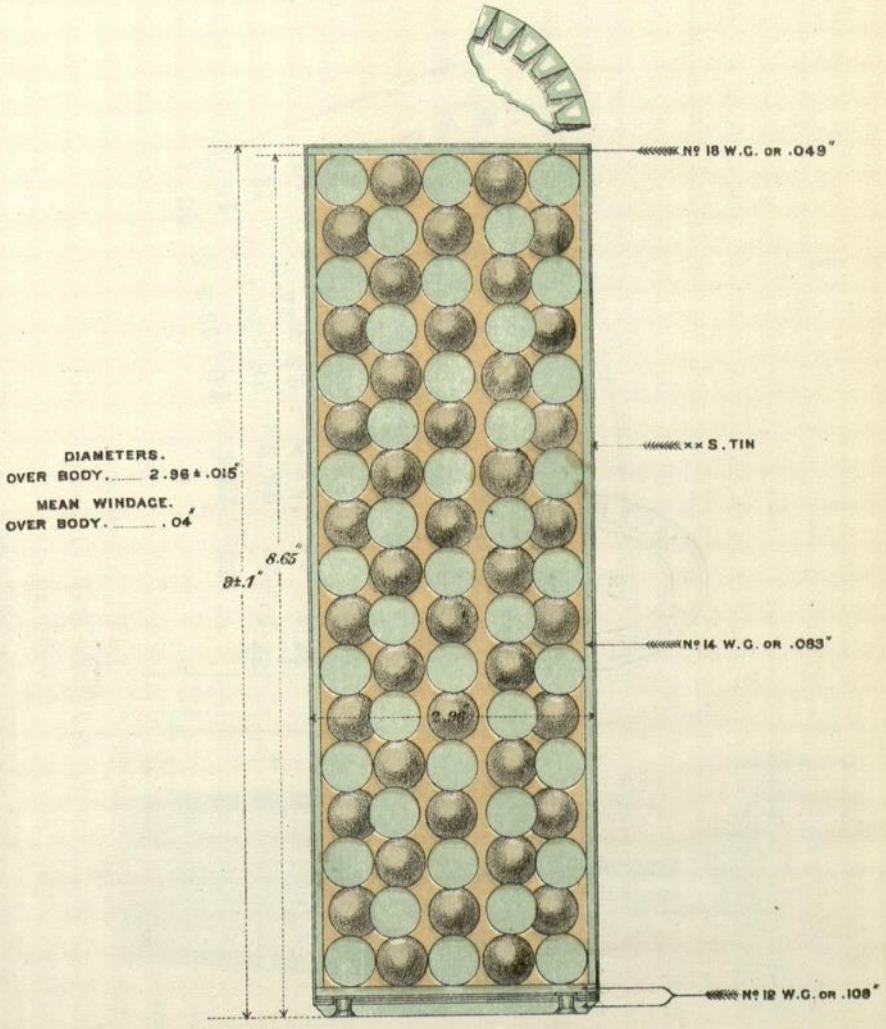
Nº 2306 $\frac{13}{3}$ Pr. REDUCED.

ROYAL LABORATORY DEPARTMENT.

SHOT R. M. L. GUN CASE 13 PR.
MARK I.

SCALE 6" = 1 FOOT
LENGTH OF SHOT = 3 CALIBRES.

AVERAGE TOTAL WEIGHT =	lbs.	oz
	13	$7\frac{1}{2} \pm 6$ oz
CASE.	2	5
340 MIXED METAL BALLS (34 PER LB)	10	$1\frac{1}{2}$
CLAY & SAND.	1	1



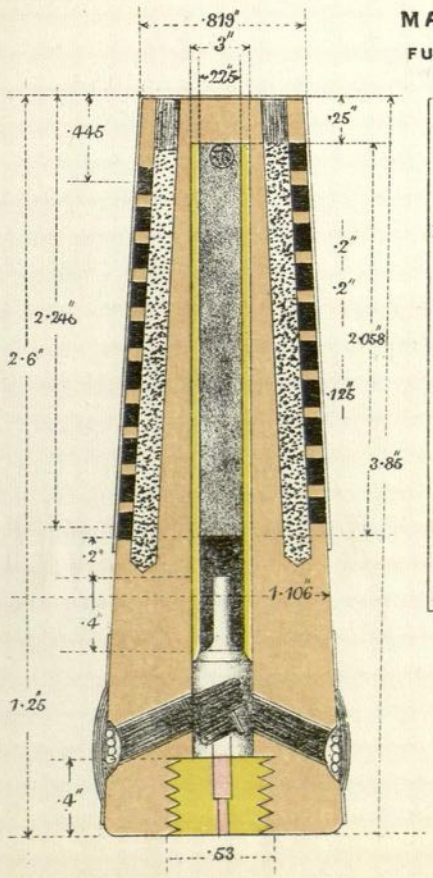
DIAMETERS.
OVER BODY..... 2.96 ± .015"
MEAN WINDAGE.
OVER BODY..... .04"

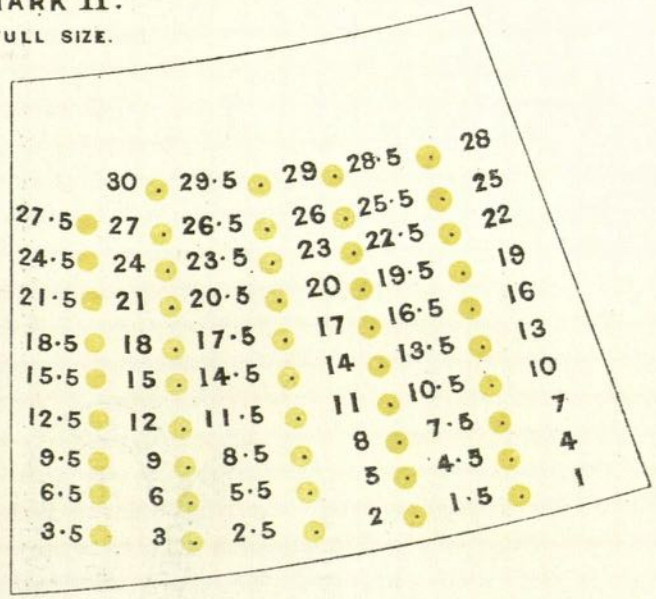
DANGERFIELD, LITH. 22, BEDFORD ST. COVENT GARDEN 3569.

FUZE, TIME, WOOD, BOXER, M.L. 15 SECONDS, WITH DETONATOR.

MARK II.

FULL SIZE.





FUZE, PERCUSSION, R.L. II.

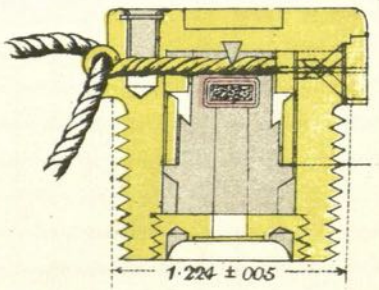


Plate IX.

DANGERFIELD LITH. 22, BEDFORD ST. COVENT GARDEN