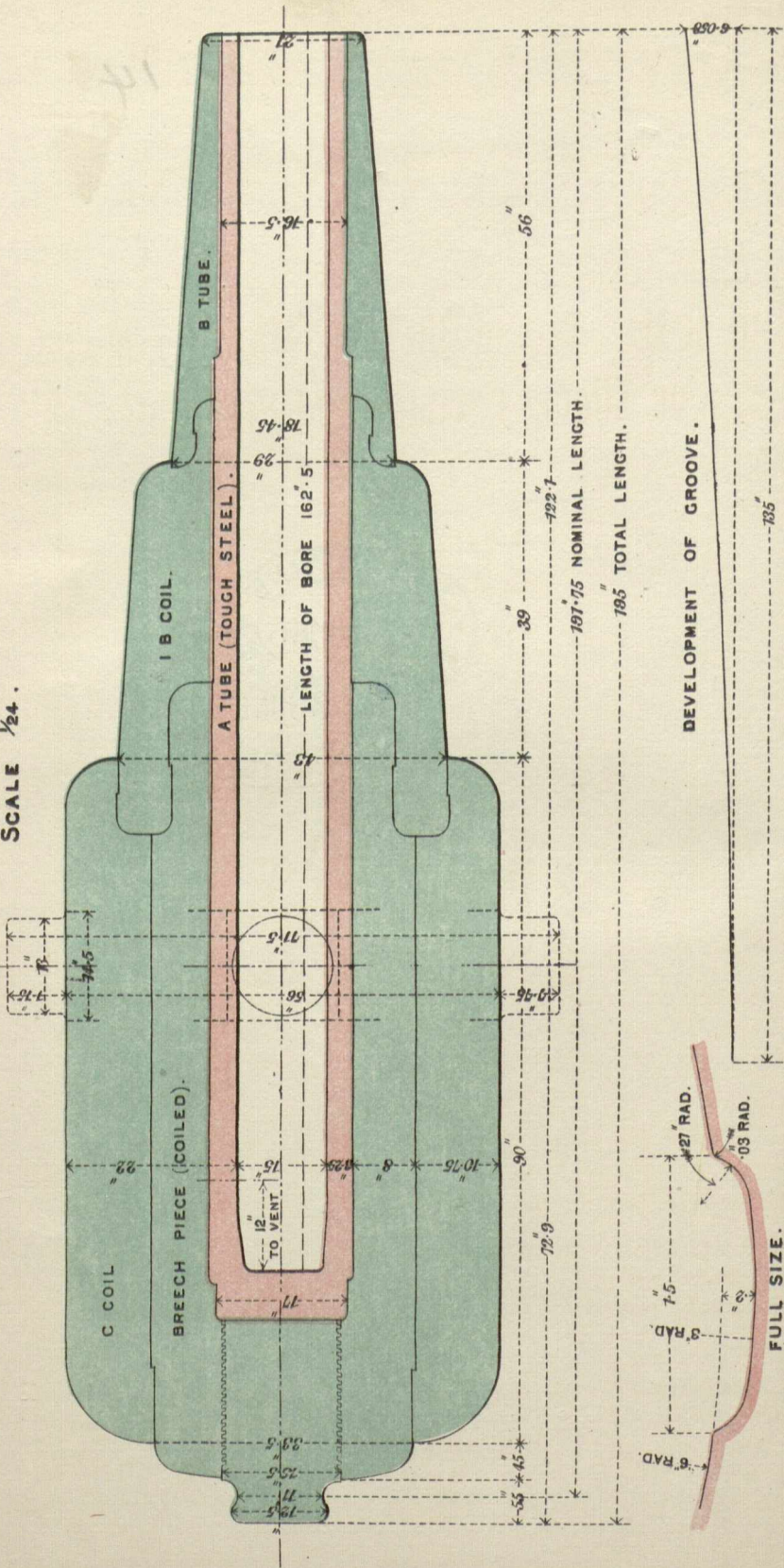


ORDNANCE, WROTH. IRON R. M. L. GUN 12 INCH 35 TONS. MARK I.

SCALE 1/24.



RIFLING.
AN INCREASING TWIST, FROM 0 AT BREECH
TO 1 TURN IN 35 CALIBRES AT MUZZLE.

FULL SIZE.
SECTION OF GROOVE
NO OF GROOVES-9.

14.

14

40185
1901.

6098

HANDBOOK

FOR THE

12-in. R.M.L. Gun of 35 Tons (Mark I.), Mounted on Sliding Carriage and Platform.

LAND SERVICE.

1884



By Authority.

LONDON:

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PLATES.

Gun		Frontispiece.	
Carriages and Platforms, Dwarf, Mark I.	{	two at Fort Carlisle	Plates I and II.
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GUN.

Mark I. (List of Changes § 2440).

Frontispiece.

Material	{ exterior	Wrought iron.	
	{ tube	....	....	....	....	Steel.
Weight, nominal	....	....	....	....	....	35 tons.
Preponderance	....	....	....	....	....	1 cwt. 1 qr.
Length, nominal	....	....	....	....	....	191.75 inches.
" of bore	....	....	....	....	....	162.5 "
Calibre	....	....	....	....	....	12.0 "
Capacity of bore	....	....	....	....	....	18586 cubic inches.
Rifling	{ system	....	....	....	....	Woolwich.
	{ length	....	....	....	....	135.5 inches.
	{ grooves	{ number	9
		{ depth2 inches.
		{ width	1.5 inches.
{ twist	....	....	....	....	....	Increasing 0 to 1 in 35.

The vent enters the bore at 12 inches from the bottom of the chamber, forming an angle of 45° with the vertical plane passing through the axis of the piece.

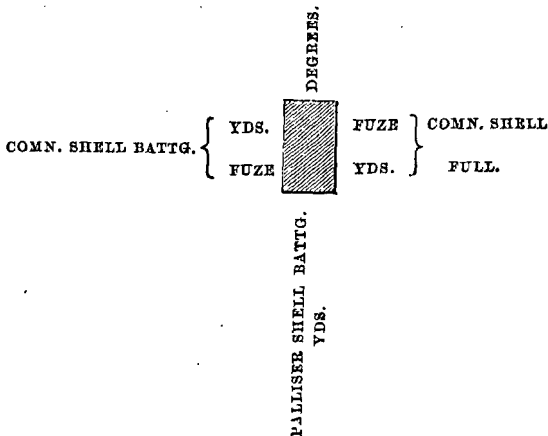
SIGHTS.

(List of Changes, § 2198.)

The gun is provided with six sights, viz. :—

Two tangent scale sights, one on each side and furnished with deflection leaves.

The bars are four-sided and marked as follows :



These sights are graduated from 0 to 10°.

One centre hind sight.—This sight is precisely the same as the tangent sights.

Two trunnion sights and one centre fore sight.—These sights are of drop pattern, and consist of a pillar and collar of gun metal, a steel leaf, and a small screw for fixing the leaf. The pillar and collar lock into a gun metal socket, which is permanently fixed in the gun, by means of a double bayonet joint.

CARRIAGE AND PLATFORM.*

Plates I. to IV.

Carriage, garrison, R.M.L., 12-inch, 35-ton, dwarf (Mark I.), iron, sliding, double plate, with gear.

Platform, R.M.L. 12-inch 35-ton, dwarf (Mark I.), iron, traversing, with gear).

Only dwarf mountings for this nature of gun have been made. They are arranged to fire over a 4 feet 3 inches parapet at 5° depression, and to allow of 10° elevation; the axis of the gun being 6 feet 0½ in. above the top surface of the outer edge of the racer.

The platform has attached to it a compression hydraulic buffer, the carriage having a bracket attached to the bottom plate for the buffer piston rod.

Weight of	{	carriage ....	....	....	....	....	113 cwt.
		platform....	....	....	....	....	185 cwt.

Carriage.

The carriage is of double plate construction, the brackets being formed of two plates of wrought iron, riveted to a framework of cast iron. The brackets are connected by three transoms; two near the front, and one at the rear; and strengthened by a pair of knee stays. The transoms and stays extending below the brackets form a well to the carriage, which is completed by the bottom plate, and by plates at the sides. The bottom plate does not extend to the rear transom. Its rear edge is strengthened by angle iron.

The parts of the carriage are:—

Elevating gear.	Rear roller jack.
Nipping gear.	Capsquares.
Compressor stop plates.	Clip plates.
Two front rollers (metal), with axles.	Rear step.
Two rear rollers (metal), with eccentric shaft.	

Elevating Gear.

Plate V.

This is spur wheel gear, and consists of a train of wheels and pinions on the right bracket of the carriage, worked by a hand wheel on the outside of the bracket. The elevating arc is rigidly attached to the gun by means of pivot pieces at the top and bottom. The gain of power in elevating is about 66 to 1.

Attached to a bearing on the bracket is a clamping arrangement, consisting of a bow or cramp, two friction pieces, and a screw with lever handle. The screw on being tightened, presses the friction pieces against the sides of the arc, and clamps it.

The outside of the arc is graduated. The graduations consist of alternate black and white spaces, each of which is numbered, and represents an angle of ten minutes, the graduations are inclined upwards for elevation, and downwards for depression. The spaces are subdivided across the arc, so that by means of a pointer fixed on the bracket of the clamp readings of two minutes can be obtained. The edge of the pointer is radial with the axis of the trunnions, and coincides with the zero of the arc, when the gun is horizontal.

NOTE.—The above describes the elevating gear on two carriages at Fort Westmoreland, and one at Fort Carlisle, Cork. In the two remaining carriages, one at each fort, the gear differs from that above described in the teeth of the arc, wheels, and pinions; and the method of graduation. The arc is graduated with two zero lines, one to be used for elevation, and one for depression.

*The 3 carriages and platforms on which the 35 ton guns are mounted in Fort Westmoreland, Cork, are of 38 ton pattern; the 3 35 ton mountings are at Fort San Rocco, Malta, with 38 ton guns mounted on them.

Nipping Gear

Is used to connect the carriage with the running back chains of the platforms.

It consists of a sprocket plate (or plate with projecting teeth), on each side, sliding through a slot in the bottom of the carriage. The two sprocket plates are joined by links to rocking levers, which are keyed on a short cross shaft, supported in bearings on the bottom plate. The rocking lever on the left side is connected, by means of a link with an eccentric, worked by a lever handle outside the left bracket of the carriage. This handle is fitted with a stud which catches in a pawl on the carriage, to keep it out of gear. A counterweight on the right rocking lever raises the sprocket plates from the chains, and throws them out of gear. The running back chains pass through brackets beneath the carriage, which hold them up to the sprocket plates when the latter are forced down.

Compressor Stop Plates

Are three plates suspended under the carriage, which, becoming jammed between the plates of the compressor stop on the platform, prevent the carriage running up after recoil.

NOTE.—Two carriages are not fitted with the compressor stop plates.

Running-up Gear

Consists of two front rollers, two rear rollers, on an eccentric shaft, and the hydraulic rear roller jack.

The front roller axles are held in metal eccentric bushes on the carriage, so that the rollers can be adjusted in their bearings when necessary.

The rear rollers run on an eccentric shaft, supported in bearings in each bracket. The shaft is fitted with a crank, to which the ram of the hydraulic jack is attached.

The jack used is the rear roller jack, common to 35 and 38 ton, and some naval carriages. It is marked left hand.

NOTE.—Right hand are only used in right hand turret carriages.

The jack is attached to the left side of the carriage by a trunnion, which is held in a metal bearing on the top of the carriage bracket. The ram is attached to the crank on the eccentric shaft. The spindle of the pump shaft passes through the end of the trunnion, and the lever handle fits on it outside.

The pump is double-acting, taking in fluid only at the up stroke (when the handle is forced to the front). In the down stroke, half the fluid is forced on to the ram, and the other half passes by a passage to the top of the plunger, which, in the following up stroke, is also forced on to the ram.

The release valve is internal, and is brought into action by pressing the handle beyond its ordinary stroke towards the rear. Care must be taken in raising the carriage on its rear rollers not to carry the lever too far to the rear, or lowering will commence.

NOTE.—In some of the jacks first issued the release valve was external.

Capsquares.

The capsquares are interchangeable and reversible on either side of the carriage. Each is secured by two French keys attached to the carriage.

Clip Plates.

These prevent the carriage jumping when the gun is fired. One is fitted on each side near the front, passing through a slot in the angle plates of the bottom of the carriage, and projecting under the top flange of the platform. Each clip is secured by one bolt passing through it and the bottom of the carriage.

It is necessary to see that these are attached before the gun is fired. They must be taken off before the carriage is dismounted.

Rear Step

Is a small step on the rear transom of the carriage, with a counterweight to cause it to remain folded against the rear transom, when out of use.

Traversing Platform.

The platform, of wrought iron, has the girders forming the sides, fish bellied in form.

Only dwarf "C" have been made. The platform allows of nominally 6 feet recoil ; (actually, when the gun is run up and front buffer compressed $1\frac{1}{2}$ inches, a recoil of 5 feet $10\frac{1}{2}$ inches is obtained). It is 15 feet 6 inches long, and has a slope of 4° towards the front.

The sides are connected by five transoms, a front top plate, and a rear bottom plate. A pivot plate is secured to the third and fourth transoms ; and block or flange plates are fixed under the sides to which are bolted the flanges for the trucks.

The front block plate is bent downwards to clear the buffer bracket on the carriage, and its rear edge is strengthened by angle iron.

The parts of the platform are—

Two front trucks.	A front buffer stop, with six spindles.
Two rear trucks.	Two rear buffer stops.
A hydraulic buffer.	Traversing gear.
Two side steps.	Running back gear.
Two rear steps.	Two snatch blocks.
Foot board.	A traversing pointer.
A compressor stop.	

Trucks.

The front trucks, which have two flanges, and the rear trucks, which have one only, are of wrought iron, bushed with gun metal, and coned to the angle due to their diameter and distance from the pivot. They are 2 feet diameter over the flanges.

Hydraulic Buffer.

A compression buffer is used to reduce the recoil. The cylinder is fixed at the rear of the platform. The end of the piston rod is secured to a bracket under the front of the carriage. When the carriage is run up, the piston is drawn to the front end of the cylinder, the oil passing behind it ; on recoil the piston is forced up the cylinder, the resistance to its passage by the oil checking the recoil. The oil passes from the rear to the front of the piston through holes in it, the size of which is fixed by the estimated velocity of the recoil ; the larger the charge the smaller the holes should be.

The following are the principal parts of the buffer :—

W. I. cylinder.	W. I. piston.
W. I. cap.	W. I. piston rod.
W. I. flange and cover, with nuts.	

The cylinder is 6 feet $6\frac{1}{2}$ inches long, about $\frac{3}{8}$ -inch thick, and 8.05 inches internal diameter, the cap is screwed upon and closes the rear end, while the flange is screwed upon the front. The cover has a hole in it, with a metal gland for securing the cotton packing round the piston rod. It is secured to the flange by seven bolts. Both the cover and the flange have a portion cut off on the upper side to admit of the carriage passing over them. The filling hole is at the rear of the cylinder on the upper surface, and is tightly closed by an iron screw plug with leather washer. A metal draw off cock is at the front of the buffer. It is screwed into the cover below the packing gland.

The piston is 8.04 inches in diameter and has four holes .65 inch diameter.

It is screwed on the piston rod, and secured by a set screw. The rod is 3 inches diameter, and fitted at the front end with two nuts, one on each side of the buffer bracket when it is secured to the carriage.

Working contents of buffer $11\frac{1}{2}$ gallons.

Traversing and Running back Gear.

The traversing and running back gear is worked by the same horizontal shaft under the rear of the platform, which is set in motion by two winch handles, working within the length of platform. This shaft has two pinions riding loosely upon it, a bevil pinion for the traversing gear, and a spur pinion for the running back gear. By means of a double clutch either pinion is made to revolve with the shaft. For traversing, the bevil pinion is connected with a longitudinal shaft, having at the front a large metal pinion,* which gears into a cast iron rack,* let into the floor of the work. For running back, the spur pinion gears into a spur wheel on another cross shaft behind it. This shaft has two sprocket wheels with teeth that fit into two endless chains, one at each side of the platform. These chains (to which the carriage can be attached when necessary) at the front, pass over plain wheels on adjusting forks, which are held in brackets, secured under the front block plates of the platform. For adjusting the forks and tightening the chains a special spanner is supplied, "Spanner socket tightening chain, with tommy," and a "Turn-screw, connecting chain," used for uniting the chains.

Clutch.—The double clutch on three platforms at Fort Westmoreland, consists of a series of discs or plates on the shaft, alternately of steel and gun metal. The former are circular in shape, and revolve with the shaft loosely inside recesses in the pinions; the latter are octagonal or of some similar form, so as to fit the recesses in the pinions, but ride loosely on the shaft. By means of the clutch lever the plates in either pinion are forced together and motion given to the pinion required.

The clutch lever is moved by means of a hand wheel, on the left side of the platform, through a screw shaft, with a nut, in the forked end of the front of the lever.

Indicator.—On the screw and behind the hand wheel is an indicator. This consists of a disc with a spiral groove on its face in which travels a pointer, sliding in a bracket on the side of the platform. The bracket is marked with the letters R, O, T, respectively, for "running back"; "out of gear"; and "traversing." When the hand wheel is turned to the left, (or towards the front of the platform), the spiral groove in the disc, as it revolves with the hand wheel, lowers the pointer to the position marked T, which shows that the gear is in readiness for traversing.

Special gear.—In the two platforms at Fort Carlisle, the traversing and running back gear differs from that described above only in the clutch. In each of these the bevil and spur pinions on the shaft, for traversing and running back respectively, are moved themselves by two forked levers, pivoted under the rear of the platform. The lever, acting on the bevil pinion (for traversing) is prolonged and formed into a handle, to work at the rear of the platform, and is fitted with a guide and pin to secure it in the position required. The other lever, acting on the spur pinion, is connected with the first one by a rod, which has a short slot at one end, so that one pinion may be fully out of gear, before the slot, which passes over a stud, causes the lever of the other to move.

These platforms have no indicator.

Side steps.—A removable wood step is suspended by hooks, on each side to staples bolted to the girder sides.

Rear steps.—A small wood step is bolted to the rear transom of the platform; and an iron step is also bolted to the same transom, placed so as to be about half-way between the wood step and the ground.

Compressor stop.—On the three platforms at Fort Westmoreland, is a compressor stop, consisting of four plates, an adjusting screw, and a compressor screw, with lever and catch, on the right side of the platform. It is fixed on the rear flange plate of the platform. It comes into action when the carriage

* The rack is similar to that for the 38-ton, but the traversing pinion is smaller in diameter owing to a difference in the height of the racers.

has recoiled 5 feet 2 inches, by jamming the plates hanging under the carriage and preventing the carriage running up after recoil. (See carriage.)

Front buffer stop.—This is fixed at the front of the platform, to prevent any injury to the carriage or platform in running up. It consists of an angle iron secured to the front top plate, a block of wood secured to the angle iron; and six india rubber rings with wrought iron spindles and split keys.

Rear buffer stops.—A rear buffer stop is fixed inside each girder side, near the rear, in such a position as to prevent any injury either to the bottom of the hydraulic buffer, or to the piston on recoil. Each consists of a powerful bracket fixed to the platform, to which is attached one ring of india rubber round a spindle, secured in the bracket by a split key.

Snatch blocks.—One is fixed on each side of the platform near the front, to lead the fall of the loading tackle in the direction required. It is attached by means of a shackle joint with nut and pin to a bracket secured to the outer flange of the girder.

Racers.—Are of steel of the same section and radius as for the 38-ton "C" platform. They are bevilled on the upper face to suit the trucks. In section solid, without flanges, they are tapered towards the top so as to allow the trucks to revolve freely without grinding.

Radius 5 feet 8 inches to centre of upper surface.

Traversing pointer.—Is of wrought iron, attached beneath the platform, on the right side, and points to a graduated metal arc for traversing, let into the floor of the work.

It is shown in the plate giving the platform at Fort Westmoreland.

INSTRUCTIONS FOR THE CARE AND PRESERVATION OF THE CARRIAGE AND PLATFORM.

The carriage must never be fired from, until it is seen, that the buffer piston-rod is attached to the bracket under the front of the carriage; that the hydraulic buffer is filled with the proper quantity of oil, and that the clip plates are on and secured. Before the carriage can be dismantled from the platform, the buffer must be disconnected, the clips removed, and the running back chains detached.

Hydraulic Buffer.

The buffer will be invariably kept on the platform filled with the proper quantity of oil; and when not required for immediate use, the piston rod will be disconnected from the carriage, and pressed home into the cylinder.

A "Spanner, hydraulic buffer, No. 5" is issued for loosening or tightening the packing gland of the buffer; and a "Spanner, hydraulic buffer, No. 6," for removing the screw plug, and turning or tightening the draw-off cock. A "Spanner, McMahan," is used for screwing and unscrewing the nuts and collars.

N.B. In all operations, such as connecting and disconnecting the piston rod of a buffer, care should be taken that the carriage is secured on the platform to prevent it running up suddenly.

Rear Roller-jack.

To fill the jack.—Remove the cover by taking out the four screws, and fill the jack with a mixture of water and methylated spirit, in the proportion of two of the former to one of the latter, to which has been added one ounce of common soda to the gallon. The mixture must be filtered into the jack through the "Filter, tin, jack, lifting hydraulic" (§ 3,794, List of Changes).

The jack must be cleaned out every three months, and the mixture passed through the filter when returning it to the reservoir.

Capacity of the jack, 4 quarts.

Running up Gear.

Should it be found that the gun is running up too quickly, lower the carriage off its rollers, by forcing the lever handle to the rear, and thereby releasing the jack; thus preventing the carriage running up too violently, and damaging the elevating gear. This should be done after the carriage has moved forward about 18 inches.

Elevating Gear.

Should the position of the clamp handle elevating gear be found inconvenient when the arc is clamped, it can be adjusted by removing the split key and handle, placing the latter in a new position on the hexagon of the screw, and replacing the key.

Running back Gear

Should the running back chains not be in a position suitable for the engagement of the sprocket plates in the nipping gear, move the chains slowly by the winch handles, at the same time pressing the nipping lever on the carriage steadily up, until the teeth catch in the chains.

The letters T and R merely indicate the direction in which to turn the hand wheel. The amount of turning should be only such as will set the clutch and prevent any slip. After the clutch is engaged and movement commences it should be eased off to lessen the end thrust.

Care should be taken that no oil or grease is upon the plates of the disc-clutch, and that they are free from dirt and rust.

The clutch-lever has a band with trunnions, which is provided with a lubricating hole. This should be filled with oil.

To put on the running back chains.—These should be put on before the gun is mounted.

Pass each chain round one of the plain wheels in the adjusting fork, through the bracket of the nipping gear under the carriage, round the rear sprocket wheel, and over the guide roller. Connect the ends by the screw-pin, using the "Turnscrew, connecting chain, 35 and 38 ton platform."

When connected, the chain can be tightened by the adjusting fork, under the front block plate, using the special spanner, for that purpose.

Note. The running back chains must be detached from the carriage before the latter can be dismantled.

Front roller.—The carriage rollers should revolve freely upon their axles, and only take a bearing on the platform when the eccentric is thrown into gear. The eccentric not being in action, the front rollers have a clearance of .03 inch, and the rear of .1 inch, which is a very small amount, and consequently should the axles of the front rollers become slightly bent, the carriage in running up, instead of moving on its rollers, will slide. Hence, it follows that the straightness of the axles should be attended to.

Front buffers.—The faces of the buffer blocks upon the carriage and platform should be parallel one to the other, or else the spindles of the buffers are liable to be twisted.

Lubrication.

The carriage should be moved once a week on the platform. Should there be any rust on the bearing surfaces of either carriage or platform, it must be removed, and the surfaces slightly oiled.

Traversing gear should be worked once a week to test its condition, and also that the position of the platform on the racers may be changed. The cog-wheels should be preserved from rust by the use of grease.

All nuts must be kept tightened up, and care must be taken that none of the loose parts become indented by being thrown down, or, by striking one against another, or with a hammer; no hammer should be used in putting on the loose parts.

Should a screw go very tight it must be withdrawn and examined

and if it is found that the bearing or screw has been indented, the burr must be carefully removed with a file.

Before the platform and carriage are used, all the lubricating screws should be taken out, the holes filled with oil, and the screws replaced. Some of the screws are under the foot-boards inside the rear of the platform, by taking out the key of the left buffer spindle, removing the spindle and india rubber ring, the boards can be lifted out and the lubricating screws taken out for oiling. They must then be replaced as well as the boards and buffer spindle.

Special care should be taken that all bearings, working and frictional parts, are properly cleaned, lubricated, and kept free from clotted oil, rust, and dirt; also, that when oil is poured into the lubricating holes, it reaches and lubricates the bearings; this can be seen by observing that the oil shows on the shaft at each end of the bearing. The discs of the clutch should not be oiled, but the clutch lever band should be.

Should the lubricating hole be stopped up, it must be carefully cleaned out with a piece of pointed wire, until it is found that the oil reaches and fully lubricates the bearing.

N.B.—In all letters or reports with reference to gear on carriages and platforms, their Register numbers should be quoted.

PROJECTILES.

Plates VI. to VIII.

Studded.

		lb.	oz.
Shells	Palliser (Mark IV) (List of Changes § 3560)	empty	688 5
		bursting charge	9 14
		filled with nut-plug and gas-check	712 13
	common (List of Changes § 3378)	empty	573 3
		bursting charge	40 0
		filled with nut-plug and gas-check	630 12
	Shrapnel (List of Changes § 3377)	with 368-4oz., or 453-3½oz. sand shot.. .. .	610 6
		bursting charge	1 15
		filled	612 8
		weight	11 14
nut		1 1	
plug	3 2		
Gas-check, Mark II, (List of Changes § 3863)			

Studless.

Shells	Palliser (List of Changes § 4141)	empty	676 6
		bursting charge	7 4
		filled with gas-check	714 0
	common (List of Changes § 4141)	empty	670 4
		bursting charge	27 4
		filled with gas-check	714 0
Shrapnel (List of Changes § 4116)	empty	579 4	
	bursting charge	2 0½	
	filled with 322-4 oz. sand shot, with gas-check	714 0	

Shot case (List of Changes § 4083)	filled with	258-8 oz. sand shot, clay	246 6
Gas-check, automatic, Mark I (List of Changes § 4141).	and sand .. .. .	.. .. .	14 6

FUZES.

(List of Changes § 4434.)

Plates IX. and X.

*Percussion, Pettman, G.S., for common shell.
Time, Wood, Boxer, 15 secs., M.L., for Shrapnel shell.

INSTRUCTIONS FOR THE PREPARATION OF SHELLS AND
FUZES AND EXAMINATION OF FILLED SHELLS.*See Clause 160, Army Circulars, 1881.*

Fixing Gas-Checks.

Projectiles fitted with Plug and Nut.

Unscrew the nut and remove it, then apply the "Wrench, removing base plugs" to the gas-check plug, and screw it well up in the direction of the arrow to ensure its being well home.

When unscrewing the nut, if there is any tendency for the plug to unscrew also, the "Wrench, removing base plugs" should be at once applied to the head of the plug and turned in the direction of the arrow, at the same time as the nut is being turned in the opposite direction.

Place the gas-check on the base of the projectile, with the concave, or unpainted side, next the base, then screw the nut on to the end of the plug with the "Spanner, gas-check nuts." With Mark I, gas-check, plug and nut, the nut must bind against the gas-check. With Mark II, gas-check, plug and nut, the nut will be screwed down to the shoulder on the plug.

Filling and Securing Shells.

Shells, R.M.L., Common, Studded.

Remove the plug from the fuze-hole, place the filling rod in the bag, insert it through the fuze-hole, taking care not to force the end of the rod through the bottom of the bag; carefully push in the bag until the neck only is in the fuze-hole, a portion being kept outside, as the whole bag must not be allowed to slip into the shell during the operation of filling; then withdraw the rod and insert the funnel in the neck of the bag, pressing the funnel well down into the fuze-hole; pass the filling-rod down through the funnel and gradually pour in two or three pounds of powder; take out the funnel and rod, lift up the bag and jerk it, so as to "set" the powder well down to the bottom and to open the bag. Then re-insert the funnel and rod as before and continue the filling.

The filling rod should be moved up and down to facilitate the passage of the powder through the funnel; the powder in the shell being pressed on at the same time. The powder should be firmly pressed upon all over, but the rod should not be forced against the bag; a steady pressure is necessary to fill the shell, and this should be frequently applied, no great amount of force being used. The use of a large mallet against the side of the shell (or any piece of wood that would answer the same purpose) will materially assist in getting as much powder as possible into the shell.

When the shell is quite full, withdraw the funnel and filling rod and tie the neck of the bag with a reef knot of twine close to the top of the fuze-hole. Cut off the superfluous choke and push the neck of the bag well down, and to one side of the fuze-hole; then screw in the fuze or plug as required.

When the shell is to be fuzed with a time fuze it must not be quite filled with powder, but sufficient space must be left for the insertion of the fuze when the choke of the bag is pushed in. No preparation of the bag, by pricking or otherwise, is necessary.

* Not set in action by the full charge.

Shells, R.M.L., Palliser, Studded.

The shell will be placed upon its point, which may be inserted in a block of wood hollowed for the purpose, or in any convenient place to steady it. No special pattern of block is necessary; it can be provided on the spot and the recess cut by any carpenter.

Pass the "Holder, shell, Palliser" over the base until it rests on the rear studs, then, whilst it is held firmly by another man, unscrew the nut with the "Spanner, gas-check nuts," remove the gas-check if it has already been fixed, and then unscrew the gas-check plug with the "Wrench, removing base plugs."

Thoroughly clean the screw-thread of the plug-hole with a piece of cotton waste or rag.

Insert the bag for bursting charge, and fill the shell as directed for the larger natures of common shell.

Before replacing the plug, any grains of powder or grit adhering to either screw must be thoroughly removed, and the screw-threads lubricated.

Insert the gas-check plug and screw it well home with the "Wrench, removing base plugs."

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 screwdriver, screw it tightly into the tube, and then screw in the fuze or plug as may be required.

Shell, R.M.L., Palliser, Studless.

The shell will be placed on its point, which may be inserted in a block of wood hollowed for the purpose, or in any convenient place to steady it. The base plug is then removed by means of the "Wrench, removing base plugs." If the plug is set firm in the shell it will be necessary to pass a selvagee round the projectile, and put a stick through the bight to steady it. Thoroughly clean the screw-thread in the base of the shell with a piece of cotton waste or rag, insert the bag for bursting charge, and proceed as with common studded shell. When the shell is quite full, tie the mouth of the bag, push it in clear of the plug-hole, remove any powder or grit from the screw threads, and lubricate them; then firmly screw in the base plug.

The gas-check may be fastened on to the shell by "nicking" with a chisel and hammer so as to cause small portions of the inner wall of the gas-check to protrude into the groove round the projection of the base of the projectile, or it may be loaded separately, the painted side towards the powder charge.

Shell, R.M.L., Common, Studless.

These shells are filled in the same manner as the Palliser studless, *i.e.*, through the base; the bags have a red shalloon nose to enable the flame from the fuze to reach the powder more easily. This red shalloon nose must be placed next the fuze-hole, and care must be taken not to push it into the fuze-hole so as to prevent the firing of the fuze. The gas-check is the same as for the Palliser shell.

N.B.—*In handling studless shells great care must be taken not to injure the projecting rim at the base.*

Fixing Plugs and Fuzes.

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

Palliser and other 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 their plugs unscrewed once at least every six months, 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, removing base plugs of Palliser shells." The "Key, iron, fuze and plug, G.S.," and the "Key, iron, plug, G.S.," are the only implements which should be used for screwing in the G.S. plug.

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.

Storage of Filled Shells in Charge of the Royal Artillery.

Shells in charge of the Royal Artillery which are kept filled will have the gas-checks fitted before being placed in the shell store.

In storing the shells, they are to be placed on their bases, resting on the gas-check plugs, and being prevented from falling over by two pieces of wood 9-inch by 1-inch square, placed one on each side of the nut.

Preparing Fuzes.

Fuzes, time, wood.

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 not to press upon the fuze so as to prevent 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 on 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.

When using the gimlet borer, hold the fuze in the hollow of the hand, insert the borer into the side hole, pressing it in perpendicular to the axis of the fuze; when it has reached the bottom of the hole, use it as a gimlet to complete the communication with the composition, boring up to the handle, then pull the borer straight out.

Fixing Fuzes.

Fuzes, Percussion, Pettman, G.S.

These fuzes require no preparation, they are simply screwed firmly into the fuze holes by means of the "Key, iron, fuze, and plug, G.S."

Fuzes, Time, Wood, 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 (with the smaller natures of shell) 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. The 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 gun-cotton round it, bringing the ends of the priming between the strands of gun-cotton; 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.

Extracting Wood Fuzes.

Fuzes for Rifled Ordnance.

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 filled with Loose Powder in Serge Bags.

Remove the plug. Draw out the neck of the serge bag by means of the metal hook, untie the twine round the neck of the bag. If the powder is in a serviceable condition, tie up the neck of the bag again, and proceed as directed in the instructions for filling. If the powder is caked from the effects of damp, empty the shell (this requires careful manipulation); up-end the shell as required; insert the filling rod or any suitable sized piece of brass wire so as to facilitate the exit of the powder, and to prevent the bag from doubling up, &c., until the whole of the powder is extracted. Take out the bag, and if it is in a serviceable condition, replace it in the shell, if not, insert a new bag, and refill with serviceable powder.

If means are available, a wooden horse placed over the open mouth of an empty powder-barrel should be used when emptying shells by up-ending them, and a piece of metal tubing, or a piece of sheet copper rolled up into a tube as large in diameter as can be inserted through the neck of the bag, will greatly facilitate the extraction of the powder.

Shrapnel Shells.

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.

140 lb. P² (in $\frac{1}{4}$ charges), 110 lb. P, and 85 lb. P².
The cartridges are of silk cloth.

Directions for Making up Cartridges.

See Clause 155, Army Circular, 1883.

Care will be taken to see that the cartridge bags are properly dried 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 which are made up without sticks will be choked by drawing together the mouth of the cartridge into several pleats with a brass needle, threaded with three strands of worsted for serge cartridges, or with silk twist for silk cloth cartridges, the

silk twist being doubled; after drawing together the mouth of the cartridge, the choke thus formed will be temporarily secured by taking two turns round it, the becket drawn tightly in on both sides, then three turns will be taken round the choke, the needle passed through the choke and becket five times, making four securing stitches. The becket form a loop about $3\frac{1}{2}$ inches in length over the choke. The cartridges will be made up to their proper lengths and diameters by means of the hoops, which should be drawn tight, so as to make a firm cartridge.

Hooping—

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 loop 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.

Marking Filled Cartridges.

All cartridges issued from store filled will have the initial or monogram of the station at which they are filled stamped on the bottom end.

The cartridges filled by the Royal Artillery will be distinguished by having no initial letter stamped on them. This order does not apply to cartridges filled by working parties of Royal Artillery for the Ordnance Store Department (*see* § 3564, "List of Changes in War Material, &c.").

The following initials and monograms will be used at the several stations mentioned:—

Home Stations.

Alderney	A	Dublin	DN	Pembroke	P
Aldershot	A	Edinburgh	E	Sheerness	S
Chatham	C	Fort George	G	Tynemouth	T
Chester	HC	Gosport	G	Upnor	U
Cork	CC	Guernsey	CG	Woolwich	W
Devonport	D	Harwich	H		
Dover	VR	Jersey	J		

Finished Cartridges.

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

Drill Cartridges.

Drill cartridges are a special manufacture and issued complete. They are of wood covered with raw hide, made to the shape of the cartridges they represent, the latest patterns of the most of them being also made to the same weights as the service cartridges.

Method of Firing.

Friction Tube.

(§ 4033. List of Changes.)

The tube is of copper, five inches in length, and has the friction bar placed vertically in the direction of its breadth. It is fired by means of a lanyard.

RANGE TABLE FOR 12-INCH R.M.L. GUN OF 35 TONS.

Charge, 140 lb. P² powder.
 Projectile, studded Palliser shell, with gas-check, Mark II. (with projections), 714 lb.
 Muzzle velocity = 1390 f.s.
 Based on practice of 13. 2. 80. and 3. 3. 80.

Range.	Elevation.	Angle of descent.	Remain- ing velocity.	5 minutes' elevation increases or decreases the range by	5 minutes will alter point of impact, vertically or laterally, at each range.	50 per cent. of rounds should fall within			Time of flight.	Dangerous zone for a flight of 20 feet.		Penetration of wrought-iron armour plate.
						Length.	Breadth.	Height.		From target.	yards, whole range.		inches.
yards.	° /	° /	f.s.	yards.	yards.	yards.	yards.	yards.	seconds.	yards.	inches.	
100	..	..	1378	..	..	..	..	..	..	..	15.9	15.7
200	..	..	1366	..	..	..	..	..	0.66	..	15.5	15.5
300	0 9	0 38	1354	50.0	0.43	4.1	0.14	..	0.87	..	15.4	15.4
400	0 19	0 48	1342	50.0	0.58	5.3	0.18	..	..	..	15.2	15.2
500	0 29	0 58	1330	50.0	0.72	6.4	0.22	0.11	1.08	..	15.1	15.1
600	0 39	1 8	1319	50.0	0.87	7.5	0.27	0.15	1.29	..	14.9	14.9
700	0 49	1 18	1308	50.0	1.01	8.6	0.32	0.20	1.50	290	14.8	14.8
800	0 59	1 28	1297	50.0	1.16	9.7	0.37	0.25	1.71	258	14.6	14.6
900	1 9	1 38	1286	50.0	1.31	10.7	0.42	0.30	1.92	230	14.5	14.5
1000	1 19	1 48	1275	50.0	1.45	11.7	0.47	0.36	2.13	209	14.3	14.3
1100	1 29	1 58	1264	50.0	1.60	12.6	0.52	0.43	2.35	191	14.2	14.2
1200	1 39	2 8	1253	50.0	1.74	13.5	0.57	0.50	2.57	176	14.1	14.1
1300	1 49	2 18	1243	50.0	1.89	14.4	0.62	0.58	2.79	164	13.9	13.9
1400	1 59	2 28	1233	50.0	2.03	15.3	0.67	0.66	3.01	154	13.8	13.8
1500	2 9	2 38	1223	45.4	2.18	16.2	0.72	0.74	3.23	144	13.7	13.7
1600	2 20	2 48	1213	45.4	2.32	17.0	0.77	0.83	3.45	135	13.5	13.5
1700	2 31	2 59	1203	45.4	2.47	17.8	0.82	0.93	3.67	126	13.4	13.4
1800	2 42	3 10	1194	45.4	2.61	18.6	0.87	1.03	3.89	119	13.3	13.3
1900	2 53	3 21	1185	45.4	2.76	19.4	0.92	1.13	4.11	112	13.2	13.2
2000	3 4	3 32	1176	45.4	2.91	20.1	0.97	1.24	4.33	106	13.1	13.1
2100	3 15	3 43	1167	45.4	3.05	20.8	1.02	1.35	4.55	101	13.0	13.0
2200	3 26	3 54	1158	45.4	3.20	21.5	1.07	1.47	4.77	96	12.9	12.9
2300	3 37	4 5	1149	45.4	3.34	22.2	1.12	1.60	4.99	92		

2400	3	48	4	16	1140	45.4	3.49	22.9	1.17	1.73	5.21	88	12.7
2500	3	59	4	27	1132	45.4	3.63	23.6	1.22	1.86	5.43	84	12.6
2600	4	10	4	39	1124	45.4	3.78	24.3	1.27	2.00	5.65	81	12.5
2700	4	21	4	51	1116	45.4	3.92	25.0	1.32	2.14	5.87	78	12.4
2800	4	32	5	3	1108	45.4	4.07	25.6	1.38	2.28	6.09	75	12.3
2900	4	43	5	16	1100	45.4	4.21	26.2	1.44	2.43	6.32	72	12.2
3000	4	54	5	29	1092	45.4	4.36	26.8	1.50	2.59	6.55	69	12.1
3100	5	5	5	42	1085	45.4	4.51	27.4	1.56	2.76	6.78	66	12.0
3200	5	16	5	56	1078	45.4	4.65	28.0	1.62	2.93	7.02	63	11.9
3300	5	27	6	10	1071	45.4	4.80	28.6	1.68	3.11	7.26	61	11.9
3400	5	38	6	24	1064	45.4	4.94	29.2	1.74	3.30	7.50	58	11.8
3500	5	49	6	39	1057	45.4	5.09	29.8	1.80	3.50	7.75	56	11.7
3600	6	0	6	54	1051	41.6	5.23	30.4	1.86	3.71	8.00	54	11.7
3700	6	12	7	9	1045	41.6	5.38	31.0	1.92	4.15	8.25	52	11.6
3800	6	24	7	25	1040	41.6	5.52	31.6	1.98	4.40	8.50	50	11.5
3900	6	36	7	42	1035	41.6	5.67	32.2	2.04	4.65	8.77	48	11.4
4000	6	48	8	0	1030	41.6	5.81	32.7	2.10	4.90	9.06	47	11.4
4100	7	0	8	20	1025	41.6	5.96	33.2	3.16	4.90	9.35	45	11.3
4200	7	12	8	42	1020	38.5	6.11	33.7	2.22	5.18	9.64	43	11.3
4300	7	25	9	4	1015	38.5	6.25	34.2	2.28	5.48	9.93	41	11.2
4400	7	38	9	27	1010	38.5	6.40	34.7	2.34	5.80	10.23	39	11.1
4500	7	51	9	52	1005	35.7	6.54	35.2	2.40	6.15	10.53	38	11.1
4600	8	5	10	18	1000	35.7	6.69	35.7	2.47	6.55	10.85	36	11.0
4700	8	19	10	45	995	35.7	6.84	36.2	2.54	6.95	11.17	35	11.0
4800	8	33	11	12	990	33.3	7.13	36.7	2.61	7.35	11.50	33	10.9
4900	8	48	11	39	986	33.3	7.27	37.2	2.68	7.75	11.85	32	10.9
5000	9	3	12	9	982	33.3	7.42	37.7	2.75	8.20	12.22	30	10.8
5100	9	18	12	39	978	31.2	7.56	38.2	2.83	8.65	12.60	29	10.7
5200	9	34	13	10	974	31.2	7.71	38.6	2.91	9.10	13.00	28	10.7
5300	9	50	13	42	970	29.4	7.85	39.0	2.99	9.60	13.42	27	10.6
5400	10	7	14	18	966	27.7	8.00	39.4	3.07	10.10	13.88	26	10.6
5500	10	25	14	57	962	27.7	8.14	39.8	3.18	10.65	14.37	24	10.5
5600	10	43	15	36	958	26.3	8.29	40.2	3.30	11.25	14.90	23	10.4
5700	11	2	16	18	954	25.0	8.43	40.6	3.44	11.90	15.46	22	10.4
5800	11	22	17	9	950	25.0	8.58	41.0	3.58	12.60	16.10	21	10.3
5900	11	42	18	6	946	23.8	8.73	41.4	3.74	13.60	16.18	20	10.3
6000	12	3	20	9	942	23.8	8.87	41.8	3.94	15.40	17.55	18	10.2

RANGE TABLE FOR 12-INCH R.M.L. GUN OF 35 TONS.

Charge, 110 lbs. P.

Projectile, 714 lb.

Range.	Elevation.	Remaining velocity.	Time of flight.	Penetration.
yards.	° ' "	f. s.	seconds.	inches.
0	0 ..	1,300	..	..
100	0 10	..	0·25	..
200	0 19	..	0·47	..
300	0 28	..	0·69	..
400	0 37	..	0·91	..
500	0 46	..	1·14	..
600	0 55	..	1·37	..
700	1 4	..	1·60	..
800	1 14	..	1·83	..
900	1 24	..	2·06	..
1,000	1 34	1,264	2·29	14·1
1,100	1 44	..	2·52	..
1,200	1 54	..	2·76	..
1,300	2 4	..	3·00	..
1,400	2 15	..	3·24	..
1,500	2 26	1,246	3·48	13·9
1,600	2 37	..	3·72	..
1,700	2 48	..	3·96	..
1,800	2 59	..	4·20	..
1,900	3 10	..	4·44	..
2,000	3 21	1,229	4·69	13·8
2,100	3 32	..	4·95	..
2,200	3 43	..	5·21	..
2,300	3 54	..	5·48	..
2,400	4 5	..	5·76	..
2,500	4 16	1,212	6·04	13·5
2,600	4 28	..	6·32	..
2,700	4 40	..	6·60	..
2,800	4 52	..	6·88	..
2,900	5 4	..	7·17	..
3,000	5 16	1,196	7·46	13·3
3,100	5 28	..	7·75	..
3,200	5 40	..	8·04	..
3,300	5 52	..	8·33	..
3,400	6 4	..	8·62	..
3,500	6 16	1,181	8·91	13·2
3,600	6 28	..	9·20	..
3,700	6 40	..	9·49	..
3,800	6 52	..	9·78	..
3,900	7 4	..	10·07	..
4,000	7 17	1,165	10·36	12·9

RANGE TABLE FOR 12-INCH R.M.L. GUN OF 35 TONS.

Charge, 85 lb. P. powder.

Projectile, studded common shell, with gas-check, Mark I. (without projections), 629 lb.

Muzzle velocity = 1294 f.s.

Based on practice of 15. 9. 79.

Range.	Elevation.		Angle of descent.		Remaining velocity.	5 minutes' elevation in-creases or decreases the range by	5 minutes will alter point of impact, vertically or laterally, at each range.	50 per cent. of rounds fired should fall within			Time of flight.	Dangerous zone for a height of 20 feet.	
								Length.	Breadth.	Height.		From target.	yards.
yards.	°	'	°	'	f.s.	yards.	yards.	yards.	yards.	yards.	secs.	yards.	
300	0	10	0	22	1258	42.5	0.43	0.9	0.11	0.00	0.75	} whole range.	
400	0	22	0	38	1246	42.1	0.58	1.2	0.15	0.01	0.99		
500	0	34	0	50	1234	41.8	0.72	1.6	0.19	0.02	1.23		
600	0	46	1	10	1223	41.4	0.87	2.0	0.23	0.04	1.47		290
700	0	58	1	25	1212	41.0	1.01	2.5	0.28	0.06	1.71	259	
800	1	10	1	37	1201	40.7	1.16	3.0	0.33	0.08	1.95	229	
900	1	22	1	51	1190	40.4	1.31	3.6	0.38	0.11	2.19	204	
1000	1	34	2	4	1179	40.1	1.45	4.3	0.43	0.15	2.43	184	
1100	1	46	2	16	1169	39.8	1.60	5.1	0.48	0.19	2.69	164	
1200	1	58	2	32	1159	39.5	1.74	6.0	0.53	0.26	2.95	149	
1300	2	10	2	44	1149	39.2	1.89	7.0	0.59	0.32	3.21	135	
1400	2	22	2	58	1139	38.8	2.03	8.0	0.65	0.41	3.48	125	
1500	2	34	3	12	1129	38.5	2.18	9.1	0.71	0.50	3.75	117	
1600	2	47	3	27	1120	38.3	2.32	10.3	0.77	0.62	4.02	110	
1700	3	0	3	43	1111	38.1	2.47	11.6	0.83	0.75	4.29	103	
1800	3	13	3	56	1102	37.9	2.61	13.0	0.90	0.89	4.56	97	
1900	3	26	4	14	1093	37.7	2.76	14.5	0.97	1.07	4.83	91	
2000	3	39	4	25	1084	37.5	2.91	16.0	1.04	1.24	5.10	85	
2100	3	52	4	39	1076	37.3	3.05	17.5	1.10	1.43	5.39	81	
2200	4	5	4	55	1068	37.1	3.20	19.0	1.18	1.62	5.68	77	
2300	4	18	5	10	1061	36.9	3.34	20.5	1.25	1.86	5.97	73	
2400	4	31	5	27	1054	36.7	3.49	22.0	1.32	2.10	6.26	69	
2500	4	44	5	40	1047	36.5	3.63	23.5	1.40	2.33	6.55	66	
2600	4	57	5	54	1041	36.4	3.78	25.0	1.48	2.58	6.83	63	
2700	5	10	6	8	1035	36.3	3.92	27.0	1.56	2.91	7.11	61	
2800	5	23	6	23	1029	36.2	4.07	29.0	1.65	3.26	7.39	59	
2900	5	36	6	35	1023	36.1	4.21	31.0	1.75	3.60	7.67	57	
3000	5	49	6	50	1018	36.0	4.36	33.0	1.85	4.00	7.95	55	
3100	6	2	6	59	1012	35.9	4.51	35.0	1.95	4.31	8.26	53	
3200	6	15	7	23	1007	35.8	4.65	37.0	2.05	4.83	8.57	51	
3300	6	28	7	39	1002	35.7	4.80	39.0	2.15	5.28	8.88	49	
3400	6	41	7	55	997	35.6	4.94	41.0	2.25	5.75	9.19	47	
3500	6	54	8	9	992	35.5	5.09	43.2	2.35	6.20	9.50	45	
3600	7	7	8	22	987	35.4	5.23	45.5	2.45	6.73	9.81	44	
3700	7	21	8	45	982	34.6	5.38	47.7	2.55	7.44	10.12	42	
3800	7	35	9	14	977	33.9	5.52	50.0	2.65	8.16	10.43	40	
3900	7	49	9	37	972	33.2	5.67	52.2	2.76	8.92	10.74	38	
4000	8	4	10	9	967	32.5	5.81	54.5	2.87	9.80	11.05	36	
4100	8	19	10	37	962	31.8	5.96	58.0	2.98	10.78	11.65	34	
4200	8	34	11	0	957	31.2	6.11	59.5	3.10	11.60	11.95	33	
4300	8	50	11	23	952	30.8	6.25	62.0	3.22	12.63	12.26	32	
4400	9	6	11	50	947	30.4	6.40	64.5	3.34	13.64	12.57	31	
4500	9	22	12	15	943	30.0	6.54	67.0	3.48	14.70	12.88	30	
4600	9	38	12	35	939	29.7	6.69	69.5	3.63	15.80	13.09	29	
4700	9	54	12	55	935	29.4	6.83	70.2	3.78	16.33	13.20	28	

DRILL WITH GUN ON A DWARF TRAVERSING PLATFORM.

The Detachment consists of 17 Nos., and falls in two deep.

To Tell Off.

Officer.

No. 1.

Tell off.

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

The detachment is marched into the casemate and halted in line, facing the shield, and to the left rear of the platform. The detachment is now in the position of "detachment rear."

To take Post under Cover.

Officer.

No. 1.

Take post under cover.

*Right turn.
Double march.*

The detachment, stepping off, wheels to its left at the left corner of the platform, the front rank filing to the left of the gun, the rear rank to the right; 2 and 3 halting close to the shield, and the rear port, 4 and 5 forming upon their right and left; 12 on the right of 4, the whole turning to the right-about together. No. 1 follows in rear of the detachment, keeping under cover as much as possible; 6 and 11 go to the head of the cartridge lift; 7 and 9 to the head of the shell lift; 8 and 14 to the cartridge store; 17 to the foot of the cartridge lift; 10 and 13 to the shell store; 15 to the foot of the shell lift; 16 goes under cover outside 12.

General Duties.

No. 1 commands, directs, or superintends the boring and fixing fuzes, assists (if required) to raise projectile, attends to valve lever of running up jack, and lays, attends to indicator.

No. 2 searches, sponges, assists 3 with cartridge, steadies, and guides projectile in raising, rams home, assists 12 to attend to mantlet, and elevates.

No. 3 searches, sponges, loads, hooks, and unhooks hoisting tackle, steadies and guides projectile in raising, uncaps fuze when in bore, attends to port bar, rams home, pumps the running-up jacket, and assists 11 to attend to mantlet.

No. 4 attends to side arms and supplies them to 2, rams home, and traverses.

No. 5 supplies wedge wads, raises projectile, rams home, attends to snatch block, traverses, and attends to lever of chain nipping gear.

No. 6 supplies cartridge to 3, raises projectile, and rams home.

No. 7 attends to fuzes, brings up projectile, raises it, and rams home.

No. 8 attends to cartridge store and serves out cartridges.

No. 9 assists 7, raises projectile, and removes empty barrow.

No. 10 attends to shell store.

No. 11 supplies 3 with cartridge, raises projectile, rams home, attends to mantlet, and traverses.

No. 12 rams home, attends to mantlet, and traverses. Attends to compressor stop.

Nos. 13 and 15 supply shells to the lift from the shell store.

Nos. 14 and 17 supply cartridges to the lift from the cartridge store.
 No. 16 assists 4 with side arms, rams home, attends to vent, makes ready, and fires.

To prepare for Action.

Officer.

Prepare for action.

No. 1.

*Prepare for action.
 Examine gun.*

"Prepare for action."—No. 1 provides and fixes sights.
 No. 2, elevating wheel, and assists 4 with side arms.
 No. 3, hoisting tackle, consisting of double and treble blocks, and handle of running-up jack. He removes the muzzle tampeon.
 No. 4, side arms.
 No. 5, wedge wads and two traversing handles.
 No. 6, cartridge cylinder and dummy cartridge for drill purposes, bucket filled, and brush, and two wood cartridge bearers, for use if required.
 No. 7, fuzes, fuze and shell implements, and selvagee for slinging projectile. He obtains the fuze boxes from 10, satisfying himself as to correctness of fuzes and fuze implements.
 No. 8 goes to the cartridge store and prepares to issue cartridges.
 No. 9, transporting barrow and a brush.
 No. 10 goes to the shell store and prepares to issue shells, tubes, and fuzes. He examines the shells carefully, cleaning them if necessary, and removing burrs from studs; he loosens the fuze hole plugs of shells that will be first issued.
 No. 11 cartridge cylinder and dummy cartridge for drill purposes, brings up rammer ropes when fitted with spring clips.
 No. 12 assists 4 with side arms.
 Nos. 13 and 15 go to the shell store.
 Nos. 14 and 17 to the cartridge store.
 No. 16 provides tubes in box, lanyard, pricker, and vent server.
 Nos. 8 and 10 satisfy themselves that the lamps in the ammunition stores are burning brightly.
 Nos. 13 and 14 that the hoisting gear at the shell and cartridge lifts work easily.
 Any irregularity in these respects should be at once reported to No. 1.
 The stores having been brought up, or found correct, No. 1 will satisfy himself that the foresights fit properly on the gun, and the deflection leaves of the hind sights work easily. He ascertains that the hydraulic buffer is filled with the proper amount of oil, and that the racers are swept; that the running-up jack, indicator, and clutch lever are in working order; he receives reports from the Nos. responsible of any irregularity or deficiency in connection with the different parts of the gun, carriage, platform, and stores, or as regards the ammunition stores, lifts, &c.
 2 and 4 place the sponge and rammer in the supports suspended from the roof, the shell extractor and wad hook in rear, so as not to interfere with the working with any of the guns in the battery, and convenient for those for which intended.
 2 sees that the elevating gear, 4 that the traversing gear is oiled and in good working order.
 3 examines the bore to see the grooves are free from grit, &c., secures the hoisting tackle to the loading bar, overhauling it until the lower block is at a convenient height for hooking to the strap on the projectile. The lower block should then be hooked back to a loop on the left mantlet.
 5 ascertains that the lever of chain nipping gear is in working order.
 6 places the sponge bucket clear of the working of the gun.
 11 coils down the rammer ropes either side of the gun, and, with 12, sees that the mantlets work easily.
 12 sees that the compressor is in adjustment.
 16 places the pricker in the loop on the side of the carriage, examines the vent server and places it in the vent (the loop of the vent server lanyard over one of the sights), straps the tube box round his waist on the right side, coils

up the lanyard, and passes the bight of it under the tube box strap : fills his box with friction tubes, which he procures from 10.

No. 1 gives the word "*Examine gun*;" 16 drifts the vent, replaces the vent server, and clamps the elevating gear ; 2 and 3 search the gun after the pricker is withdrawn, 2 supplying himself with the wad hook, and replacing it ; 12 elevates until the gun is in a convenient position for loading and clamps the elevating gear.

To Load.

<p style="text-align: center;"><u>Officer.</u></p> <p style="text-align: center;">Range—yards.</p> <p style="text-align: center;">With—load.</p>	<p style="text-align: center;"><u>No. 1.</u></p> <p style="text-align: center;"><i>Trail right or left (if necessary), Halt.</i></p> <p style="text-align: center;">With—load.</p>
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"*Trail right or left.*"—No. 1 adjusts the indicator for traversing ; 4, 5, 11, and 12 trail right or left.

The gun is traversed to a convenient position for loading if necessary.

"*Load.*"—No. 1 gives 7 the nature of shell (and length of fuze required) and adjusts the tangent sight.

2 moves into position for sponging, receives the sponge from 4, and, assisted by 3, sponges the gun, being careful to observe that the vent server is in the vent. He returns the sponge to 4, and, with 3, steadies the projectile in raising and guiding it into the bore. He then receives the rammer from 4 (with right rammer rope attached), and, assisted by 3, steadies the stave, whilst the cartridge and projectile are being rammed home. The rammer ropes being manned by 4, 6, 12, and 16 on the right, 5, 7, 9, and 11 on the left of the gun. Should "*Not home*" be given by 2, they again stand to the ropes, and force the charge home. At "*Home*" they go under cover ; 2 and 3 detach the rammer ropes (if fitted with spring clips), hand them to 11 and 12, spring the rammer ; 3 inserts a wedge wad, which is pressed steadily home by 2 and 3, and jammed under the head of the projectile by two smart taps. They then spring the rammer (2 handing it to 4), and go under cover.

3 moves into position, and having fixed the port bar and assisted 2 to sponge, slews to his right, withdraws the first cartridge from the cylinder, placing it on his right shoulder, choke to his front ; he then turns left about until his back is towards the muzzle and slides the cartridge from off his shoulder into the bore.

He does the same with the second cartridge. The projectile is now brought up on the barrow with selvagee ready fixed ; 3 standing clear close to the front of the platform, 5 casts loose the lower block of the hoisting tackle, and 3 hooks it into the selvagee and gives "*Hoist away*," and with 2 steadies and guides the projectile, which is raised by 5, 6, 7, 9, 11, and 1 if necessary, manning the running end of the fall ; 3 gives "*High enough*," "*Ease off*," and, having, with 2, forced the projectile into the bore, casts, loose the selvagee, replacing it in the barrow, and uncaps the fuze. The barrow may be pushed clear by 3 before hoisting. 3 now hooks the left rammer rope, which he receives from 11, and the charge and wedge wad are rammed home in succession, the rammer sprung by 2 and 3, and the port bar unshipped by 3.

4, assisted by 16, hands the sponge to 2 and receives it back from him ; he hands him the rammer as soon as the projectile is in the bore, and mans the rammer rope. When the projectile and wed wad have been sent home, he receives the rammer back from 2, and assists 16 to replace it.

5, as soon as the cartridge is in the bore, casts loose the lower block of the hoisting tackle, attends to snatch block, mans the fall in raising the projectile, and the rammer rope in ramming home. When the charge is home he supplies 3 with a wedge wad, and hooks the lower block of the hoisting tackle to the loop on the left mantlet.

6, after supplying 3 with cartridge, which he brings up on his shoulder, lid to the rear, mans the fall of hoisting tackle and afterwards the rammer rope on the right of the gun.

7 brings up projectile in barrow with straps on, having, when necessary, adjusted the fuze according to No. 1's directions, assists to raise and ram it home

8 issues a cartridge to 6.

9 assists 7 to prepare, bring up, and raise and ram home projectile, removes barrow and strap.

10 issues shell.

11, after supplying 3 with cartridge, raises and rams home projectile, and attends to the left mantlet and left rammer rope.

12 rams home, attends to the right mantlet and right rammer rope.

13 and 15 work the shell lift.

14 and 17 the cartridge lift.

16 lowers the sponge and rammer in succession from the rope support in the roof of the casemate, and assists 4 to hand them to 2, replacing them with 4's assistance.

N.B.—When rammer ropes fitted with "spring clips" are not in use, they are coiled down between the racers close to the piers by 11 and 12.

To Run Up.

Officer.

No. 1.

Run up. Halt.

"*Run up.*"—12 releases the compressor by raising the weighted lever, holding it up until the carriage has moved clear; when clear, he presses down the lever towards the front of the platform. No. 1 stands to the running-up jack (screwing up the valve lever should the release valve be external). No. 3 pumps up the jack until the gun begins to move to the front. No. 1 checks it if necessary by forcing the lever to the rear, or (should the release valve be external) by unscrewing the valve lever handle.

Note.—In order that the gun should not run up to the stops violently, No. 1 should lower the rear of the carriage gradually and with care, commencing to lower as soon as the carriage has moved forward about 18 inches, lowering rapidly or not, according to his judgment.

When up to the front stops No. 1 gives "*Halt,*" and lowers the rear of the carriage as described for checking it. (Should the running-up jack be out of order, the gun can be run up by use of the chain nipping gear, in which case No. 1 adjusts the indicator for running up; 5 raises the lever of the chain nipping gear towards the front, 4, 5, 11, and 12 work the traversing handles). After the gun is run up 5 hauls down the lever of chain nipping gear, 16 hooks a tube to the lanyard; 2, 3, 11, and 12 close the mantlets.

To Lay the Gun.

Officer.

No. 1.

Elevate. Halt.

Depress. Halt.

Trail right. Halt.

Trail left. Halt.

No. 1 adjusts the indicator for traversing, and then, looking over his sights, gives "*Elevate,*" &c., as required. 2 at "*Elevate*" releases the clamping arrangement of elevating gear by lifting the handle of the clamp towards the front; he then turns the hand wheel to the right (or towards the front). At "*Depress*" he reverses the movement of the hand wheel; at "*Under cover*" or "*Ready*" he clamps the elevating arc by pressing the handle down towards the rear. 4, 5, 11, and 12 work the traversing handles, turning them towards the rear for "*Trail right,*" the reverse for "*Trail left.*"

To Make Ready and Fire.

Officer.

No. 1.

Fire—rounds.

No.—Ready.

No.—Fire.

At "*Ready*" the gun Nos. stand clear. 16 places the tube in the vent, passes the lanyard through the rear eyebolt of the carriage, and stands ready to fire, facing the gun. At "*Fire*" he draws the lanyard strongly towards him without a jerk; he drifts the vent, replaces the vent server, and coils up the lanyard, placing it under his belt. As soon as the gun has been fired 11 and 12 (assisted by 4 and 5 if necessary) will traverse it back to a position convenient for loading without any word of command.

To Run Back and Unload.

Officer.

No. 1.

Run back. Halt.
Unload.

At "*Run back*" No. 1 adjusts the indicator for running back; 5 raises the lever of chain nipping gear until the teeth of the sprocket plates catch in the running-in-and-out chains on the platform, and holds it up (or secures it) until the gun having been run back the carriage is lowered on to the platform, after which he forces the lever down until it is held by the catch; 3 works the lever of running up jack until the rear of the carriage is raised.

4, 12, 16, on the right, 5, 9, 11, on the left, work the traversing handles, 12 raises the compressor lever. As soon as the gun is back No. 1 gives "*Halt*," and forces the lever of jack as far to the rear as possible, or (if the release valve is external) unscrews the release valve, until the rear of the carriage rests on the platform.

No. 1 then adjusts the indicator for traversing.

"*Unload*." The gun is unloaded by the same Nos. who loaded it.

To Cease Firing and Replace Stores.

Officer.

No. 1.

Cease firing.
Replace stores.

Depress. Halt.
Replace stores.

The gun is depressed and the stores are replaced by the Nos. who brought them up.

To Form Detachment Rear.

Officer.

No. 1.

Detachment rear.

Outwards turn. Double march.
Halt. Front.

"*Detachment rear*," No. 1 doubles to the left rear of the platform, faces to his left, and gives the order "*Outwards turn*;" 2, 4, 12, and 16 turn to their left, 3 and 5 to their right.

"*Double march*," 16 and 5, followed by 12, 4, 3, and 2, wheel to their right and left, and when clear of the platform, to the right, and round No. 1's left shoulder, 6, 7, and the remaining numbers coming up into their places; when 2 and 3 have passed him No. 1 gives "*Halt*," "*Front*," and changes his flank by the rear.

To Change Rounds.

Officer.

No. 1.

Change rounds.

Change rounds.

In changing rounds, 2 becomes 4, 4 1, 1 17, 17 16, 16 15, 15 14, 14 13, 13 12, 12 11, 11 10, 10 9, 9 8, 8 7, 7 6, 6 5, 5 3, and 3 2.

DRILL BY SIGNALS.

Detachments, well drilled, can be exercised in the service of guns by means of signal (to be used instead of words of command for which they stand), unless smoke, darkness, or some other absolute necessity renders the word of command necessary.

This method possesses the advantage of enforcing silence, and compels the numbers working at the gun to fix their attention on the No. 1 or other number giving the signal.

Drill by Signals for Casemate Batteries.

<i>Officer.</i>		<i>No. 1.</i>
<i>Prepare for action.</i>		<i>Prepare for action.</i>
<i>Range—yards.</i>		<i>Examine gun.</i>
<i>With—load.</i>		<i>With—load.</i>

No. 1 mounts upon the platform and adjusts his tangent sight ; the others numbers act as usual.

(No. 3. "Hoist away") No. 3 raises his right hand palm to the rear, fingers pointing upwards.

(No. 3. "High enough") No. 3 again raises his right hand as before.

(No. 3. "Ease off") No. 3 repeats the signal with his right hand as before.

(No. 1. "Run up") No. 1, standing in rear of the platform, holds up his right hand, palm to the front ; 2 and 3 then proceed as usual.

(No. 1. "Elevate") No. 1, looking over the sights, holds up his right or left hand, fingers pointing upwards (according as the right or left elevating wheel is in gear).

(No. 1 "Depress") No. 1 turns his hand, so that the fingers point downwards.

(No. 1. "Halt") Drop the hand to the side.

(No. 1. "Trail right or left") Motions with the right hand in the required direction, the arm well back, resting on the body.

(No. 1. "Halt") Drops the arm.

(No. 1. "Under cover") No. 1 jumps off the platform, and goes under cover with the other numbers.

As soon as the gun is fired, the vent is drifted, the vent server is replaced, and the loading and firing is proceeded with until the specified number of rounds have been fired. The whole of the numbers then go under cover.

The service of the gun is to be carried out without any word of command after the order of the officer to "Load," and with the least possible noise.

When the object is stationary and the front obscured by smoke, the gun may be laid by means of the index plate and reader combined with the arc on the floor and pointer on platform ; the positions of which should be carefully noted when the gun is laid by the tangent sights.

The above drill can only be effectively carried out by careful training of the detachments, who should be instructed to fix their attention on the Nos. issuing the orders.

In all respects not above mentioned the drill is the same as laid down for the different natures of ordnance.

SERVICE OF GUN IN BARBETTE BATTERY WITH SUNKEN WAYS.

The guns are fitted with muzzle derricks and supplied with loading stages.

The running end of the fall of the hoisting tackle is led through an ordinary single 8-inch Bothway block, which is hooked into a permanent eye let into the wall of the parapet.

Two 4-inch snatch blocks are hooked to the loops or eyes on the derrick and the bell ropes of the rammer are passed through them. The snatch blocks are hooked for "Loading" by 2 and 3, unhooked by them when the wedge wad has been rammed home, and laid down with the rammer ropes when not in use by 11 and 12, who attend to them. The upper block of the hoisting tackle should be moused with spun yarn.

The service of the guns is the same as for those mounted in casemates and behind shields, with the following exceptions:—

"General duties," 5 attends to muzzle derrick; 7 and 9 attend to loading stage.

"Prepare for action," 5 and 8-inch single Bothway block; 11 two 4-inch snatch blocks, which he hooks on to the derrick; 9 tackle for hoisting projectiles on to loading stage.

2 and 4 place the sponge and rammer on the ground on the right of the gun.

"To load," 5, as soon as the cartridge is in the bore, raises the derrick and overhauls the tackle; after supplying 3 with a wad he rounds in the tackle and throws back the derrick, 7 and 9, assisted by 13 and 15, having placed a projectile on the loading stage, run it under the muzzle of the gun, and after the rammer has been withdrawn from the bore, run the stage back to its former position.

If no crane or derrick is available for lifting projectiles on to the loading stage, they can be rolled on on a plank.

The paragraphs relating to portbar, mantlets, and transporting barrow do not apply to this drill, the barrow being required for conveying projectile to loading stage only.

N.B.—For guns mounted en barbette without sunken ways, a transporting barrow is used for conveyance of projectile to the muzzle of the gun, instead of a loading stage.

NOTES ON VARIOUS OPERATIONS IN THE SERVICE OF THE GUN.

Running up.

Raise the carriage on its rollers by means of the hydraulic jack rear roller; and release the compressor stop by lifting the weighted lever. When the carriage has been run up clear of the compressor stop, the weighted lever must be pressed down towards the front of the platform.

Should it be found that the gun is running up too quickly, lower the carriage off its rollers by forcing the pumping handle to the rear, thereby releasing the pressure in the rear roller jack.

Elevating.

To elevate, release the clamping arrangement by lifting the handle of the screw towards the front, and turn the hand wheel to the right (or towards the front); when the required elevation is obtained, clamp the arc by pressing the handle down towards the rear.

Depressing.

To depress, release the clamping arrangement as for elevating, and reverse the movement of the hand wheel; and again clamp the arc.

Should the position of the handle of the clamping arrangement be found to be inconvenient when the arc is clamped, it can be adjusted by removing the split key and handle, and replacing the latter in the new position on the hexagon of the screw, then refixing the split key.

Traversing.

Force the friction cone into the recess of the bevel pinion on cross shaft by means of the hand wheel on left side of platform, turning the hand wheel to the left (or towards the front), when the indicator behind the hand wheel will be lowered to T.

For "*Trail right*," turn the winch handles towards the rear.

For "*Trail left*," reverse of the above.

Running-back Carriage.

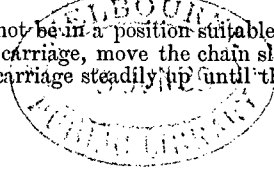
Disengage the lever on left side from the catch and lift it towards the front, until the teeth of the sprocket plates catch in the running-in-and-out chains on the platform. Raise the carriage on its rollers, as for "*Run up*," and continue to hold up the lever until the carriage is run back. Lower the carriage off its rollers, and disengage the sprocket plates by forcing the lever down until it is again held by the catch.

Platform.

While the carriage is on its rollers and the sprocket plates in gear with the running-in-and-out chains, raise the weighted lever of the compressor stop, and hold it up; force the friction cone into the recess in the spur pinion by means of the hand wheel on the left side, turning the latter to the right (or towards the rear), the indicator will then rise to R, then turn the winch handles towards the front until the carriage has been run back the required distance.

ENGAGEMENT OF CHAINS IN SPROCKETS.

Should the running-in-and-out chains not be in a position suitable for the engagement of the sprocket plates in the carriage, move the chain slowly, at the same time pressing the lever on the carriage steadily up until the teeth catch in the chains.



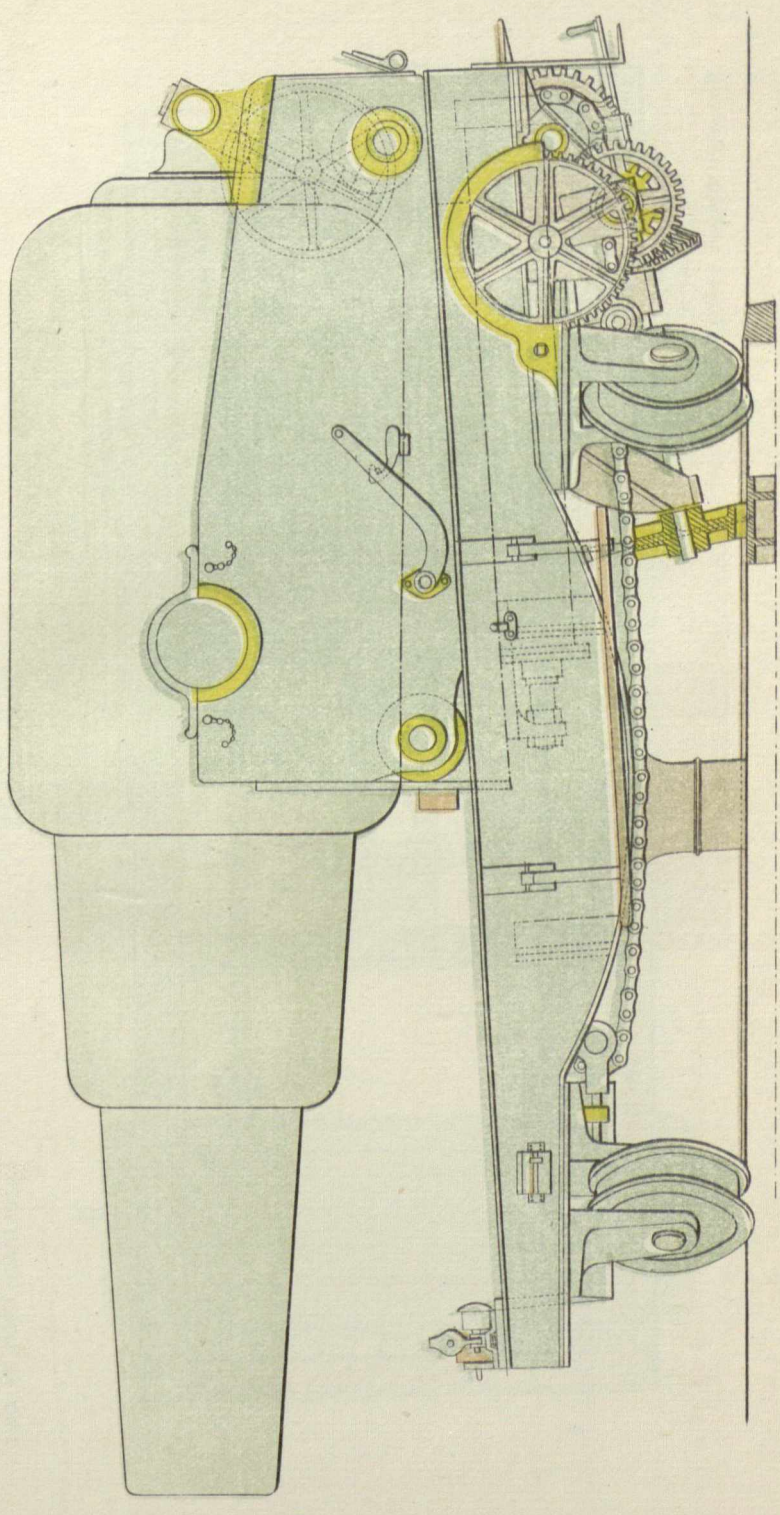
LONDON :
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY HARRISON AND SONS,
PRINTERS IN ORDINARY TO HER MAJESTY.
(Wt. 8790. 375 | 9 | 84. 1737).

CARRIAGE GARRISON, DWARF, 12 IN, 35 TON. MARK I.
IRON, SLIDING, DOUBLE PLATE, WITH GEAR.

SCALE $\frac{1}{28}$ TH.

PLATFORM, DWARF, 12 INCH, 35 TON, MARK I.
IRON, TRAVERSING WITH GEAR.

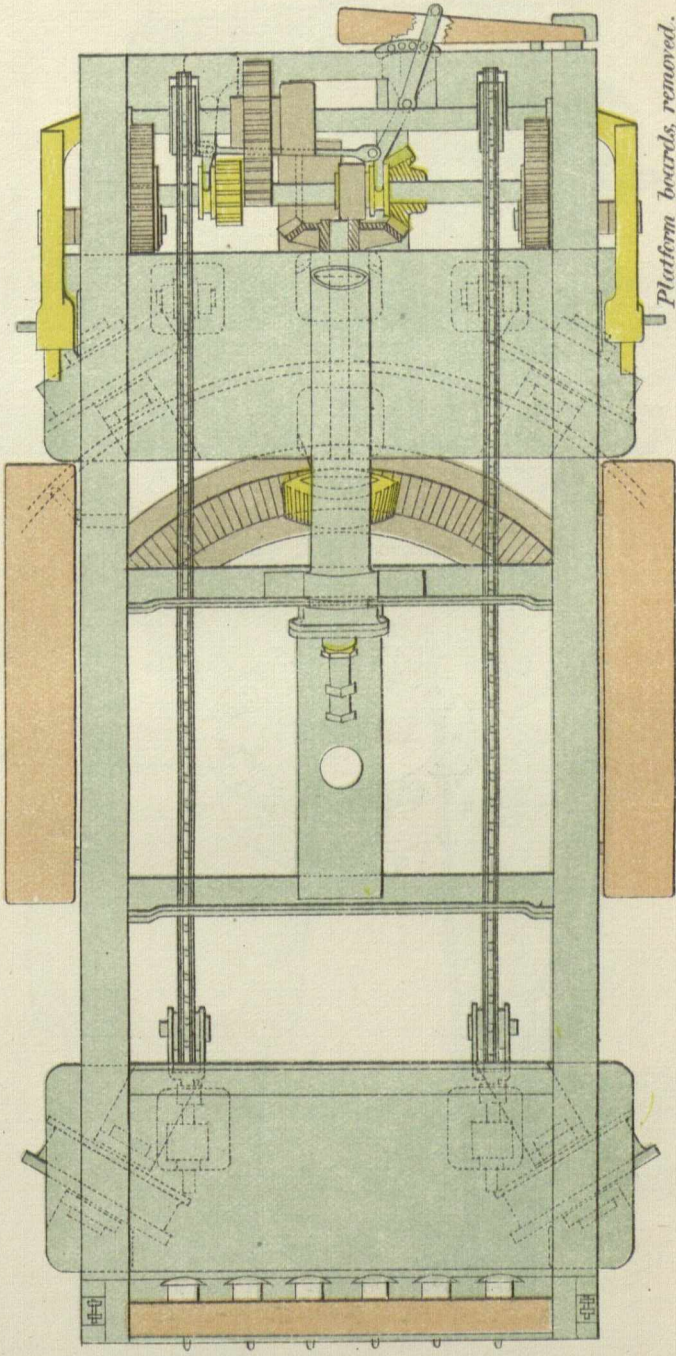
TWO AT FORT CARLISLE



PLATFORM, DWARF, 12 INCH, 35 TON, MARK I.
IRON, TRAVERSING, WITH GEAR.

TWO AT FORT CARLISLE.

SCALE $\frac{1}{28}$ TH.



Platform boards, removed.

CARRIAGE, CARRISON, DWARF, 12.5 IN 38 TON MARK I.

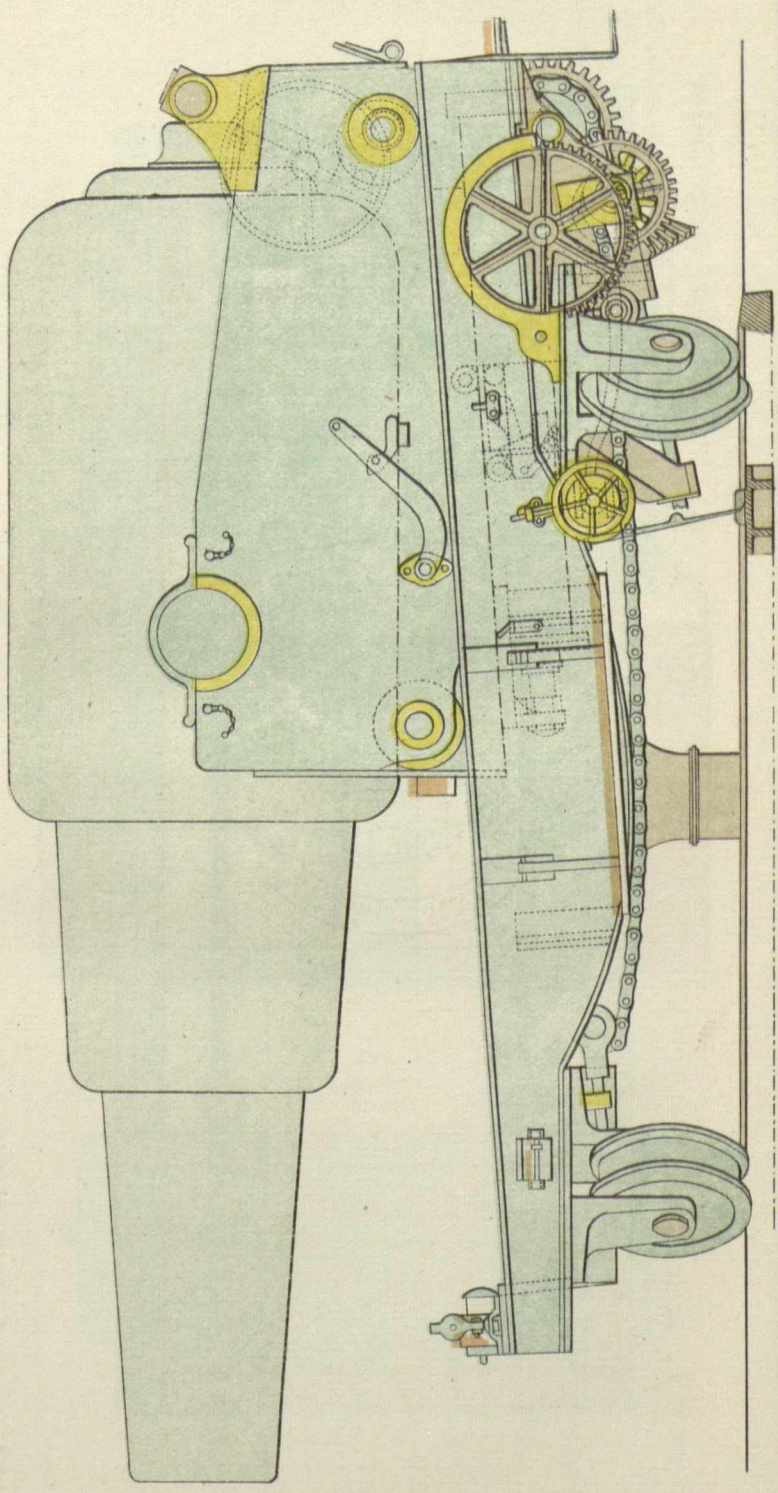
IRON, SLIDING, DOUBLE PLATE, WITH GEAR.

THREE AT FORT WESTMORELAND.

SCALE 28 TH.

PLATFORM, DWARF 12.5 IN, 38 TON, MARK I.

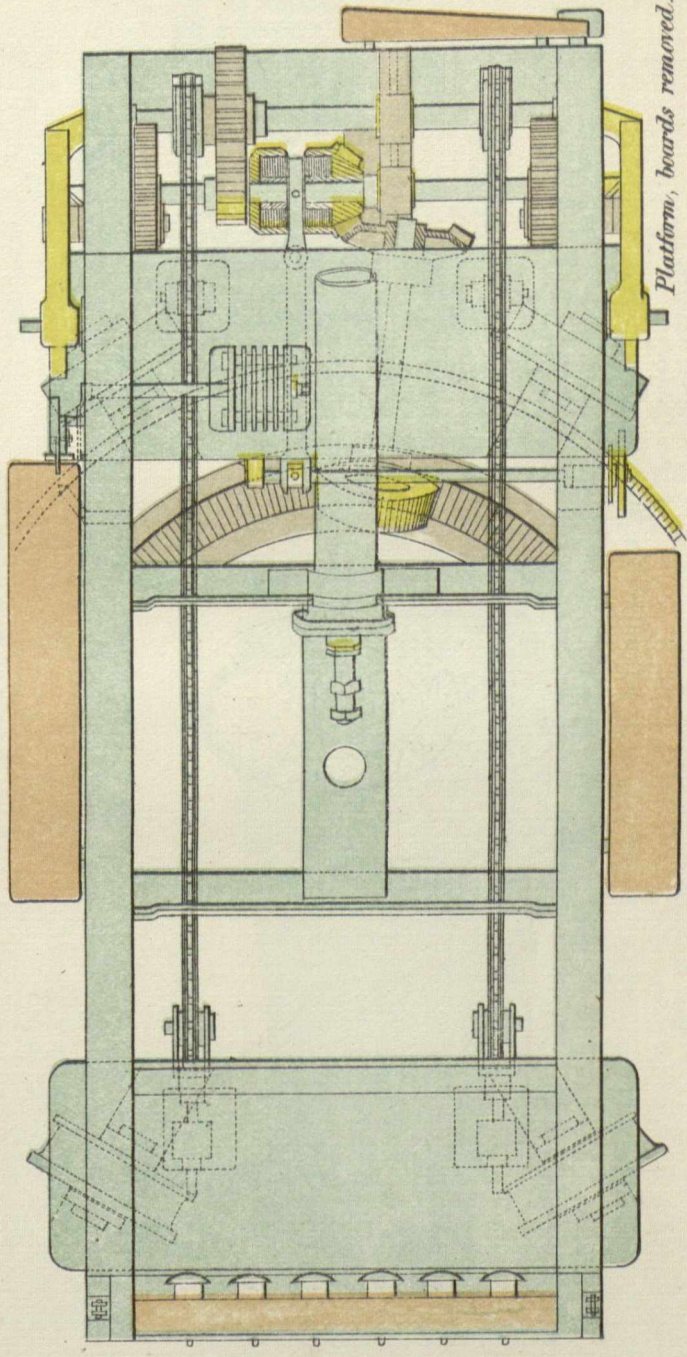
IRON, TRAVERSING, WITH GEAR.



PLATFORM, DWARF, 12.5 IN. 38 TON, MARK I. IRON TRAVERSING WITH GEAR.

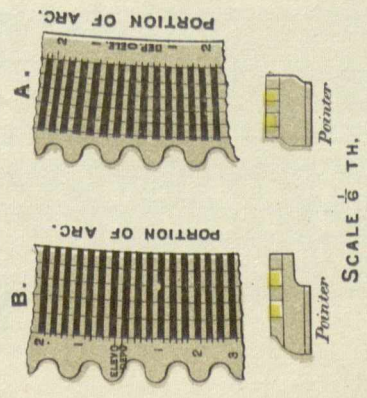
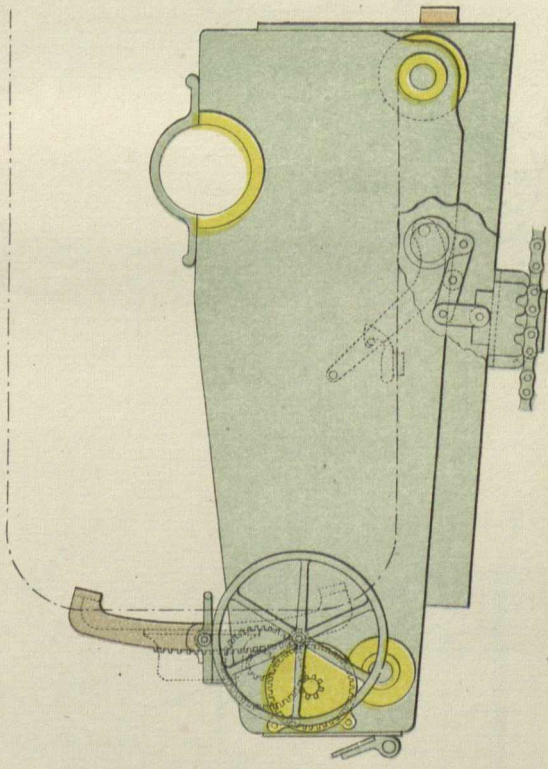
SCALE 2B TH.

THREE AT FORT WESTMORELAND.



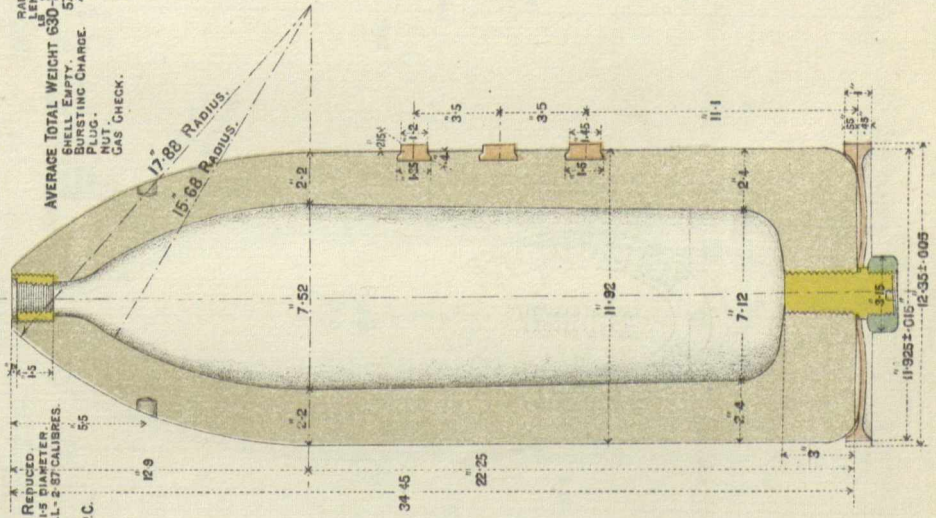
ELEVATING GEAR.

SCALE $\frac{1}{28}$ TH.



*A. Two Carriages, at Fort Westmoreland.
 One " " at Fort Carlisle.
 B. One " " at Fort Westmoreland.
 One " " at Fort Carlisle.*

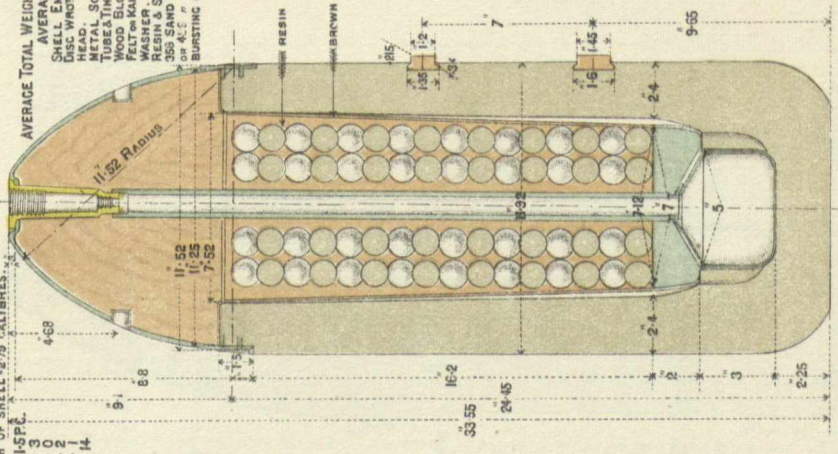
PROJECTILES STUDDED. SCALE 1/8.
COMMON. MARK III.



N^o 1869 $\frac{1}{8}$ Reduced.
 RADIUS OF HEAD-1.5 DIAMETER.
 LENGTH OF SHELL-68.0 CALIBRES.
 AVERAGE TOTAL WEIGHT 772-132 1/5 P.C.
 SHELL EMPTY. 610 1/2
 BURSTING CHARGE. 3 1/4
 METAL PLUG. 1 1/4
 WROUGHT IRON NUT. 11-14
 GAS CHECK.

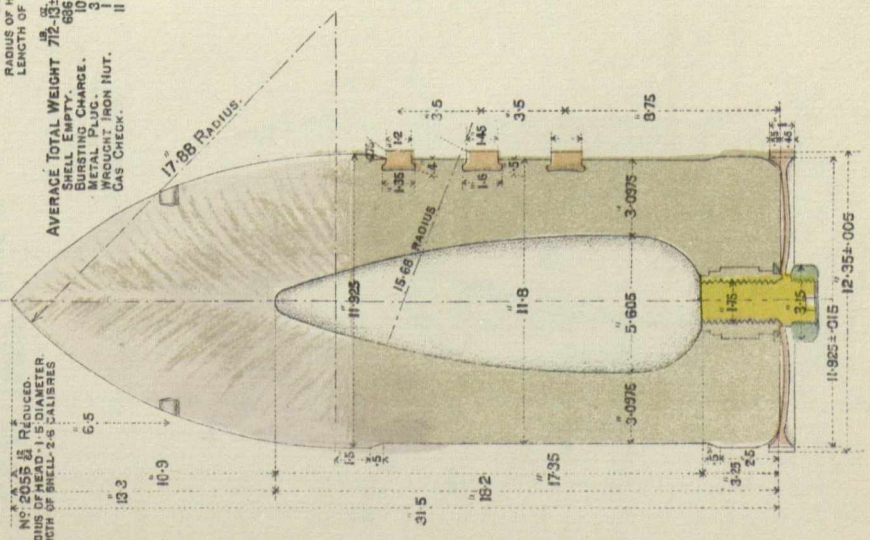
N^o 1132 $\frac{1}{8}$ Reduced.
 RADIUS OF HEAD-1.5 DIAMETER.
 LENGTH OF SHELL-68.0 CALIBRES.
 AVERAGE TOTAL WEIGHT 650-153 P.C.
 SHELL EMPTY. 41 1/2
 BURSTING CHARGE. 3 1/2
 NUT. 1 1/4
 GAS CHECK. 11-14

SHRAPNEL.
MARK I.



N^o 1132 $\frac{1}{8}$ Reduced.
 RADIUS OF HEAD-1.5 DIAMETER.
 LENGTH OF SHELL-91.0 CALIBRES.
 AVERAGE TOTAL WEIGHT 618-91 P.C.
 SHELL EMPTY. 462-8
 BURSTING CHARGE. 19 1/2
 METAL SOCKET. 10 1/4
 TUBE & TIN CUP. 2 1/4
 WOOD BLOCK. 11-1
 WROUGHT IRON NUT. 11-1
 RESIN & SOLDER. 13-12
 355 SAND SHOT (4oz) 32-0
 on 4.5" (3.5oz) 32-0
 BURSTING CHARGE. 1-15

PALLISER.
MARK IV.



N^o 2055 $\frac{1}{8}$ Reduced.
 RADIUS OF HEAD-1.5 DIAMETER.
 LENGTH OF SHELL-68.0 CALIBRES.
 AVERAGE TOTAL WEIGHT 772-132 1/5 P.C.
 SHELL EMPTY. 610 1/2
 BURSTING CHARGE. 3 1/4
 METAL PLUG. 1 1/4
 WROUGHT IRON NUT. 11-14
 GAS CHECK.

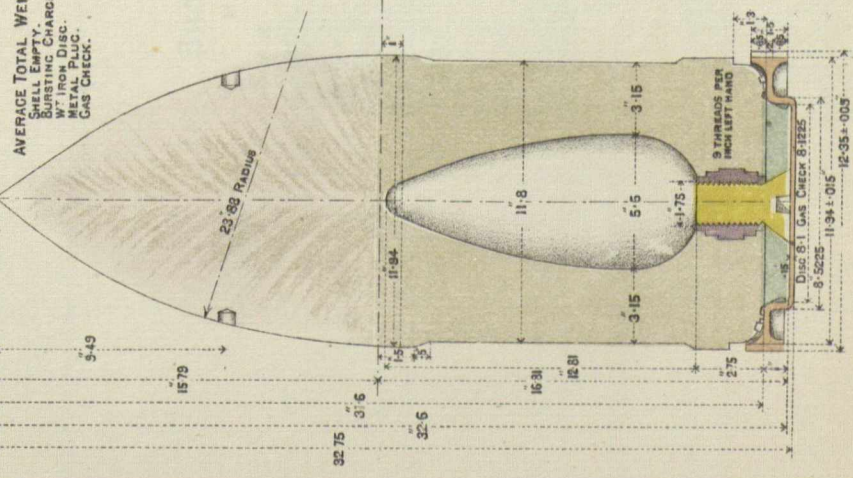
N^o 1869 $\frac{1}{8}$ Reduced.
 RADIUS OF HEAD-1.5 DIAMETER.
 LENGTH OF SHELL-68.0 CALIBRES.
 AVERAGE TOTAL WEIGHT 772-132 1/5 P.C.
 SHELL EMPTY. 610 1/2
 BURSTING CHARGE. 3 1/4
 METAL PLUG. 1 1/4
 WROUGHT IRON NUT. 11-14
 GAS CHECK.

PROJECTILES STUDLESS. SCALE 1/8.
COMMON. MARK I.

**PALLISER.
MARK II.**

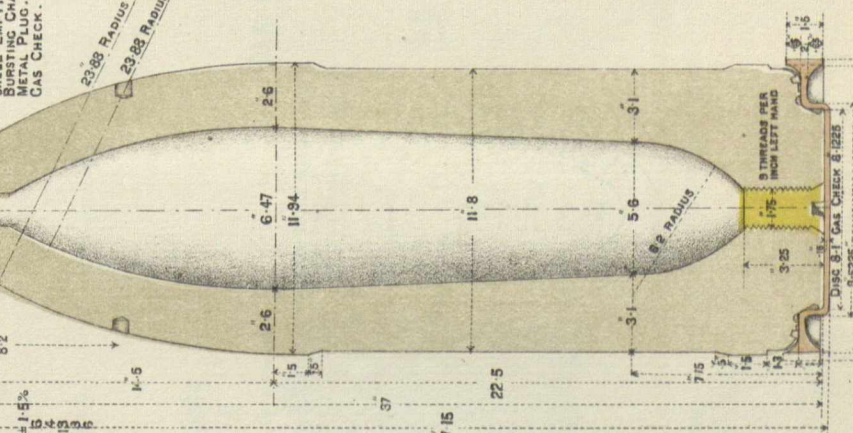
№ 3706 $\frac{1}{8}$ REDUCED.
RADIUS OF HEAD - 2 DIAMETERS.
LENGTH OF SHELL - 33 CALIBRES.

AVERAGE TOTAL WEIGHT 714-15%
BURSTING DISC. 57-9
W⁷ IRON DISC. 12-3
METAL PLUG. 3-9
GAS CHECK. 14-5



**№ 3634 $\frac{1}{8}$ REDUCED.
RADIUS OF HEAD - 2 DIAMETERS.
LENGTH OF SHELL - 33 CALIBRES.**

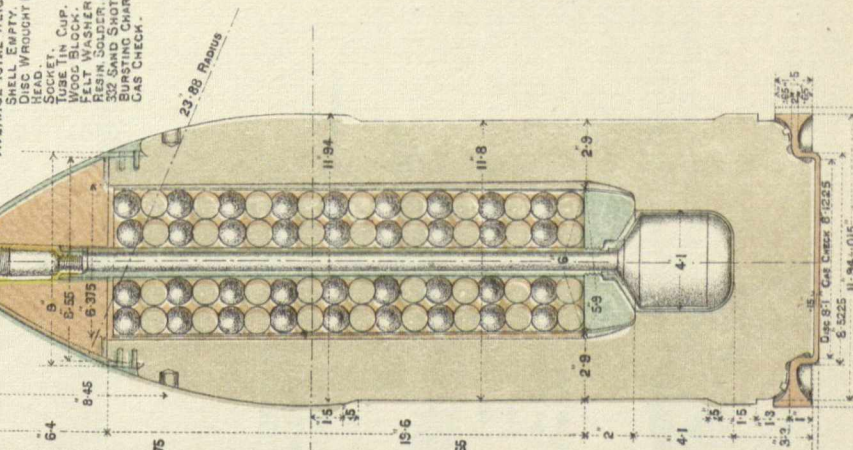
AVERAGE TOTAL WEIGHT 714-15%
BURSTING DISC. 57-9
W⁷ IRON DISC. 12-3
METAL PLUG. 3-9
GAS CHECK. 14-5



**SHRAPNEL.
MARK I.**

№ 3797 $\frac{1}{8}$ REDUCED.
RADIUS OF HEAD - 2 DIAMETERS.
LENGTH OF SHELL - 33 CALIBRES.

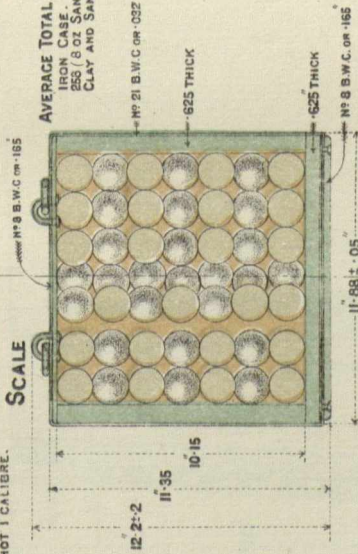
AVERAGE TOTAL WEIGHT 714-15%
SHELL EMPTY. 570-4
BURSTING CHARGE. 27-2
METAL PLUG. 14-6



AVERAGE TOTAL WEIGHT 714-15%
SHELL EMPTY. 579-4
DISC WROUGHT IRON. 12-8
HEAD. 6-13 1/2
SEAD. 3-11 1/2
TUBE TIN CUP. 3-11 1/2
WOOD BLOCK. 3-13 1/2
FELT WASHER. 11-1
W⁷ IRON DISC. 12-3
332 SAND (SHOT 400). 60-8
BURSTING CHARGE. 27-0 1/2
GAS CHECK. 14-6

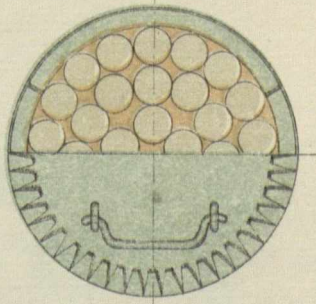
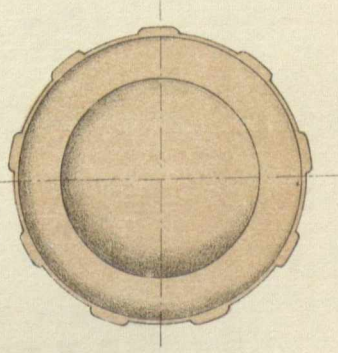
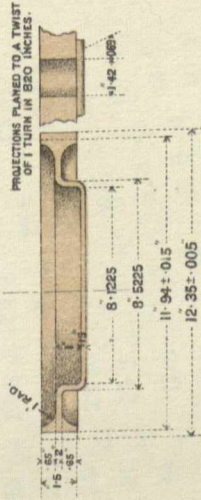
SHOT CASE. MARK III.

NO 3478 $\frac{1}{8}$ REDUCED.
LENGTH OF SHOT CALIBRE.



GAS CHECK COPPER AUTOMATIC. MARK I. SCALE $\frac{1}{8}$.

NO 3378 $\frac{1}{4}$ REDUCED.



FUZE, PERCUSSION, PETTMAN GENERAL SERVICE.

MARK I.

FULL SIZE.

