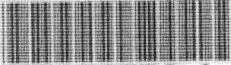


DEFENCE INFORMATION SERVICES



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ALL INTELLIGENCE CORPS OF M.D.

HANDBOOK
FOR THE
I-P R. Q. F. GUN
(MOUNTED ON FIELD CARRIAGE)
1902.

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SVC. Military District

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1-PR. Q.F. GUN, MARK 1.

DESCRIPTION.

Material	Steel.
Weight (nominal)	410 lbs.
Length	{	with shoulder-piece 87.58 inches.
		without	.. .. 73.75 "
		barrel (to face of lock)	.. .. 43.56 "
Calibre	..	..	1.457 "
Rifling	{	system	.. .. Polygroove, plain section.
		length	.. .. 39.05 inches.
		twist	.. .. Uniform, 1 turn in 29.92
			calibres.
		grooves {	number	.. .. 12.
		width	.. .. .322 inch.
		depth	.. .. .0156 inch.
Firing mechanism	..	..	Percussion.

The gun is made of steel, and consists generally of two portions, i.e., (1) recoiling, and (2) non-recoiling. The recoiling portion, which consists of the barrel, recoil plates, and lock, is forced to the rear, when the gun is fired, by the explosion of the charge, the parts being automatically returned to the firing position by means of the barrel and crank springs. The non-recoiling portion consists of the barrel case, feed block, and breech mechanism case, the latter being provided with trunnions for the attachment of the gun to the carriage.

The barrel is of steel, chambered to suit the cartridge, and rifled. Trunnions are provided on both sides at the breech end for the attachment of the recoil plates, and a recess is formed on the upper surface for the reception of one end of the crank lever of the feed block. A nut and washer for retaining the barrel spring is provided near the front end. The outer surface of the barrel is coated with copper to protect it from rust.

Recoiling
portion.

The recoil plates are "right" and "left" respectively, and are each provided with a hole near the front end for the reception of the barrel trunnions. Bosses are provided on the outside of the plates at the rear, forming bearings for the crank, the outer end of the boss on the left plate being prepared for the reception of the crank spring case. A flat spring for retaining and centering the lock in the firing position is riveted to the "right" plate at the front end. Longitudinal grooves are formed on the inside of the plates which serve as guides for the lock.

The lock consists of a steel frame fitted with a striker, cocking lever, trigger sear, safety catch, and main spring for percussion

firing. An extractor, fitted with a flat spring, gib, gib spring, pawl, spiral spring, and cover, is attached to the front face of the lock frame. The lock is actuated by a crank and connecting rod fitted to the recoil plates, the crank being provided with a lever with handle for withdrawing the lock on one side, and with a helical spring for returning the lock to the firing position on the other.

Non-recoiling
portion.

The barrel case is of gunmetal, and is fitted with glands at both ends packed with asbestos packing to suit the barrel, which passes through the case. It is provided with a filling hole in the upper side near the breech, and an emptying hole in the under side near the muzzle, both of which are fitted with screw plugs secured by chain and eyebolt. Another hole connected with the steam tube in the case is provided in the upper side near the muzzle, this hole is stopped by a cork plug. The barrel case holds about 11 pints.

The ejector tube with spring is fitted to the under side of the barrel case.

The breech mechanism case consists of two steel side plates "right" and "left" respectively, gunmetal buffer block, and steel cover plate. The side plates are provided with trunnions for the attachment of the gun to the carriage, and are secured to the barrel case by means of dovetail projections and a taper fixing pin. Elevating brackets for connecting the gun to the elevating gear of the carriage are attached to the lower edge of the plates at the rear. Fixed cams with pawls, springs, and stop studs for guiding and controlling the extractor of the lock and barrel stops to prevent undue recoil of the barrel are attached to the inside of each plate. A stud for the attachment of the shoulder piece is riveted to the left plate immediately in front of the elevating bracket, the shoulder piece is further secured to the elevating bracket by a fixing screw. A roller and crank lever latch are fitted to the outside of the "right" plate, also two studs for ammunition box. A regulator and indicator plate is also fitted to the rear end of the "right" plate; the regulator can be adjusted by means of the lever and indicator plate so that:—

- (a) The gun cannot be fired.
- (b) For single shots only.
- (c) For automatic firing.

A trigger bar connecting the trigger with the trigger sear is fitted by means of two studs to the lower part of the "right" plate. The bar is retained in position by a spiral spring.

The side plates are connected at the rear end by the buffer block, to which they are attached by dovetail projections and a taper fixing pin. The buffer block is provided in the centre with a buffer case, gland, and piston; at the lower end with a trigger guard, trigger lever, connecting link, and trigger; and on the upper rear face with a tangent sight bracket.

The cover plate is hinged to the side plates at the front end by a joint pin, and is provided on the under side with a guide block, which serves to guide the extractor and retains the lock frame in position when clear of the groove in the recoil plates. A bracket with foresight and cap is riveted to the upper right side at the front. The plate is retained in the closed position by a securing pin with chain and eyebolt.

The feed block is of gunmetal, and is fitted with a slide actuated by a crank lever in the block, one end of the lever engaging with a stud on the slide, and the other end with a recess in the barrel.

The slide is provided with two actuating levers for travelling the ammunition belt through the feed block, and two retaining levers are provided in the feed block for holding the belt while the slide is moving in the opposite direction. Steel guides are fitted to the upper and lower sides of the feed block to ensure the cartridges being in the correct position for withdrawal by the extractor of the lock. Cartridge and shell stops inside the feed block serve to prevent cartridges being pushed too far through the feed block.

SIGHTING.

The gun is sighted on the right side with fore and tangent sights. The fore sight consists of a steel acorn point in a bracket which is attached to the cover of the breech mechanism case.

The tangent sight is made of steel, having a crosshead giving 2 degrees deflection right and left, provided with a notched deflection leaf and traversing screw. The sight bar is fitted with a removable range strip graduated with a yard scale to 3,000 yards, reading to 100 yards, and is provided on the front face with a rack gearing with the pinion in the sight socket. The sight is supported in a bracket attached to the rear end of the gun, and is secured by a pin with chain.

ACTION OF MECHANISM.

Suppose the gun to have just fired:—The explosion causes the recoiling portion to move backwards through a distance of about $1\frac{1}{2}$ inches, thereby causing the curve on the under surface of the crank handle to press against and move along the roller, thus rotating the crank (thereby drawing back the lock) and causing the crank handle to fly forward with an accelerated movement; thus a large portion of the energy of recoil is transferred to the crank. The travel of the recoiling portion to the rear compresses the barrel spring and also moves the actuating levers in the feed block slide to the right, so as to engage behind a fresh cartridge in the belt. When the lock moves backward the extractor withdraws the empty case from the barrel and a fresh cartridge from the belt in feed block. The extractor is kept in position by means of its horns, which move along the upper surface of the solid cams inside the breech case until the cartridge is clear of the belt; when it arrives at the rear end of these cams, it falls, partly by its own weight and partly by the action of the guide block on the cover, thus bringing the cartridge drawn from the feed block opposite the chamber, and the empty case drawn from the chamber opposite the ejector tube. The cover block also keeps the lock in position when the latter is quite back, as its flanges are then clear of the guides on the recoil plates.

Action on
recoil.

When the force of recoil is expended, the action of the barrel and crank springs comes into play, carrying the recoiling portion forward and revolving the crank by the unwinding of the crank spring, thereby forcing the lock to the front. As the recoiling portion travels forward it moves the actuating levers on the feed block slide to the left, and thus brings up, automatically, a fresh cartridge into position in the feed block. As the lock moves

Action of
barrel and
crank springs.

forward into the firing position, the live cartridge and the empty case are placed in the barrel chamber and ejector tube respectively, the extractor is moved upwards by the actuating lever acting on the extractor levers, thereby leaving the empty case in the ejector tube, where it is held by the ejector tube spring until pushed out by the next case, also causing the live cartridge to slide over the gib until opposite the firing hole, and engaging a fresh cartridge which has been automatically moved up into position in the feed block. The turning of the crank lever to the front not only draws the lock away from the barrel, but also gives a downward motion to the connecting rod and rear portion of the actuating lever, which latter, bearing on the tail end of the cocking lever, rotates it on its axis, and the head of the lever, being engaged in a recess in the striker, forces the latter to the rear, compressing the main spring. When the bent of the cocking lever has moved above the bent of the trigger sear, the latter is forced by the main spring under it, and is thus able to hold the cocking lever in the cocked position. The continued motion of the cocking lever carries back the striker until the safety catch (which is above and is acted upon by the safety catch spring) is forced into the bent of the striker and retains it. The striker is thus prevented from flying forward by two actions, viz., that of the trigger sear and that of the safety catch, so that the striker cannot move forward unless both are disengaged.

On the crank handle returning to the latch the lock moves to the front, and the connecting rod and rear portion of actuating levers have an upward motion, so that the upper surface of the latter engages the tail end of the safety catch and lifts it clear of the striker when the lock is in the forward position, the striker then moves slightly to the front till it is stopped by the bent of the cocking lever engaging the bent of the trigger sear. If now the trigger lever in the trigger bracket is pulled, the trigger bar is drawn backwards, at the same time a projection on the latter engages and draws with it the tail end of the trigger sear, thereby releasing the cocking lever, the mainspring then propels the striker on to the cap and explodes the cartridge.* If the gun has been set for automatic fire and the pressure on the trigger is maintained as the lock moves forward, the lower end of the trigger sear comes in contact with the projection on the trigger bar, and its bent is thus withdrawn from the cocking lever before the extractor has quite reached the firing position; the striker is therefore held only by the safety catch, and when the latter is lifted by the rear end of the actuating lever, the striker is released and is thrown forward on to the cap by the action of the mainspring. The release of the safety catch from the striker is so timed that it cannot take place until the lock is in the firing position.

Points to be attended to before firing:—

- (a) Examine the barrel and see that the bore is clear.
- (b) See that the hydraulic buffer contains the proper amount of liquid (glycerine and water in equal parts); this can be tested by removing the filling plug at the upper side of the cylinder, the liquid should be up to the edge of the filling hole.

* Outside the trigger sear a guard is fitted which prevents the possibility of its being accidentally pulled when the lock is being removed or after it has been removed from the gun.

- (c) See that the barrel case is filled with water.
- (d) Work the mechanism several times by means of the crank lever, releasing the striker each time, and see that all parts work smoothly and correctly.
- (e) Examine the ammunition and see that it is of the proper description, that the belts are correctly filled with it and packed carefully in the ammunition belt boxes, the shells pointing towards the muzzle. To fill an ammunition belt by hand, insert the cartridge in the loop from the thin edge and pass it through until the front copper ring is flush with the front or thick edge of the belt. To pack a belt in the ammunition belt box, place the box so that the lid can be drawn to the right, press the locking spring and draw out the lid, then, with shells to the front, lay the belt in layers in the box, taking care to fit them tightly, and well up to both ends, then replace the lid. If the foresight is fitted with a cap, see that the latter is removed.

To fill an ammunition belt.

To pack a belt in an ammunition belt box.

Points to be attended to during firing:—

Points during firing.

- (a) See that a sufficient supply of water is kept in the barrel case, so that the barrel should *never* be uncovered.
- (b) To load the gun, insert the ammunition belt in the feed block, turn the crank lever fully to the front, pull the belt through the feed block to the left as far as it will go and release the crank lever, then turn crank lever to the front again, pull the belt a second time, and on releasing the crank lever the gun is loaded and ready for firing.
- (c) That the right hand is kept clear of the crank lever to avoid risk of injury.
- (d) That the regulator lever is always in the "safe" position, except while the gun is actually being fired.
- (e) That the belt is on no account to be pulled while the gun is firing.

To load the gun.

Points to be attended to after firing:—

Points after firing.

- (a) That the regulator lever is turned to "safe," that the gun is unloaded, and that no cartridges are left in the ejector tube. To unload the gun, turn the crank lever fully to the front, and release it, again turn it to the front, and release it; this leaves the barrel and extractor empty, and if the lock be now drawn back till the horns of the extractor are caught by the cam pawls, then any cartridge left in the ejector tube can be withdrawn by hand.
- (b) That the interior of the barrel is oiled immediately after firing, to prevent erosion.
- (c) That the water is removed from the barrel case, which is quickly done by removing the emptying plug.
- (d) That the main spring is released.
- (e) That the lock is taken out, cleaned and oiled, and that the extractor, striker, and springs are examined to see they are not damaged.

To unload the gun.

To guard against rust and erosion.

N.B.—It will not be necessary to strip the lock for this.

- (f) The gun should be covered, to protect it from salt water, rain, &c.

FAILURES THAT MAY OCCUR, AND HOW TO REMEDY THEM.

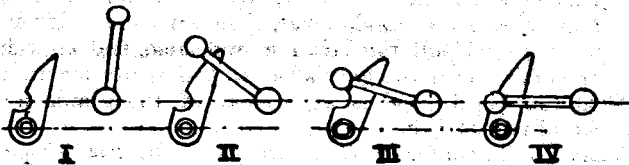
Accidental stoppages in the automatic action of the gun are generally due to either:—

Position of
lock on
occurrence
of failures.

- I. Inability of the lock to come back far enough to allow the extractor to drop.
- II. Inability of the lock to come right forward after recoil.
- III. Extractor being unable to rise to its highest position although the lock is almost home.
- IV. Failure to fire the cartridge, or to get sufficient recoil from it if ignited, although the lock has gone correctly into the forward position.

In each of the above cases it is seen therefore that the lock and extractor are arrested in different positions, and as these are exactly indicated by the crank handle, the position of the latter should be carefully observed directly a stoppage occurs.

To assist in doing this, diagrammatic sketches are given, which show approximately the position of the crank handle in each of the above four cases.



Probable
causes of
failure.

The causes of failure are probably:—

- I. Too much weight on the crank spring, want of oil, or a light charge.
- II. Obstruction in chamber or defective ammunition.
- III. (a) Too little weight on the crank spring.
(b) Want of oil.
(c) Damaged lock.
(d) Fault in feed.
- IV. (a) Missfire.
(b) Empty cartridge or one with a loose projectile.

The above may be remedied as follows:—

First case.

I. There is no need to open the cover, simply bring the crank handle fully forward and release it, then all is ready for firing. If the stoppage is repeated the crank spring should be lightened as previously described, taking care to see that the regulator lever is at "safe."

Heavy crank
spring.

Want of oil.

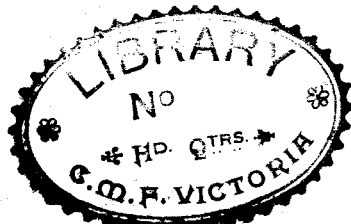
If this stoppage recurs with the crank spring at minimum weight, the cover should be opened and the bearings and working parts well oiled, the regulator lever being previously turned to the "safe" position.

Second case.

II. Turn the regulator lever to "safe," open the cover, press down the extractor and turn the crank handle over to the front, jerking it up by force if necessary, raise the lock and examine the chamber to see if there is any obstruction in it, and also the cartridges in the extractor to see if any are damaged.

Third case.

III. First remove finger from trigger lever, then without opening the cover, strike the crank lever sharply with the right hand to send it



home, taking care to remove the hand from the handle instantly; if this is easily done, and then on again pulling the trigger the same stoppage recurs after firing a few rounds, it will be advisable to turn the regulator lever to the "safe" position and to increase the weight of the crank spring.

Light crank spring.

If this stoppage recurs with the spring at maximum weight, the regulator lever should be turned to the "safe" position, the cover opened, and the bearings and working parts well oiled.

Want of oil.

If the gun again fails similarly, the lock should be removed for examination and replaced by the spare one.

Damaged lock.

Should it be found when this stoppage occurs that the crank lever cannot be easily sent home by a blow from the hand, then turn the regulator lever to the "safe" position, open the cover, and look at the face of feed block, when it will probably be seen that the cartridges have not been properly fed up. Now feel the belt in the feed block to see whether it is loose or jammed; if the former, it can probably be adjusted by pulling the belt to the left front; but should it be tightly fixed with the cartridges fed crossways, withdraw the lock (taking care to press down the extractor while doing so), raise it, and clear it of cartridges; next replace the lock and fix it as follows:—Turn crank lever to the front until the cam pawls engage the horns of the extractor, then let go the crank lever and the lock will now be found fixed so that on pulling the crank lever to the rear the recoiling portion is drawn back and the actuating levers in the feed block are moved to the right, thereby releasing the pressure on the belt, so that by pulling the latter to the left front the next cartridge can usually be correctly brought into position; then close the cover, turn the crank lever fully to the front, and let it go; then on turning the crank lever again to the front, and pulling the belt to the left, all is ready for firing.

Fault in feed.

How to move recoiling portion by means of crank handle.

A jam in the feed block can usually be readily recognised without opening the cover, as in that case the recoiling portion is prevented from going right forward, and so a space can be clearly seen between the front of the crank bearing and the end of the slot in breech case.

How to recognise a jam in the feed block.

If it is found that the feed is correct but that the crank lever cannot be sent home, the lock should be removed for examination, and if necessary replaced by the spare one, care being taken that the regulator lever is previously placed in the "safe" position.

It may be added that the plan of fixing the lock and moving the recoiling portion by turning the crank lever as described above, affords a ready method of oiling the bearing parts of the barrel at its most important points, viz.:—(a) Just in rear of the breech packing gland (which can be got at by removing the feed block), and (b) at the muzzle end in front of the packing gland.

IV. Turn the crank lever over fully to the front, pull the belt to the left through the feed block, and let go the lever. By this action the defective cartridge will be drawn out of the chamber and placed in the ejector tube, and a new cartridge drawn from the belt and placed in the chamber.

Fourth case. Missfire.

Missfires may occur as follows:—

Causes of missfire.

1. By a weak main spring.
2. By the firing pin in the striker being broken or worn flat on the point.
3. Lock mechanism being corroded.
4. By a defective cartridge.

ammunition, the other to carry two ammunition belt boxes. At the front of the box, immediately under the seat, two compartments are formed for carrying—on the near side—a 3-lb. grease box, two water tanks, and a can for spare buffer liquid—on the off side—a box for spare parts and tools.

The stores carried on the limber are detailed at p. 43.

AVERAGE WEIGHTS.

(Without personal equipment or any Nos. of detachment.)

						Mark I.			Mark II.		
						cwt.	qrs.	lbs.	cwt.	qrs.	lbs.
Weight of	gun	..	..	..	..	3	2	18	3	2	18
	water in jacket	..	..	..	..	0	0	14	0	0	14
	carriage	..	..	..	..	7	1	22	9	0	17
	ammunition belt box bracket	..	..	..	..	0	1	0	0	1	0
	limber { (with 12 empty belt boxes)	..	..	..	..	11	2	4	—	—	—
	2 " " "	..	..	..	..	—	—	—	10	1	0
	300 rounds of ammunition	..	..	..	..	4	0	18	—	—	—
	400 " " "	..	..	..	..	—	—	—	5	2	5
Average total weight behind traces						27	0	20	28	3	16

AMMUNITION.

(Plates IX and X.)

CARTRIDGE.

The cartridge case is of solid drawn brass, slightly tapered towards the mouth and recessed at the base to take a percussion cap. The charge consists of about 1 oz. 90 grs. of cordite, size $3\frac{1}{4}$, placed loose in the case, with an igniter of nitrated canvas placed underneath.

PROJECTILES.

The common shell is made of cast iron, and is screwed in the head to receive a nose fuze.

The steel shell has a pointed head, and is screwed in the base to receive a base fuze.*

Both shells have a copper driving band near the base and a copper steadying band on the shoulder. A groove is turned below the driving band, into which the neck of the cartridge case is pressed.

FUZES.

The fuze for both shells is percussion, and constructed on the same principle. Each fuze is provided with a split collar, and a pellet, which contains the detonator. On the shock of discharge, the collar expands and sets back over the pellet, and then, on impact, both are thrown violently forward, so that the needle (which is fixed in the screwed cap) pierces the detonator, thus igniting the powder in the shell.

* A number of steel shells have been issued, but no more will be provided.

DIMENSIONS, WEIGHTS, BALLISTICS, &c.

Nature.	Diameter.			Length (maximum).	Bursting charge.		Weight filled and fuzed.
	Body.	Driving band.	Steadying band.		Nature.	Weight.	
Common shell ...	in. 1.45	in. 1.503	in. 1.456	in. 3.367	{ Pistol powder Special fine-grain powder }	grs. 340	lb. oz. 1 0
Steel shell * ...	in. 1.45	in. 1.503	in. 1.456	in. 3.616		200	1 0

					lbs.	ozs.	grains.
Weight of {	Cartridge case ..	..	..	..	—	6	0
	Complete cartridge, with shell	..	..	..	1	7	140 (about)
Mean capacity of cartridge case ..					=	4.36	cubic inches.
Muzzle velocity ..					..	1800	f.s.
Pressure in chamber of gun ..					about 11 $\frac{3}{4}$	tons	per sq. inch.
Perforation of wrought iron {	at muzzle	..	..	..	=	2.25	inches.
	at 109 yards	..	..	..	=	2.08	"
	at 656 "	..	..	..	=	1.39	"

MACHINE FILLING BELTS.

(Plate XI.)

The belt filling machine is designed to force home the cartridges which have been partially inserted into the pockets of the belt by hand.

It consists of a metal block with a groove on top, and a lever pivoted at the bottom rear end of the block.

The belt is laid on the top of the block with the cartridge (which has been partially inserted into a pocket) lying in the groove, with the base towards the lever. On pressing the lever towards the block, the cartridge is forced home into the belt; the latter being prevented from moving by two projections on each side of the groove. Care should be taken that the lever completes its stroke each time, or the heads of the cartridge will not be in line.

The machine is carried in a special packing chest, which also acts as a stand for the machine when in use.

Weight of chest with machine and accessories, 57 lbs.

TOOLS FOR REPAIRING BELTS.

The tools for repairing belts consist of a die and punch, and the method of use is as follows:—

Remove the damaged eyelet or strip.

Put the new eyelet in the strip, and, placing the large end of the eyelet on the die, insert the punch in the small end and expand it by light blows on the punch.

In putting strips on the belt, care must be taken to keep the wide end of the strip the correct way, as, if not, the pockets will not be correct.

* A number of steel shells have been issued, but no more will be provided.

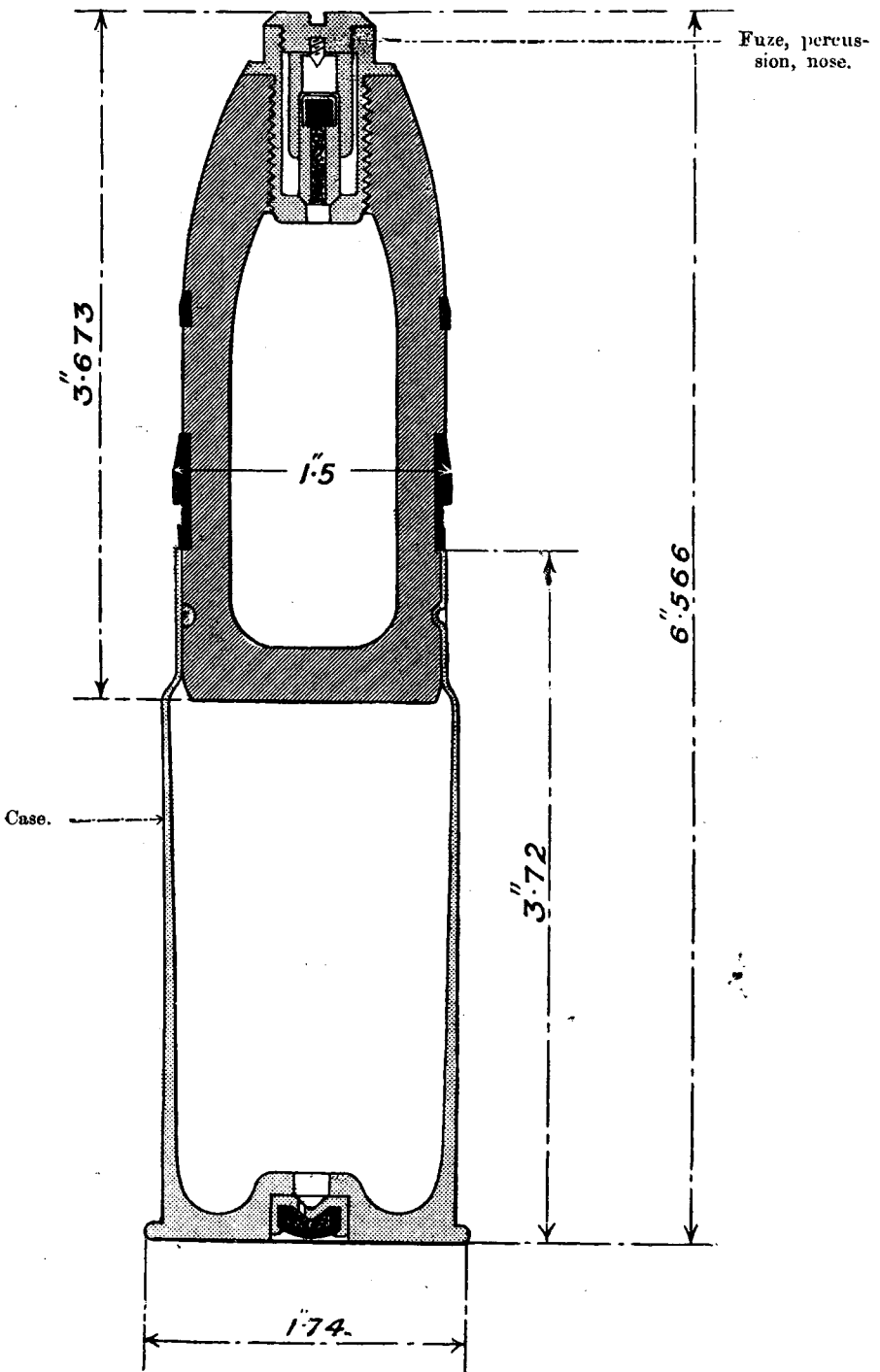
RANGE TABLE FOR Q.F. 1-PR. GUN, MARK I.

Weight of $\left\{ \begin{array}{l} \text{Charge, about 1 oz. 90 grs. cordite.} \\ \text{Projectile, 1 lb.} \end{array} \right.$

Muzzle velocity, 1800 f.s.

Range.	Elevation.		Angle of Descent.		Time of Flight.	Remaining Velocity.
yards.	°	'	°	'	secs.	ft.-secs.
100	0	11	0	16	0.17	1686
200	0	18	0	23	0.35	1578
300	0	25	0	32	0.54	1475
400	0	33	0	42	0.75	1378
500	0	42	0	53	0.98	1290
600	0	52	1	5	1.22	1211
700	1	2	1	19	1.47	1142
800	1	13	1	34	1.74	1083
900	1	24	1	50	2.03	1035
1000	1	36	2	7	2.33	997
1100	1	48	2	26	2.64	964
1200	2	1	2	46	2.96	933
1300	2	15	3	7	3.29	904
1400	2	30	3	29	3.63	877
1500	2	45	3	52	3.97	851
1600	3	1	4	16	4.32	826
1700	3	17	4	42	4.68	802
1800	3	34	5	9	5.06	780
1900	3	51	5	37	5.45	759
2000	4	9	6	6	5.86	738
2100	4	27	6	35	6.28	718
2200	4	46	7	5	6.71	699
2300	5	6	7	36	7.14	680
2400	5	26	8	7	7.58	662
2500	5	47	8	39	8.03	644
2600	6	8	9	12	8.50	627
2700	6	30	9	46	8.98	610
2800	6	52	10	21	9.48	593
2900	7	14	10	57	9.99	577
3000	7	37	11	33	10.52	561

CARTRIDGE, Q.F., 1-PR., MARK I.
COMMON SHELL.



CARTRIDGE, Q.F., 1-PR., MARK I.
STEEL SHELL.

